JOURNAL OF BUSINESS MODELS

2021
Vol.9 - No.4

Journal of Business Models (2021), Vol. 9, No.4
Editorial staff: Robin Roslender, Marco Montemari & Mette Rasmussen

Graphics: Kristina Maria Madsen

Font: Barlow

ISBN: 978-87-7112-126-1
ISSN: 2246-2465

Published by:

Aalborg University Press
Skjernvej 4A, 2nd floor
9220 Aalborg
Denmark
Phone: (+45) 99 40 71 40
aauf@forlag.aau.dk
www.forlag.aau.dk

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JOURNAL OF BUSINESS MODELS

Editorial

It is especially pleasing to be able to able to publish a second standard issue of the *Journal of Business Models* in 2021, a year in which Covid-19 returned with a vengeance to further disrupt just about every aspect of our daily lives. As I write this editorial there are signs that some countries are contemplating re-introducing measures designed to contain worrying increases in the incidence of the virus. At the same time we now have a number of vaccines that have proven effective in combatting its severity amongst populations. These vaccines are complemented by a growing range of administrative arrangements designed to further contain the transmission of the virus, one of which is the development of digital vaccination certificates. It is fitting, therefore, that one of the papers in this issue, contributed by Liina Joller, documents the development of a vaccination certificate using the platform business model framework.

The issue contains a further three full length papers, together with three short papers. There is also the first book review to be published in the journal, Raphael Amit and Christoph Zott's *Business Model Innovation Strategy*, published in 2021 by John Wiley and Sons. We aim to publish further reviews in coming issues.

In June we learned that the journal had been listed on the Academic Journal Guide (AJG) for the first time. Formerly referred to as the ABS (Association of Business Schools) list, in recent years the AJG has become increasingly influential across business and management disciplines as they pursue reliable indicators of academic publication quality. This listing has been achieved after only eight years of activity as a locally-funded, open-source outlet for work in the business model field. We are particularly happy to see that the AJG identifies us within its Strategy sub-list, alongside many long-established and widely recognised journals. Many thanks to everyone who has contributed to the progress we have achieved over the past eight years.

As we approach 2022, we do so with a recently established expanded editorial structure. Two new Associate Editors have been recruited: Annabeth Aagaard will assume responsibility for the development of a thematic section focused on digitalisation and business models; and Florian Ludeke-Freund who will be responsible for the development of a thematic section focused on the sustainability and business models. Marco Montemari continues as the Associate Editor for short papers and the Business Model Conference special issue, with Irina Atkova now looking after the publication of an increased number of special issues. Mette Rasmussen also continues as Managing Editor alongside myself and Christian Nielsen in our existing roles. It is envisaged that further Associate Editors may be recruited as the business model field continues to develop.

As the scale of activity has increased, and hopefully will continue to do so, we have become conscious

DOI: https://doi.org/10.5278/jbm.v9i4.7014
ISSN: 2246-2465

that we need to improve the review and throughput process to provide a better service to our various stakeholders. The present submission guidelines are under review, with the intention of ensuring that all submissions are sufficiently well developed to enter the existing double-blind peer review process. Members of both the Editorial Advisory Board and Editorial Board are being invited to commit to undertaking more reviews in the future, while the database of ad hoc reviewers will initially be slimmed down. The editorial team has also begun to identify colleagues who they believe should be invited to become associated with the journal as we seek to enhance its present academic status. The journal's website will be amended to reflect all of these changes.

Following a very successful Business Model Conference 2021 in Copenhagen in early October, we took the decision to strengthen the link between the journal and the conference. Three issues of collected short papers submitted to previous conferences have been published, with a collection from the Copenhagen conference presently under development for publication in early 2022. Previous conferences have also provided papers for special issues. We feel the link could now be beneficially further highlighted, thereby attracting a wider level of interest and in turn a higher quality of submissions to the journal. Information regarding the 2022 conference, to be held in Lille next June, will feature this process. Further initiatives to strengthen the profile of the journal are also under discussion. A fuller use of the communication technologies now available the academic and business model communities will soon become evident.

Again, many thanks to everyone who has contributed to the progress that the *Journal of Business Models* has made since its launch in 2013. On behalf of the editorial team, I hope you find the content of the present issue valuable and that it encourages you to continue your association with the journal.

Robin Roslender, Editor-in-chief
Aalborg University Business School
December 2021

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What Is a Business Model – For Products, Platforms, or Ecosystems?

Esko Hakanen[1]

Abstract

This article suggests that the definition of a business model depends on the application context: products, platforms, or ecosystems. Building on existing literature and illustrative examples, the paper clarifies the business model construct by emphasizing the context of analysis. The article presents three different approaches for evaluating business models in different settings and delineating the context-specific characteristics for each business model. Also, the paper strengthens the explanatory power of the business model concept beyond the boundaries of a focal firm, offering clarity to complex settings without a clear division between a supplier and a customer.

Keywords: business models, platforms, ecosystems

Acknowledgments: I would like to thank the members of BATCircle (Business Finland) for their support) and ATARCA (EU H2020 grant No. 964678) for their support. I thank associate editor Marco Montemari and two anonymous reviewers for their helpful suggestions.

Please cite this paper as: Hakanen, E. (2021), What Is a Business Model – For Products, Platforms, or Ecosystems?, Journal of Business Models, Vol. 9, No. 4, pp. 1-12

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DOI:https://doi.org/10.5278/jbm.v9i4.6475
ISSN: 2246-2465

Introduction

The business model of a firm has become an established concept in management research for describing the activities of firms in the middle ground between their strategies and operations (e.g., Casadesus-Masanell and Ricart, 2010; Massa et al., 2017). The concept has been used to describe a firm's business mainly from the supplier's perspective and intended to outline the focal firm's offering and activities with its customers (Priem et al., 2018). Put differently, the business model has been considered as the manager's or the focal firm's conjecture about who their customers are, what those customers want, and how the firm can deliver value to these customers with a profit (Foss and Saebi, 2017; Teece, 2010).

However, as value creation is taking increasingly networked, dynamic, and complex forms, such approaches that focus on a focal firm's actions are becoming limited (Massa et al., 2018). Consider, for example, the Linux open-source software community, where the customer is not a clearly defined group of actors, nor the provider is a sole organization. Since the community members provide different contributions and have various reasons or incentives for partaking, it is practically impossible to delineate the value proposition for each contributing member or action with the traditional approach, in which the business model is conceived unidirectionally from the provider's perspective. Moreover, novel decentralized technologies have enabled solutions without intermediary actors, offering new premises for economic and social systems (Mas et al., 2020). Thus, managers or firms looking to build a community–or an ecosystem of interdepended partners who contribute toward a shared goal (Adner, 2017; Shipilov and Gawer, 2020)–require a different approach to outline the business model of such complex systems of activities that span the boundaries of the focal organization (Massa et al., 2018).

The purpose of this paper is to amend the current thinking of business models by suggesting a context-specific approach for the conceptualization of the business model. Since a common understanding of the essence of business models is still largely missing (Wirtz and Daiser, 2018), this article highlights how the context of analysis influences the persistent question of "what actually is a business model?" (Belussi et al., 2019). We offer examples of viable conceptualizations of business models for products, platforms, and ecosystems and argue that the exact articulation of the concept should depend on the context of analysis. Building on existing literature and illustrative examples, we show how the different approaches help delineate the typical characteristics of the transactions associated with the various business model elements in distinct contexts. In so doing, we address recent calls to provide a common language for scholars and practitioners addressing the business model concept in different contexts (e.g., Belussi et al., 2019; Massa et al., 2018; Wirtz and Daiser, 2018). We contribute to theory by adding coherence to the dispersed literature. Moreover, as the popularity of different business model definitions builds on essentially distinctive factors, we complement the existing literature by suggesting the most viable setting for the said approach. Next, after a short overview, we will present three approaches to business models suitable for products, platforms, and ecosystems, respectively.

Approach

Despite numerous attempts, the academic literature has been rather far from finding a commonly agreed definition for a business model (Belussi et al., 2019; Foss and Saebi, 2017; Massa et al., 2017; Ritter and Lettl, 2018). For instance, Belussi et al. (2019) noted considerable differences in the level of abstraction in the past research, ranging from models and frameworks to meta-models and activity systems. The more concrete representations outlined different elements and frames for business models, whereas more abstract ones combined micro individual processes with broad themes (e.g., novelty, complementarities, lock-ins). Similarly, Massa et al. (2017) identified three common interpretations of business models: formal descriptions of organization's functions; attributes of real firms impacting the business operations; or cognitive/linguistic schemas held by the managers. Despite the merits of these classifications, a demand to reduce the variety of the presented typologies remains (Belussi et al., 2019). In particular, scholars have rarely instructed how the context of analysis should be accounted for when analyzing business models.

To address this deficiency, our main argument in this paper is that different approaches in the business model literature are suited for delineating the business models in specific analytical contexts. Subsequently, we suggest that the context of analysis should be acknowledged when defining what a business model is. Table 1 summarizes our conceptual arguments, including the context of analysis, the illustrative examples we address in this paper, typical transaction relationships and partners, the

Table 1.

Context of analysis	Products	Platforms	Ecosystems
Illustrative examples provided	iPhone Traditional value chain Robot vacuum selling idle computing power	iPhone AppStore Apps: Uber, Spotify	Apple Continuity Tracey fishery data Intelligent goods with smart contracts Open-source community (Linux)
Typical transaction relationships and partners	Dyads, firms (e.g., customer-provider)	Triads, sides (e.g., in multisided markets)	Activities, members (e.g., complements & complementors)
Business model elements	Value proposition	Value creation	Activity system
	Value constellation		
	Value sharing (economic and/or social)	Value capture	
Key references	(Richardson, 2008; Teece, 2010; Yunus et al., 2010)	(Casadesus-Masanell and Zhu, 2013; Demil et al., 2015; Zhu and Furr, 2016)	(Amit and Zott, 2015; Massa et al., 2018; Zott and Amit, 2010)
Suggested readings	(Bocken et al., 2014; Foss and Saebi, 2017; Osterwalder and Pigneur, 2010; Reim et al., 2015; Teece, 2018)	(Casadesus-Masanell and Ricart, 2010; Choudary, 2015; Parker et al., 2016; Priem et al., 2018; Thomas et al., 2014)	(Adner, 2012, 2017; Jacobides et al., 2018; Kapoor, 2018; Marttila et al., 2019; Rajala et al., 2018; Shipilov and Gawer, 2020)

Table 1: Different approaches for analyzing business models and the suggested business model elements to consider depending on the context of analysis

different business model elements and their interrelation, and some key references and additional readings to support our argumentation. Overall, the three alternative approaches to defining business models have different reasons for their popularity. Thus, these views should be regarded as complementary rather than alternatives, as different analytical perspectives may provide additional insights if applied in the same context of analysis.

First, for analyzing product-centric transactions, it might be useful to identify and differentiate the key elements for a business model. Most commonly, these elements state "*the firm's value proposition and market segments, the structure of the value chain required for realizing the value proposition, the mechanisms of value capture that the firm deploys, and how these elements are linked together in an architecture*" (Foss and Saebi, 2017, p. 202). More distinctively, this perspective summarizes a business model through three key elements, value proposition, value constellation, and value sharing, in which the value constellation refers to how the value proposition is realized (Yunus et al., 2010), and value sharing refers to how the created value is distributed among the different participants (Svejenova et al., 2010). Thus, value sharing incorporates the aspects of profit and revenue models of the firm (Richardson, 2008) and provides the financial translation of the other two elements, including non-economic measures (Yunus et al., 2010). While there might be slight differences in terminology, many authors share the conceptual model of describing the chosen architecture for value proposition, value creation and delivery, and value capture (e.g., Bocken et al., 2014; Reim et al., 2015; Richardson, 2008; Teece, 2010).

Second, different platforms rely on facilitating value-creating interactions between their members (Choudary, 2015; Parker et al., 2016; Thomas et al., 2014). Such an approach resonates with the stream of business model research that originates back to the rise of e-commerce when the business model became the tool to describe the "*content, structure, and governance of transactions designed to create value,*" accompanied by a revenue model that "*refers to the specific modes in which a business model enables revenue generation*" (Amit and Zott, 2001, pp. 511–515). Such thinking follows a popular option to describe a business model as the value creation and capture mechanisms of a firm (Demil et al., 2015; Massa et al., 2017; Zhu and Furr, 2016). Platforms leverage network effects by mediating the interactions between their members (Choudary, 2015; Thomas et al., 2014), thus connecting the value proposition (i.e., the suggested benefit) and the means to realize the proposed value (i.e., value constellation) tightly to the interactions facilitated through the platform. In many cases, it is difficult–if not impossible–to separate the value proposition from the value constellation, making it more relevant to address these jointly as the mechanisms for creating value. Furthermore, since the value is created through interactions that are facilitated by the platform and, typically, a part of that value is–directly or indirectly–captured by the platform provider as compensation (Casadesus-Masanell and Zhu, 2013; Choudary, 2015; Zhu and Furr, 2016), such twofold approach to business models lays out a fitting foundation for analyzing platform businesses.

Third, for analyzing the business models in ecosystems, a different perspective may be needed. An ecosystem, often defined as "*a set of actors with varying degrees of multi-lateral, non-generic complementarities that are not fully hierarchically controlled*" (Jacobides et al., 2018, p. 2264), can make the business model analysis challenging, especially if one tries to delineate the different elements or the dyadic transactions that take place in this setting. [1] Luckily, a stream of business model research has been approaching the concept as a set or system of interlinked activities necessary for some value to be realized (Amit and Zott, 2015; Massa et al., 2018; Zott and Amit, 2010). While these activity systems may

[1] While many alternative definitions for the ecosystem exist, all of them are complicated from the business model perspective. Consider, for instance, the descriptions by Adner (2017): "ecosystem is defined by the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize" or Kapoor (2018): "an ecosystem encompasses a set of actors that contribute to the focal offer's user value proposition" and whether it would be possible to identify how the focal firm delivers value to the customers, attracts payments and converts those payments to profits (cf. Teece, 2010). Moreover, different views on ecosystem governance may differentiate between open and closed ecosystems, complicating the issue further (see Jacobides et al., 2018).

vary in the level of complexity, all of them can be described as an integrated whole of different interacting components (Massa et al., 2018). This approach does not differentiate between the various elements or parts of a business model but emphasizes how all the different activities are ultimately interlinked and multilateral. The definition is relatively abstract and may not be practical, for instance, to delineate transactional agreements typical in a product-centric context. However, the growing interest in ecosystems within the business context calls for employing such a holistic view (e.g., Rajala et al., 2018; Shipilov and Gawer, 2020; de Vasconcelos Gomes et al., 2018). Next, we will elaborate on these three contexts of analysis using illustrative examples.

Key Insights

To outline the approaches in detail, we will start from the most concrete product offerings, then discuss multisided transactions in platforms, and end with the most abstract view of interlinked ecosystems. For an illustration of the applicability of the presented definitions, consider Apple. The company illustrates all three approaches in its operation. Moreover, these approaches relate simultaneously to a single offering. We present three examples from the company: iPhone as a product, apps (for iPhone) as platforms, and Apple's Continuity feature that integrates different operating systems as an ecosystem.[2] Also, we complement our argumentation with other examples, including the widely-known platforms of Uber and Spotify, and perhaps less-known ecosystems for fishery catch and trade data (Marttila et al., 2019) and intelligent goods (Rajala et al., 2018).

Product manufacturing relies on dyadic transactions in supply chains

First, consider the (physical) product perspective-the iPhone. It is a classical representation of supply chain manufacturing. The whole process is very strictly controlled and hierarchically governed. Transaction prices are set with fixed and thin margins. The supply chain aims for zero deviation within the single product class. Despite the different generations (such as iPhone 8, 12, or XS) and specifications (64, 256, or 512 GB of storage), the whole purpose is that two units with the same specifications are identical. The value that Apple communicates to its potential customers relates heavily to technical aspects. This focus can be seen easily from the company web pages, filled with technological specifications, lists of new features that the current product enables, and so forth. Clearly, the focus is on delineating why the iPhone is a good product.

There are different stages in materializing the offering. The first step is to convince the customer that this is the product to buy (i.e., what is their value proposition to what kind of customers). After that decision has been achieved, the customer is directed to the practicalities, such as where to buy, whether online from Apple or locally from some retailer. This part links to the value constellation. Third, the customer considers and compares the prices, delivery times, or payment agreements between the alternative suppliers, and the value sharing stage initiates. Ultimately, this third step impacts how the created value is distributed among the different participants and defines the value sharing of each product sale (Svejenova et al., 2010). These three business model elements might not always be temporally distinctive phases, but they are different facets that need to be sorted out for making the sale. In addition, such product-centric, dyadic transaction relationships may also be identified as a part of more complex structures, similar to how Apple's iPhone sales feed to the growth of their AppStore platform and the functionality of their Continuity feature.

Platforms facilitate interactions for value creation and capture

Second, consider AppStore for iPhones. The majority of iPhone's success as a market disruptor has been accredited to this solution for developing and distributing the software-or apps-to the end customers' phones (Adner, 2012; Gawer and Cusumano, 2014; Parker et al., 2016). Such an approach, which effectively leverages the available network effects, has been described as "platform thinking" (Choudary, 2015) or even "platform revolution" (Parker et al., 2016). In general, platform business models may not focus on creating tangible products but rather enable value by curating and governing interactions

[2] Continuity: All your devices. One seamless experience https://www.apple.com/macos/continuity/

between different members (Choudary, 2015; Massa et al., 2017). The platforms offer an architecture for connecting and mediating interactions between different sides, while the providers of those platforms "*leverage a shared trading platform to create and appropriate value from both sides of the market*" (Thomas et al., 2014, p. 110).

Thus, from a business model perspective, a significant change is that, in platforms, value proposition and value constellation have become intertwined. The value that is communicated to potential customers is heavily focused on usage. Therefore, platform thinking is not targeted traditional manufacturing of physical products nor supply chains. The marketing material–or description pages in AppStore–include phrases such as "download now for free" or "you'll find all the necessary tools to get you started." The digital content is readily downloadable, and, in many cases, the pricing follows the freemium principle (cf. Teece, 2010) or "sponsor-based business models" (Casadesus-Masanell and Zhu, 2013). For any provider, it is surmountable that the value creation happens by leveraging the resources and infrastructure of the platform (Thomas et al., 2014), feeding to the platform's scale and growth through positive network effects (Choudary, 2015; Parker et al., 2016)

So, even though the different elements may be inseparable, each offering includes aspects of value creation (i.e., what you can do with the app) and value capture (i.e., download for free, improve with in-app purchases). The platform provider acts as an intermediary between the connected sides and can utilize this position by setting a commission for each transaction. Similar thinking applies to other popular platform companies, such as Uber. As the disruptor of the taxi industry, Uber may be offering their customers cheaper rides, ease of use, or integrated payments. Still, all these benefits are only available through using their proprietary platform if the customers and providers (i.e., riders and drivers) agree on Uber's pricing policy. Similarly, Spotify provides a clear example of how value creation is tied to its platform. The different subscription plans impact the price of the service (i.e., value capture) and the available value-creating elements.[3] Thus, in platforms, value creation and value capture are ultimately defined by the tools and rules set by the platform provider (Choudary, 2015).[4]

Ecosystems are based on dynamic systems of interlinked activities

The third perspective is best suited to the current trend of open systems, driven by complementarity in consumption and production. From a business model perspective, when there is a feature that supports and improves the use of other products or services but has no apparent solution for monetizing this benefit, we suggest analyzing that setting from an ecosystem perspective.[5] As an example, Apple improves the usability of their different products with the "Continuity" feature. Continuity offers seamless integration between Apple's various operating systems–iOS for handheld devices and macOS for computers–by which the user can, for instance, begin writing an email with their iPhones, but once near their laptop, they can simply click an offered icon to continue writing that same message on a computer. The same philosophy is applied when Apple announces on its web pages how "your favorite apps are even better with iCloud," thus supporting the overall value proposition of their product line, including the iPhone. In these settings, it may remain ambiguous what is truly offered to the customers or how Apple improves the user experience with these features. Moreover, all of the benefits are offered free of charge.

3 Spotify Premium: https://www.spotify.com/us/premium/

4 The platform provider has a powerful position in controlling the interaction between the participants. Indeed, Apple's recent announcement to offer a reduced commission rate of 15% (in contrast to 30%) for small businesses underlines the controlling power of the platform providers: no negotiation was needed; simply an announcement of the new policy was sufficient. https://developer.apple.com/app-store/small-business-program/

5 While business model research has acknowledged the role of activities as the base of understanding what a business does, there is often implicit guidance toward efforts that can be monetized, since: "These activities only make economic sense when they follow logics of value creation and value capture" (Ritter and Lettl, 2018, p. 4). Monetization is more straightforward in consumer product markets (Teece, 2018) or in situations where the activities can be decomposed into bilateral relationships, such as in a supplier-provider relationship or when a platform provider acts as an intermediary between the sides (e.g., when Uber conducts transactions separately for drivers and riders). In fact, Adner (2017, p. 53) argues that the ecosystem construct is not needed in these situations: "ecosystems matter when the multilateral relationships that underlie a value proposition are not decomposable into multiple bilateral relationships."

For a more elaborate example, consider the Tracey ecosystem,[6] which brings together a company called TX, WWF Philippines, and UnionBank, and utilizes blockchain solutions for documenting and verifying fishery catch and trade data. TX is a consultancy partner of Streamr, which in turn is a distributed open-source software project, an organizational form that is rarely in the focus of business model research. However, since "*every organization has some business model*" (Casadesus-Masanell and Ricart, 2010, p. 206), we have to conclude that one can be drawn for the Tracey ecosystem as well. The project aims to facilitate reliable and traceable catch and trade data while incentivizing the fisherfolk to provide the data by creating direct and indirect rewarding schemes for their actions (Marttila et al., 2019). The ecosystem brings together various stakeholders, with different objectives and incentives for participation: *for WFF*, the main goal might be to get reliable, timely, and electronic catch and trade data to replace unreliable paper documentation; *for UnionBank*, it may be to explore new technologies and attract new customers to their services; *for the fishers*, it is to secure their livelihood by preventing overfishing or getting access for bank loans; and *for TX*, it might be to showcase Streamr's decentralize data marketplace technology or perhaps simply the admin fee for developing the solution. Altogether, the project relies on a complex activity system and utilizes many digital platforms but differs from a platform business model. Since the Tracey app is a decentralized application (DApp), as it builds on Streamr's decentralized, open-source data ecosystem, there is no focal orchestrator who mediates the interactions between the members, and, subsequently, no one cannot implement complete hierarchical control over other project partners at any stage.

Discussion and Conclusions

This paper offered three perspectives to business models to analyze products, platforms, or ecosystems. To illustrate our main arguments, we provided several examples to support our argumentation. In addition, we emphasized how the three alternative approaches to defining business models all draw from a long tradition of research and have different reasons for their popularity. We sought to increase coherence between the differing views among business model scholars by suggesting a contextual setting most applicable for each business model definition. Most importantly, as the different analytical perspectives complement one another, it might be valuable to apply multiple views in a single context of analysis.

Acknowledging the context of analysis is particularly important in complex settings with multilateral interdependencies and nested hierarchies (Massa et al., 2018). With new technological solutions, such as the blockchain and smart contracts (Dal Mas et al., 2020), we face more and more situations where the different approaches to business models become tightly intertwined. For example, Rajala et al. (2018) presented an ecosystem based on interchangeable electric vehicle battery packs as intelligent goods utilizing smart contracts. The battery pack could perform a trend analysis on electricity market price, utilize additional computing power from nearby smart devices (e.g., other vehicles or a robot vacuum cleaner), and pay for these resources in cryptocurrencies. Each member in this setting will have their own goals, incentives, and justifications for partaking. The underlying, complex activity system relies on a new infrastructure for transactions and illustrates a business model in an ecosystem context: each participant can flexibly contribute to the system as they see fit, assuming different roles and interacting with other members, ultimately strengthening the emerging ecosystem (Adner, 2017; Jacobides et al., 2018; Shipilov and Gawer, 2020). Yet, many of the activities can be regarded as dyadic transactions, for which a more specific product-centric business model can be defined. For instance, the smart contract between the battery pack and a robot vacuum cleaner may outline what is offered (computing power), how the offering will be delivered (granting access through an API), and how much it will cost (payable in cryptocurrency). Nevertheless, this one transaction is only part of a much larger, encompassing ecosystem and needs a vibrant community to make it relevant or worthwhile. Similarly, the Tracey ecosystem may contain dyadic agreements, for instance, when the data is sold or bought in the

6 TX Project: Tracey: "How the Tracey ecosystem works" https://tx.company/projects/tracey/

Streamr data marketplace. As these examples illustrate, the different aspects of the larger ecosystem build on various activities that are easier to understand when dissected at the proper level of analysis.

Another reason why the context of analysis may become increasingly relevant is when value creation and value capture become decoupled. In particular, ecosystems may exhibit such decoupling, complicating the business model analysis and also differentiating ecosystems from platforms. Such distinction can also be seen in the ecosystem literature, as "business ecosystem" research has focused on value capture, whereas "innovation ecosystem" has emphasized value creation (de Vasconcelos Gomes et al., 2018). The Tracey ecosystem illustrated this decoupling, as it comprised many vital activities for value creation in the ecosystem (e.g., facilitating the data flows) that did not directly link to a financial reward (or other means of compensation).[7] Instead, the Tracey ecosystem illustrated how value capture might often rely on indirect mechanisms, without the possibility to ensure the size of the reward for a member's contribution to the ecosystem. The defining features of ecosystems–interdependence, complementarity, and modularity (Adner, 2012; Jacobides et al., 2018; Kapoor, 2018; Shipilov and Gawer, 2020)–explain how a system of interlinked activities can help to create more value. However, there is no guarantee that an entity that helps to create a flourishing ecosystem will benefit financially from doing that (Teece, 2018). This dilemma may explain the highly expected benefits of collaborative ecosystems, including in the traditional fields such as manufacturing supply chains (Rajala et al., 2018), but the relatively slow pace for realizing these possibilities.

In conclusion, we suggest that scholars and practitioners should pay closer attention to the context of analysis when defining business models. Such an approach allows us to study various business models with higher distinction and better acknowledge the unique elements for each setting. In particular, Table 1 and the suggestion to focus on the said context (a product, a platform, or an ecosystem) may prove highly valuable to managers who wish for support in understanding the business models as they face the transition from linear value chains to complex ecosystems. It also helps to extend the explanatory power of the business model concept outside the boundaries of a focal firm, offering clarity to complex settings with no clear division between a supplier and a customer or where value creation is fundamentally decoupled from value capture.

7 See also "Data and revenue flows for the Tracey project" https://streamr.network/case-studies/tracey/

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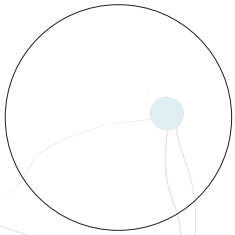

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Journal of Business Models (2020), Vol. 9, No. 4, pp. 13-35

JOURNAL OF BUSINESS MODELS

The Interaction Between Business Models and Business Reality

Peter Kesting[1]

Abstract

Purpose: The aim of this paper is to conceptualize the connection between business model and business reality. On this basis, the paper aims to put the business model on a solid conceptual basis and to build bridges to its neighbouring concepts. In this way, this paper should to contribute to more terminological and conceptual rigor of the business model construct. In addition, this paper aims to conceptualize the processes of constructing and using business models for decision-making.

Design/Methodology/Approach: This is a conceptual paper; it introduces and specifies a new construct, the status quo, as real-world counterpart to the business model. Based on this, it develops a model of the interaction between business model and status quo.

Findings: The key finding of this paper is that business model and status quo are shaped (and need to be described) by different characteristics. The characteristics of the status quo result from repetition (stability) and routinization (efficiency, low resistance, etc.). The characteristics of the business model result from observation, abstraction and simplification (purpose, observer perspective, etc.).

Originality/Value: This is the first paper to develop the status quo as an independent construct for management research. It also offers the first comprehensive model of the relation between business model and business reality. Based on that, it allows establishing new connections between the business model concept and the theory of the firm, particularly with regard to innovation and routine.

Keywords: business model; status quo; inertia; innovation; routine; theory of the firm

Please cite this paper as: Kesting, P. (2021), The Interaction Between Business Models and Business Reality, Vol. 9, No. 4, pp. 13-35

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DOI: https://doi.org/10.5278/jbm.v9i4.6238
ISSN 2246-2465

Introduction

In their seminal review, Zott, Amit and Massa (2011) show that there is a rich body of research on the business model construct[1], offering a variety of insights and demonstrating the explanatory power of the concept. However, in the same paper the authors conclude: 'the business model remains a theoretically underdeveloped (and sometimes overloaded) concept, which may raise doubts concerning its usefulness for empirical research and theory building. Future research on business models should seek to overcome these limitations.' (ibid.: 1038). Much has happened since; however, not all theoretical shortcomings could be overcome by research (Jensen, 2013; Fielt, 2013; DaSilva and Trkman, 2014; Wirtz, Pistoia, Ullrich and Göttel, 2016b; Foss and Saebi, 2018). One remaining theoretical problem is the relation between business model and business reality.[2]

Let me illustrate this problem with the example of Amazon. For quite some while, there has been an intense discussion in Germany about whether the business model of Amazon is that of a logistics company or that of a retailer (ver.di, 2019). This question was of particular interest for the involved participants, because if Amazon is a retailer, it has to pay significantly higher wages due to different collective agreements. However, the theoretical key point behind this discussion is that both parties are right to a certain extent. There are good arguments for either position and no side could prevail so far. Similar observations can be made in expert interviews or teaching exercises on business models: People have a different perspective on the business model of the same firm—most likely they have different information, but they also interpret their information in different ways. But what does this mean? What is the business model of the firm? Is it the interpretations of individuals, so that, as a consequence, the same firm can have two or more mutually exclusive business models at the same time? Or is the business model the reality behind the interpretation? But what is this reality? Retailer or logistics company? How can we make assertions about this and what is the epistemological status of such assertions?

This lack of clarity points to a more fundamental underlying conceptual problem: in fact, the business model does not denote one, but two different constructs at the same time. On the one hand (reality level), the business model denotes attributes of real firms, 'how a company makes money' (Birkinshaw and Goddard, 2009: 81). Chesbrough (2007: 12, emphasis added), for instance, states: 'Every company *has* a business model, whether they articulate it or not.' On the other hand (abstraction level), the business model denotes the conceptual representation of the business reality (Massa, Tucci and Afuah, 2017). Osterwalder, pegnuer and Tucci (2005: 3), for instance, specify the business model as 'a conceptual tool containing a set of objects, concepts and their relationships'.

This confusion has been recognized and discussed before (DaSilva and Trkman 2014; Baden-Fuller and Morgan 2010), but it has never been cleared up. Different levels of abstraction have been distinguished (Osterwalder, 2004; Massa et al. 2017; Jensen, 2013; Taran and Broer, 2017). However, these different levels are hardly related to each other and mostly exist side by side. There is no holistic model that conceptualizes the interaction between business model and business reality. As a consequence, the use of the business model term is often erratic, oscillating somewhere between the different meanings; in the words of Foss and Saebi (2018: 9), 'BM and BMI [business model innovation] constructs are used in multiple explanatory contexts.' Or as Jensen (2013) has put it: 'much of the discussion and confusion is

[1] The two terms, concept and construct, are closely related. Both denote phenomena that are thought as a semantic unit, becoming part of a thought or a theory. Concept, consisting of the Latin prefix "con" and the verb "capere" (taking, grasping) is more focusing on its theoretical function, whereas construct, which is borrowed from the Latin word "construere" (erect, build), is more focusing on its mental nature. In the text, I use both terms as characterizations, either pointing to the theoretical (concept) or the cognitive (construct) dimension of the respective term.

[2] The notion of reality is strongly loaded in the philosophical discussion. One key challenge is that there is no valid inference, leading from subjective impressions to evident statements about the nature of matters (Popper, 1959; Caldwell, 1982). It is not even uncontroversial if there is one reality at all and inasmuch reality itself is (socially) constructed (Lawson, 2016). However, the use of the term reality in this article is broad, pointing to the existence of firm activity as the subject of model construction.

due to lack of clarity of more fundamental aspects in the different applications of the concept.'

What is the problem? Wittgenstein (1921) already noted that many philosophical problems have their origin in an imprecise use of language. In this line of thought, terminological, conceptual and methodological rigor became key principles of research. Assigning two or more substantially different meanings to one and the same term fundamentally violates these principles, leading to confusion and unproductive discussions. One example of this is the ongoing dispute about the relation between business models and strategy, with some researchers understanding business models as part of strategy itself and others as its consequence and manifestation (Teece, 2010, 2018; Massa et al., 2017; Casadesus-Masanell and Ricart, 2010; Zott and Amit, 2008). Both positions are contradictory and correct at the same time (depending on the grounding concept of business model). Similar confusions can be diagnosed for other aspects of business models, including cognition, routine, innovation and many more. At all these points, the missing distinction between the abstraction and reality level is impeding the progress of business model research. This is very much in line with the critical conclusion by Foss and Saebi (2018: 9): 'We argue that the lack of cumulativeness stems from lack of construct clarity (i.e., BM and BMI are seldom defined with much precision) and lack of agreement on definitions'.

This conceptual confusion can only be cleared up by the conceptual distinction of two independent constructs, one denoting the reality level and the other one the abstraction level. Moreover, without such a distinction it is impossible to conceptualize the complex interaction between abstraction and reality, how business models are constructed in order to capture firm reality, how this impacts strategy and how strategy again impacts firm reality.

The main aim of this article is to introduce the concept of the *status quo of the firm* as real-world counterpart to the business model. The status quo of the firm specifies how a firm pursues its business at a certain point in time (without any substantial changes). The construct has a long history and an outstanding meaning for almost all dynamic theories, beginning with Schumpeter's theory of innovation, and leading to more recent research like the distinction of exploitation and exploration and the specification of dynamic capabilities. However, the status quo has barely been a subject of reflections itself and most researchers are not familiar with it. For this reason, the status quo concept is carefully presented in section 2. The emphasis here is on persistence as key characteristic of the status quo and its relevance for firm behaviour, particularly with regard to innovation. Following, an overview of research insights in relation to that is given. In section 3, I will argue that the very conception of the BM stipulates that a business model is an abstract representation of a certain status quo of a firm. Based on this conceptual positioning, I will then introduce a model of the interaction between business model and status quo. This interaction model provides a conceptual ground for the clarification of the attributes of its key constructs, business model and status quo. It will be outlined how the business model is shaped by the construction process and the status quo by repetition. Interaction mechanisms will be identified and mapped. The discussion in section 4 then outlines the consequences of the interaction model and key contributions of this paper: a far-reaching terminological and conceptual clarification; a new perspective on the interaction between business model and business reality; and the establishment of new bridges, linking business model research with the theory of the firm.

The Status Quo of the Firm—What and Why

As a starting point, and in order to get a deeper understanding of its structure, it needs to be pointed out that the concept of the status quo does not have any distinct meaning for the neoclassical theory of the firm. As is well known, the theory of the firm was originally an economic domain that has been shaped by the principles of neoclassical economics from the later 19th century onwards (Blaug, 1992). In neoclassical economics, the key principle of the explanation of firm behavior is rational decision making (Hausman, 1992; Samuelson, 1983). Because of this, firms have been

seen as perfectly flexible in that they always immediately react to context changes in an optimal way. In this sense, there is no distinction between continuation and change. Continuation is just an identical outcome of repeated decisions happening incidentally. The status quo has therefore no distinct meaning for the neoclassical theory of the firm whatsoever.

This changes latest in 1912 with the publication of the Theory of Economic Development by Schumpeter (1934). In this theory, the status quo is represented by the circular flow of the economy, as described as general economic equilibrium by Walras (Samuelson, 1951). Schumpeter challenges Walras by claiming that there is no tendency of the circular flow to change from the inside, i.e. for inherent economic reasons; it stays unchanged as long as it is not disturbed by external shocks.

For the context of this study, it is particularly relevant for the status quo to not only remain unchanged, but to tend to persist so that it requires an extraordinary effort to change it. This is in sharp contrast to neoclassic economics, challenging their concept of flexibility. In this sense, Schumpeter (1934) conceptualizes innovation not as a simple change, but a break with the existing status quo. He puts forward three reasons why such a break is particularly challenging: First uncertainty, not only with regard to the outcome, but also to the process, the right way to carry out the innovation. Secondly resistance, introduced by Schumpeter already as a mixture of rational reason and psychological aversion against change. Later (Schumpeter, 1942), he even describes resistance as a broader, societal phenomenon. Thirdly capital needs; Schumpeter already describes the challenges of new venture financing. He argues that innovation raises the only systematic need for capital that is inherent to economic activity. These challenges all lead to the persistence of the status quo.

This persistence of the status quo makes it difficult to carry out innovations successfully; it therefore requires a distinct personality to do so – the entrepreneur. Schumpeter expends a lot of effort to specify the entrepreneurial personality, grounding it in contemporary elite theories. Later, he focuses on the entrepreneurial function (Schumpeter, 1939). Yet the focus has always been on the specific challenges that entrepreneurs have to overcome in order to change the status quo.

On the level of national economies, seminal changes of the status quo cause turbulence, business cycles, and lead to creative destruction (Schumpeter, 1942). The key in Schumpeter is that change is not just the choice of a different solution like in neoclassical theory, but a phenomenon on its own, following a different logic and requiring different theoretical explanations than the continuation of a given status quo. The status quo becomes a reference point for innovation; innovation is determined by the persistence and the specific characteristics of the status quo. This understanding is essential to the Schumpeterian theory of innovation. This paradigmatic incommensurability is the key difficulty for neoclassical economists to integrate Schumpeter in their theoretical understanding.

After Schumpeter, this perspective has been supported and further developed by a number of different research streams. These research streams have substantially advanced the theoretical understanding of the status quo. However, they also build on the distinct characteristics of the status quo and much of this research would be pointless without this. To give one example: Research on dynamic capabilities offers an investigation of the firm's ability to adapt to context changes. "Dynamic capabilities thus reflect an organization's ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions." (Teece, Pisano and Shuen, 1997: 516). This research challenges the Schumpeterian dictum of the entrepreneurial personality as key driver of innovations and poses that resources can change conditions significantly. However, the focus here is again on the specific challenges to overcome the status quo and how to address them; if these challenges did not exist, firms would need no specific dynamic capabilities (like they do not need dynamic capabilities when they continue their business unchanged) and the entire research would be pointless.

Table 1 gives an overview of the most important theories and research streams and their relation to the status quo in different ways. This relation is specified and key insights with regard to the status quo are listed.

Table 1.

Research stream	Relation to status quo	Key insights on the status quo
Organizational inertia (Henderson & Clarke, 1990; Rumelt, 1995; Christensen, 1997)	Tendency of the status quo to persist	- Offering rich empirical support for persistence - Offering specifications and theoretical explanations of persistence, including: • age dependency • status quo biases; decision avoidance • individual motives • political deadlocks • dependency and focus on key customers
Organizational ambidex-terity (Duncan, 1976; Raisch & Birkinshaw, 2008); exploitation-exploration (March, 1991); punctuated equilibrium (Romanelli & Tushman, 1994)	Specification of the difference between continuing the status quo and breaking with it	- Implications of continuation and change for organizational learning - Investigation of the ability/challenges to pursue incremental and radical innovations at the same time - Antecedents of organizational ambidexterity
Momentum (Miller & Fiesen, 1980)	Resistance towards reversals in the direction of change in strategy and structure	- Offering empirical support for persistence - Offering specifications and theoretical explanations of persistence - Offering specifications and theoretical explanations for reorientations
Entrepreneurship and innovation management (Schumpeter, 1934; 1939; 1943; Kirzner, 1997; Tidd, 2001)	Approaches to overcome the status quo	- Development of various aspects of innovation, including: • Entrepreneurial personality and motives; entrepreneurial function • Specification of the opportunity concept • Creativity and ideation • Resistance, leadership, organizational culture • Employee participation; team organization • First mover advantage, innovation strategy; competitive advantage
Dynamic capabilities theory (Teece, Pisano & Shuen, 1997; Eisenhardt & Martin, 2000; Arndt, & Pierce, 2017).	Approaches to overcome the status quo	- Investigating the meaning of capabilities (as subject of organizational decision-making) for change - Specification and discussion of a number of different capabilities, including: • the ability to learn • the integration of new strategic assets • the transformation of existing assets

Table 1: Specification of the relation between research streams and the status quo

Table 1. *(Continued)*

Research stream	Relation to status quo	Key insights on the status quo
Turnaround management (Lewin, 1951; Kotter, 1995)	Approaches to overcome the status quo	- Introducing the stage concept of unfreezing—change—refreezing - Approaches to create an urgency to change - Advantages of the status quo
Path dependency (Nelson 1993; Sydow et al., 2009)	Longer-term development of the status quo (meso level)	- Investigation of how a given status quo determines possibilities for future development - National innovation systems
Evolutionary economics (Nelson & Winter, 1982)	Longer-term development of the status quo (macro level)	- Insights on economic developments that are caused by an innovation of the status quo - The meaning of routines for business organizations
Routine research (Simon, 1947; Betsch et al., 1999; Feldman &Pentland, 2003)	Micro-foundation of the status quo	- Explanation of the characteristics of the status quo - Insights on antecedents and drivers - Specification of the advantages of the status quo - Investigation into the challenges of operating outside the status quo
Dual process theory (Hodgkinson & Healey, 2008; Kahnemann 2003)	Micro-foundation of the status quo	- Like routine research - Investigation of the interplay between continuation and change

Table 1: Specification of the relation between research streams and the status quo

All the research streams in Table 1 build on a concept of the status quo with its distinct properties; in a neoclassical world of total flexibility, most of this research would be pointless. From all this follows that it makes a difference if something is already realized or not. The status quo therefore becomes a theoretical category as reference point for change. The substance of change is not just finding another solution as in the neoclassical theory of the firm, but overcoming an existing status quo.

Perhaps the most significant insight on the status quo after Schumpeter is its micro-foundation by routine research and the dual process theory, showing that the distinct characteristics of the status quo are grounded in the human bounds of rationality. This research allows an understanding of the antecedents of the status quo and the causes for its distinct characteristics. It allows an understanding of why the status quo is as it is. This research also allows us to position the status quo in a relation with neoclassical economics.

It should be noted that there is not only the current status quo but that status quo can also relate to the past and the future (in the same sense as

the business models can). A future status quo is hypothetical and only gets its properties after its establishment. It is also important that the status quo of the firm is not completely stable, but allows for changes to the day-to-day business within the limits of given structures. Schumpeter has defined these structures by the production function; nowadays, the structure of firm activity is described by its strategy, its value chain – or its business model.

The Business Model as an Abstract Representation of the Status Quo

As with many other complex constructs there are also various definitions of the business model term. A few of these are collected in table 1 (a broader overview can be found in Massa et al., 2017). The table exposes how substantially different the definitions for the same construct are. Even though all definitions include value, they address different elements of it from different perspectives. One puts the focus on governance, another on competitive advantage, a third on customer needs, which all relate to completely different fields associated with different research streams. However, these definitions (and all other definitions that I know of) have one thing in common: they specify the business model as one distinct way to run the business.

Let us elaborate this using the example of the definition by Osterwalder and Pigneur (2010: 14): 'A business model describes the rationale of how an organization creates, delivers, and captures value.' In this definition, the specification of a business model is connected with one certain rationale. This rationale is constitutive in the sense that it distinguishes the business model – a different rationale leads to a different business model. In this sense, every different business model canvas also represents a different business

Table 2.

Amit & Zott, 2001: 511	The business model depicts 'the content, structure and governance of transactions designed so as to create value through the exploitation of business opportunities.'
Osterwalder & Pigneur, 2010: 14	A business model describes the rationale of how an organization creates, delivers, and captures value.
Morris et al., 2005: 727	A business model is a 'concise representation of how an interrelated set of decision variables in the areas of venture strategy, architecture, and economics are addressed to create sustainable competitive advantage in competitive markets.'
Chesbrough & Rosenbloom, 2002: 529	The business model is 'the heuristic logic that connects technical potential with the realization of economic value.'
Baden-Fuller & Haefliger, 2013: 1	A business model is 'a system that solves the problem of sensing customer needs, engaging with those needs, delivering satisfaction and monetizing the value.'

Table 2: Definitions of the business model term in highly quoted papers

model. The same applies to the other definitions: it is one certain 'system', one certain 'concise representation', etc. that specifies a business model. In all these definitions, a business model relates to a certain business reality, or in other words, to a certain status quo.

Given this, one can conclude the following conceptual relation between BM and status quo. *A business model is an abstract representation of a distinct status quo of a firm*. In other words, every business model (specific business model, like a filled business model canvas) is constructed in order to represent one certain status quo. The conceptual relationship between these two constructs is therefore very close.

This theoretical foundation of the business model leads to a first fundamental insight: Like the status quo, the business model is inherently static. This statement is a little difficult to understand and might irritate some readers, so it requires more detailed elaboration. Static means that one business model always relates to one specific structure of the business reality. This follows from all the definitions above, specifying the term business model as *one certain* 'content, structure and governance', *one specific* 'heuristic logic', *one specific* business model canvas – in other words as one certain way to run the business. To stick with a given business model means to stick with the given status quo; conceptually every structural change of the status quo leads to a new business model. This insight is not new, but has been recognized before, e.g. by Doz and Kosonen (2010).

However, static does *not* mean that it is not possible to change business models. To the contrary, that business models can be changed and are in fact changed on a frequent base is one of their key characteristics. There is a broad range of literature on business model innovation (Wirtz, Göttl and Daiser, 2016a), specifying management approaches (Teece, 2010; Chesbrough, 2010; Amit and Zott, 2012; Baden-Fuller and Haeflinger, 2013) and key elements and dimensions of business model innovation (Wirtz and Daiser, 2017). Research shows that it can be vital for firms to change their business model (Holm, Günzel-Jensen and Ulhøi, 2013). However, research also shows that it is often challenging to change an existing (and often previously successful) business model and that firms miss necessary changes (Christensen, 1997). Moreover, in the same way as with the status quo, business models allow for incremental day-to-day changes as long as these do not affect the structure of the business.

However, this static character should not be understood as a deficit or shortcoming, but as a positioning of the business model construct. Indeed, with its current definition, the business model takes a very important conceptual position for theoretical reasoning – as a reference point for change. In this way, the business model becomes the conceptual counterpart of the factual level of the status quo, which takes a central position in many theories. The business model specifies the structure of the status quo of the firm that is subject to be overcome by an innovation (leading to a new status quo in the moment where the innovation is implemented). In other words, it conceptualizes what to innovate. In this way, it also helps to understand the challenges that need to be addressed in the innovation process (Cavalcante, Kesting and Ulhøi, 2011). The entire reasoning about innovation becomes much clearer when based on a business model concept. For that reason, the business model is more than a mere research fashion.

Due to their close relation, status quo and business model interact with each other: On one hand, every business model is constructed with the aim of representing a certain status quo. The status quo is therefore the subject of the business model construction. On the other hand, the business model guides the perception of the status quo and with it decisions about continuation and change. People construct business models in order to create a basis for decision making. In this way, the status quo becomes the object of the business model. This interaction can be represented by the model in figure 1:

The ground structure of the model in figure 1 resembles a feedback model with an ostensive and performative aspect interacting with one another, not unlike e.g. that of Feldman and Pentland (2003). This is very much the case if the business model is developed as a planning tool and systematically used to monitor and control the business reality. However,

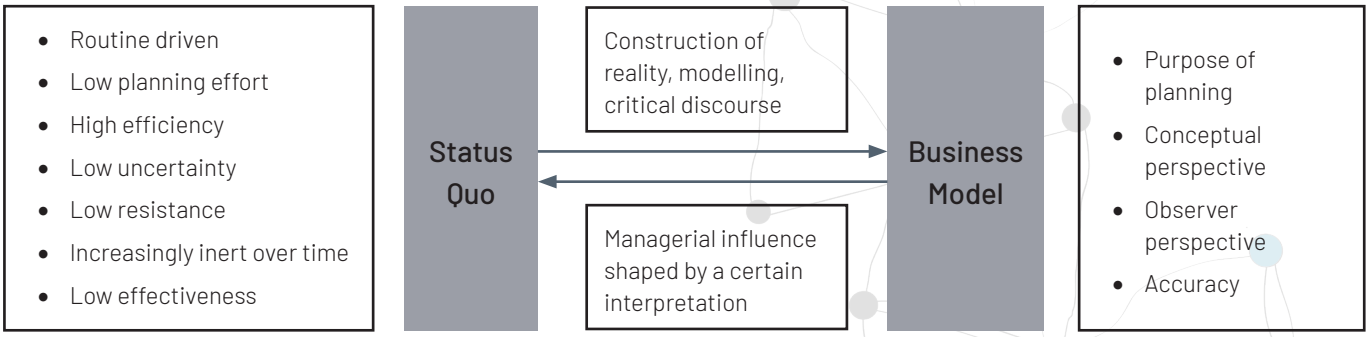

Figure 1: Model of the interaction between status quo and business model

business models are often also used in more informal and descriptive ways (Massa et al., 2017). In these cases, there is no strict feedback structure and the relationship becomes more interactive.

In its simplest form as represented in figure 1, the model has four elements, two positions, the status quo and the business model (the two boxes in figure 1), and two processes, business model construction and managerial influence (the two arrows, linking the boxes in figure 1). These model elements will now be specified in more detail. Let us first have a look at the distinctive characteristics of the status quo on one hand and the business model on the other. These characteristics help understand the differences between the two and why it is so important to distinguish between them.

The status quo

As outlined above, research offers comprehensive insights into the status quo, its attributes and its meaning for a firm's activity and change. Some insights which are particularly relevant to understanding the characteristics of the status quo come from its micro-foundation. These insights give a deeper understanding of underlying mechanisms that drive the status quo.

The basis for the micro-foundation is the stability; firm activity in the status quo broadly consists of repetition – of production and sales processes, promotion activities etc. This repetition is the basis for the development of routine; standard solutions are developed for standard problems (Betsch, Fiedler and Brinkmann, 1998, Betsch, Haberstroh, Glöckner, Haar and Fiedler, 2001). The longer it lasts – and the more stable it is – the more activity tends to be routinized in the status quo. This process of routinization shapes the characteristics of the status quo. Specifically, increasing routinization of the status quo leads to the following characteristics:

- First, planning needs tend to decrease because the use of standard solutions only requires some planning of application and adaptation, but not of the solutions as such (Simon, 1947; 1977; Betsch, Brinkmann, Fiedler and Breining 1999). This decrease in the need for planning is particularly relevant with regard to the strategic level of management capacities (Kesting and Ulhøi, 2010).
- Second, processes tend to become more efficient as with increasing repetition the firm goes through the learning curve (Arrow, 1962; Argote, 1999). Solutions are developed and refined as a result of planning, trial and error and feedback in the course of repetition (Nelson and Winter, 1982).
- Third, uncertainty tends to decrease and to be transformed into controlled risk (Simon, 1955; North, 1990). The use of standard solutions and their outcome have been observed repeatedly by members of the firm. Processes are refined and better understood and possible scenarios are identified and evaluated.
- Fourth, resistance tends to decrease after decisions are made and routines are established (Waddell and Sohal, 1998; Rumelt, 1995). In line with this, Nelson and Winter (1982) have characterized routine as a 'truce.' A successful status quo (i.e. an absence of change) can therefore be associated with a relatively low level of conflict.

These are significant advantages stemming from the continuation of a status quo. The persistence of the status quo therefore broadly results from its success; a change of the status quo is associated with high planning effort, leading to a structurally uncertain outcome. Decisions for change lead to disagreement and conflict. Wrong decisions and missing practice are seen as leading to inefficient results. This is why people say, 'never change a running system'.

Other reasons for persistence have been identified, for instance political deadlocks and the focus on existing markets and customers (Hendersen and Clarke, 1990; Rumelt, 1995; Christensen, 1997), as well as irrational status quo biases in decision making (Samuelson and Zeckhauser, 1988). Persistence is therefore multi-causal and not all reasons for it are grounded in the success of routine.

However, the inherent persistence means that the status quo is not fully flexible and adapted to context changes. As a consequence, the status quo tends to become ineffective over time (Betsch et al. 1999; Simon, 1947). Standard solutions are not adequate for changed problems or unchanged problems in a changed context anymore. As a result, a tension between the benefits of the status quo and the need for change arises. This tension becomes particularly challenging because it involves a comparison between the familiar (status quo) and the uncertain (outcome of a change).

These are some characteristics of the business reality, given that the status quo is continued over a longer period of time. However, these are not the characteristics of the business model, i.e. the simplified abstraction of the business reality. The confusion of these different levels of analysis is the cause of many misunderstandings and ambiguities. The business model in itself is a result of an intellectual construction; its characteristics depend on this process. The specification of the business model is that of an analytical procedure.

The business model

Some research is addressing the model-characteristics of business models already explicitly (Massa et al., 2017; Baden-Fuller and Morgan, 2010), however, there is a fully developed research body on abstraction and model construction in the theory of science. This should be the basis for the reflections about the characteristics of the business model as a construction in this section.

Understood as a model, a business model is a conceptual construction, based on an envisioning of the business reality. Like all other models, construction means that the business model is an outcome of a creative process. Already in 1908, Schumpeter points to the constructive nature of models, but he also notices that models are constructed in hindsight to capture real phenomena (Kesting, 2008). In connection with this, Weber (1978) introduces the notion of the ideal type, emphasizing the essential and abstracting from the unimportant. The concepts of both of them already imply that there is not one model, but rather that a variety of models can represent the same reality. And in fact, in conclusion of his review of 20th century philosophy, Caldwell (1982: 51) points out 'that for any set of data, an infinite number of theories can be developed to explain them.' Models are not right or wrong, but only more or less accurate and purposeful.

Caldwell (1982: 47) further concludes: 'Any observation requires both selection and interpretation by the observer, and such activities will be colored by the observer's prior theoretical framework, which incorporates such intangible qualities as interests, perspectives, past experiences, and anticipations regarding results.' This does not only apply to the observation, but also to the model construction. Based on this insight, four characteristics can be assigned to business models:

Purpose—There are many and various purposes to construct a business model (Massa et al., 2017). Business models are constructed in order to identify managerial opportunities (Nenonen and Storbacka, 2010); to reduce market risks of innovations (Euchner and Ganguli, 2014); to describe how strategy is put into practice (Rauter, Jonker and Baumgartner, 2017); but also due to academic interests, driven by a variety of research questions. This specifies the business model as a tool, helping to structure a

complex business reality (Teece, 2018). The purpose defines the requirements for the tool. Information is prioritized according to its relevance, and relevance is determined by purpose (Weber, 1978). In this way, purpose becomes one important characteristic of the business model.

Conceptual perspective—Business models are typically constructed based on a given framework. This framework shapes the construction, its structuring, its content, and its focus. Currently, research and practice are dominated by the structure of the business model canvas (Osterwalder and Pigneur, 2010), but various other concepts have also been developed such as i.e. the business model framework by Hamel (2000) or the business model components by Morris, Schindehutte and Allen (2005) or the new business model canvas for platform businesses in two-sided markets (Taipale-Erävala, Salmela and Lampela, 2021). The conceptual perspective is a choice (since there are different perspectives) that closely relates to purpose.

Observer perspective—As emphasized by Hanson (1958) in particular and later supported by Popper (1965), every observer has an individual perspective on the outside world. This perspective is shaped by experiences and convictions, but also by values. In this context, Kuhn (1970) has pointed to the incommensurability of perspectives. A marketing executive typically has a different perspective on the same business reality than an engineer or financial advisor etc. Bini, Guinta, Nielsen, Schaper and Simoni (2021) have just brought up this point with regards to the understanding of the business model concept by users and preparers of financial statements, one out of many different target groups of business models.

Accuracy - Generally speaking, accuracy denotes the correspondence of the business model with the business reality. Accuracy is a key for the usefulness of the business model as a decision-making tool. This is not a question of perspective or purpose, but of constructing. However, as Caldwell (1982) shows, because an infinite number of business models can be constructed to describe the same business reality, there are no objective standards to judge accuracy; or as Harré (1985) has put it, 'there are no brute facts.' As a consequence, there is no objective procedure to judge accuracy, but accuracy needs to be assessed in a critical discourse in which arguments are presented and evaluated.

These characteristics specify the outcome of the modelling process, the construction of the business model. They describe the way in which the business model represents the business reality. This knowledge is important to understand the influence of business models on perception and decision-making. These characteristics are fundamentally different from that of the business reality that is described by the business model, so there are two different layers of observation. At this point, it is important to distinguish very carefully.

These are characteristics of the positions in the interaction model (figure 1). Let us next have a closer look to the processes, driving the interaction between status quo and business model. On the one hand, the status quo of a company shapes the business model as the one is constructed with the purpose to represent the other. On the other hand, also the business model can shape the status quo when management decisions are based on it. The following sections present an overview of insights research offers on these processes and of open research questions.

Business model construction

The status quo and the business model are positions, describing a state at a certain point in time. In contrast, business model construction describes a process, capturing a status quo in abstract terms and leading to the business model. It consists of the observation of a practice that is driven by certain interests and which leads to an abstract representation. This process is contingent on determining how a business model looks for a given business reality.

Literature on business model construction is dominated by handbooks, guides and instructions (Osterwalder and Pigneur, 2010; Bocken, Short, Rana and Evans 2013; Joyce and Paquin, 2016, and many more). Some insights on the construction process come from the literature on cognitive schemas (Massa et al., 2017). Clues can also be taken from

the discussions about business model components (Wirtz et al., 2016b), business model representations (Zott et al., 2011), business model ontology (Osterwalder, 2004), and business model archetypes (Baden-Fuller and Morgan, 2010).

However, more research, less normative and more positive, is needed to gain a systematic understanding of the process of business model construction, particularly: A systematic identification of the drivers of business model construction; frameworks and criteria to discuss the accuracy of business models; frameworks and criteria to discuss the fit between purpose and approach. The result would be a conceptual foundation for business model construction and the discussion about accuracy and purposefulness.

Managerial influence

Business model construction is describing processes leading from business reality to abstract representation. In contrast, managerial influence describes processes leading from abstraction to reality, i.e. how the use of business models is shaping the business reality via management decisions.

Massa et al. (2017: 79) specify that 'the business model can be considered a dominant logic – a current thinking pattern or established belief or cognitive schema held by managers in organizations'. This quote is related to the understanding of business models as cognitive/linguistic schemas, but it can be understood more generally. This way, business models are shaping the managerial perception of the business reality (Bettis and Prahalad, 1995) and in particular also the process of opportunity recognition (Teece, 2007). They can be a key element of organization-level sense making or even used more strategically for sense giving (Gioia and Chittipaddi, 1991). Usually they are a result of, and their role is manifested in, social interaction (Massa et al., 2017).

By shaping managerial perception, business models become an antecedent of managerial decisions (Massa et al., 2017), having an impact on the status quo and leading to an interaction of both. This is particularly the case when business models shape innovation processes, leading to a change of the status quo (Massa et al., 2017; Teece, 2010; Afuah, 2014). The concept of business model innovation links innovation directly to the business model construct (Chesbrough, 2010; Amit and Zott, 2012; Foss and Seabi, 2017).

There is a large number of research contributions throwing a light on the general link between managerial perception and decision-making. For instance, research offers some evidence that the interpretation of strategic issues as an opportunity or threat has a critical impact on strategic decision-making (Jackson and Dutton, 1988; Thomas, Clark and Gioia, 1993). Chesbrough and Rosenbloom (2002) outline how the bias for an outdated business model blinded the management of Xerox for attractive opportunities. This case is interesting as it shows how the agreement on a business model – a certain interpretation of the business reality – influences action and becomes a source of inertia itself. This finding appears to go along with research on entrepreneurship where business plans are identified as a source of inflexibility (Sarasvathi, 2001). Hambreck and Mason (1984) throw a light on the meaning of subjective perceptions of top managers for management decisions. Research addresses sensing, social construction and envisioning (Teece, 2010, Teece 2018).

A very comprehensive and systematic study of the role that business models play in managerial cognition, particularly with regard to innovation, was recently been published by Sund, Galavan and Bogers (2021), concluding that there are still "numerous gaps in our knowledge" (p. 7).

Discussion

The conceptualization of the interaction between business model and business reality allows for conceptual clarification and a deeper understanding of underlying processes. Based on this, the key contributions of this paper are: a terminological and conceptual clarification; a conceptual foundation to investigate the interaction between business model and business reality; and building a bridge to neighbouring concepts.

Terminological and conceptual clarification

First, the conceptual grounding in this paper allows for a clarification of the relation between different business model definitions. Several researchers have already pointed to a mutual core of business model definitions. DaSilva and Trkman, for instance, (2014: 282), have specified the unifying ground structure of the business model construct as: 'Understanding how business works and how value is created for different stakeholders.' With the introduction of the status quo, the analysis of this paper offers a conceptual foundation for a closer specification of this unifying ground structure. *The mutual core of the business model construct is the aim to specify (capture and structure) one certain (current, past, projected) status quo of a firm*. This specification might not be so very different from that of DaSilva and Trkman, but it embeds the business model in a theoretical foundation – the status quo and the rich theory behind it. Other characteristics of the business model construct can be derived from this: The business model is (i) a unit of analysis (Morris et al., 2005; Zott et al., 2011) because of its association to a firm (as a unit). It is (ii) holistic (Zott and Amit, 2010; Joyce and Paquin, 2016) as it aims to provide a big picture of firm activity in the status quo. It (iii) focuses on value (creation, capture, Osterwalder and Pigneur, 2010; Chesbrough and Rosenbloom, 2002) because firm activity focuses on that. It (iv) is static because it describes one and only one status quo.

Differences in the business model concept result from different purposes as well as different conceptual backgrounds. The business model canvas by Osterwalder and Pigneur, 2010 is currently dominant, but there are other ways to represent the status quo of the firm. Hamel (2000), for instance, puts a stronger focus on strategy; Morris et al. (2005) have a stronger focus on the competitive advantage. This is a valid and immediate consequence of the construction and simplification procedure that leads to the business model. People from different functions typically see different things and have different interests. Some variety is therefore even supportive.

Secondly, the analysis of this paper offers a conceptual structure to clarify the semantic of statements about business models. Specifically, the analysis of this paper shows that the formulation 'a firm has a business model'—used as an attribute of a real firm (Massa et al., 2017)—also necessarily needs to build on a construction. This formulation expresses an observer's conviction that the business practice of the status quo of a firm is structured in a certain way. It is a statement about the factual level of business practice, 'the way firms do business' (Shafer, Smith and Linder, 2005: 126), or 'how a company makes money' (Birkinshaw and Goddard, 2009: 81). However, as outlined above, every conviction necessarily results from a construction by an observer – based on observation, interpretation, and simplification. Therefore, even statements about 'the way firms do business' are based on models – often informal models, less articulated and reflected, but still constructed. As a consequence, there is no substantial difference between business model conceptions at this point. *All verbally or graphically expressed business models, and even unarticulated convictions, are abstract representations of the business reality – there is no way around*. This perspective places a question mark on the distinction between business models as 'attributes of real firms' and 'formal conceptual representations/descriptions' by Massa et al. (2017).

Given this, business models can have different degrees of formalization. They can consist of an informal image of individual managers, giving a structured account of their perception of the business practice (Chesbrough and Rosenbloom, 2002). On the other side of the spectrum, business models can be fully elaborated and tested formal artefacts, representing the business practice of a firm, like a fully developed business model canvas (Osterwalder and Pigneur, 2010). But irrespective of the degree of formalization, business models are always constructed – in order to capture the business practice of a firm, but still constructed.

As a consequence, it is still valid to use a formulation such as 'the firm has a business model' as a statement about the business practice of a firm. However, the research should point to the informal character of such formulations and also to the complex relation between business model and business reality.

Investigation of the interaction between business model and business reality

Another contribution of this paper is the introduction of the interaction model itself, structuring and conceptualizing the processes that drive the interplay between business model and business practice. To date there are only general feedback models (like that of Feldman and Pentland, 2003), but there is no feedback model specifically related to business models. The function of the interaction model in figure 1 is to identify and distinguish elements, and position and relate them conceptually.

One important element of the interaction model is the identification and distinction of different characteristics of the status quo on the one hand and the business model on the other. These characteristics result from substantially different processes and have substantially different effects. The characteristics of the status quo result from repetition (stability) and routinization (efficiency, low resistance, etc.). The characteristics of the business model result from observation, abstraction and simplification (purpose, observer perspective, etc.). Both are related to cognition, but in very different ways. These characteristics are relevant drivers of processes, important for understanding, but often ignored. Some of these characteristics were described previously (for example: Cavalcante et al, 2011; Doz and Kozonen, 2010; Andries and Debackere, 2013), but only unsystematically; there was no concept for their theoretical positioning.

The interaction model allows for a more differentiated understanding of the function and use of the business model construct, more specifically because: first, it allows for a more structured analysis of how people construct and use business models. The basis for this is again the status quo as subject and reference point of the business model construction. The interaction model provides a frame for the what and how, namely the abstract representation of a (current, past, projected) status quo. The model also outlines the feedback and the influence of business models on decision making. Business models shape the perception of decision makers by providing an interpretation of the business practice, focusing of some aspects and abstracting from others. This is what business models are there for and why people spend time and effort on constructing them – to provide a better understanding of the business reality. More research is needed into this interaction process in order to get a better understanding of the influence of business models on managerial decision-making. This research might be able to support managers in their use of business models in order to improve managerial decision-making.

Secondly, the interaction model of this paper can contribute to the evaluation of the accuracy of business models. Accuracy means that business models are correct and exact. This becomes particularly relevant when business models are used as a basis for decision-making. Using inaccurate business models means that decisions are based on wrong assumptions. But what does accuracy mean in this context? How to assess accuracy? When business models describe company attributes on the reality level (like in Birkinshaw and Goddard, 2009 or Chesbrough, 2007), this question is meaningless because in this case business models are immediate. On the other hand, when business models are conceptual representations of the business reality (Massa et al., 2017; Osterwalder et al., 2005), accuracy requires a clear specification of the business reality to be represented. In this case, the status quo (with all its inherent characteristics) provides a reference point for the analysis and the interaction model helps to specify the meaning of accuracy with regard to business models. The core point is that without a clear concept of business reality (be it the status quo or any other concept) there is no assessment of the accuracy of a business model.

Building bridges to neighbouring concepts

Finally, the interaction model contributes to research by identifying and developing the status quo as a conceptual link between the business model and its neighbouring concepts (see also Colquitt and Zapata-Phelan, 2007). As outlined in table 1, the status quo is not only specified by research, but also an essential element of it. Against this background, the status quo can also serve as a theoretical foundation of the business model.

Based on this foundation, it is possible to position the business model conceptually in the research

environment. At first glance, its static character seems to lessen the explanatory power of the business model construct. However, the opposite is the case: by representing the status quo of the firm, the business model can take over an important conceptual function for various research streams. Business models can give firms a face by conceptualizing what they presently (i.e. in the status quo) are and what they are doing. This is how Siemens, or IBM, or Google currently look. The business model offers a frame to capture the functions and processes within these firms. In this way, the business model fills the black box of 'the firm' with life. This perspective emphasizes the characteristic of business model as a holistic unit of analysis.

Previously in neoclassical economics, the firm was represented by the production function (Walras, 1874; Debreu, 1959). One might recall that based on this understanding, Schumpeter (1934) defines an innovation as a change of the production function. Like the business model, the production function is also a holistic unit of analysis, describing what a firm does. This conceptualization has dominated economic thinking from the 1870s onwards (Hausman, 1982). However, for business research, the abstraction of the production function was too strong and too focused on production. An increasing number of researchers were trying to capture the firm beyond that (including Simon, 1947; March and Simon, 1958; Cyert and March, 1963). There were some concepts which took the position of the production function (such as Porter's (1985) value chain), but none of these could prevail and none of these is as powerful as the business model. The 'black box' was often filled with a diffuse concept of 'the firm'. As a representation of the status quo of a firm, the business model is now filling this position in a very structured way.

Taking this position, the business model construct can make a considerable contribution to its neighbouring concepts. One example is the analysis of innovation, which can now be specified as a change of the business model in that the business model takes the position of a reference point of change, representing the static and inert status quo of the firm. This provides the management with a much more detailed picture of what it is facing. Not all building blocks are affected by change, and building blocks are affected in very different ways (Cavalcante et al., 2011). So in this way, the business model provides a new, far more differentiated conceptual foundation for a structural analysis of innovation. Similarly, the business model creates a new conceptual foundation for other research streams like inertia, dynamic capabilities, ambidexterity, turn-around management and others. The business model provides an instrument to locate inertia and relate it to specific processes and building blocks (and not only to a global 'firm'); it provides an instrument to investigate the effect of dynamic capabilities on different processes and building blocks etc. It can contribute everywhere where a holistic conceptualization of the firm is needed. This way, the status quo suits to build a conceptual bridge between business model research and the theory of the firm.

Conclusion

The theorizing of this paper takes some positions, particularly the strict understanding of the business model as a construct and its static character. However, its static character does not weaken the business model concept; on the contrary, it strengthens it, as it enables it to be positioned in a place where a strong concept was lacking so far, a holistic specification what a firm is and what it does in the status quo. In this way, the business model can take the position as a reference point for innovations. The status quo and the interaction model then offer a comprehensive grounding which is suitable for overcoming most of the theoretical deficits of the business model construct. It offers a clear theoretical grounding of the construction of the business model and also of its characteristics. Furthermore, it builds a conceptual bridge to the business reality; this way it establishes a link to well-developed theories of the firm. As a result, it provides a clear perspective of what a business model is and where it is positioned in the research context.

The most important practical implication is the establishment of clarity. This paper urges practitioners to carefully distinguish between business model and business reality. In this way, not only can a lot of

misunderstandings be avoided. Practitioners also get a better understanding of the construction and use of business models. It is useful to be aware that construction serves a purpose and that it is shaped by the conceptual and observer perspective. This insight might facilitate the development of a variety of applied business model canvases like the one just proposed by Taipale-Erävala et al., (2021). The reference to the status quo provides an anchor for the variety: all canvas variations describe the same status quo, but from different perspectives. Carefully differentiating between business model and business practice can also help practitioners incorporate the business model concept into their understanding of the company, particularly with regard to innovation and routine.

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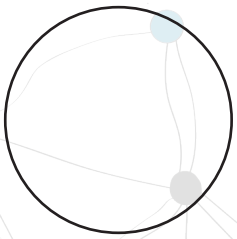

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Journal of Business Models (2021), Vol. 9, No. 4, pp. 36-66

JOURNAL OF BUSINESS MODELS

Boundary Work for Collaborative Sustainable Business Model Innovation: The Journey of a Dutch SME

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Abstract

Purpose: How does a small business engage in boundary work to innovate its business model towards sustainability? We employ a boundary work lens to trace the endeavors of a small company to explore, negotiate and (re)align organizational boundaries in its multi-stakeholder network around new, sustainable value propositions.

Design/Methodology/Approach: We engaged in longitudinal research of a company's endeavors for multi-stakeholder alignment in sustainable business model innovation (SBMI). By means of thick description, this paper offers rich empirical insights on the processes of interaction between a small company and its stakeholders in the Dutch pork sector, with special attention to boundary spanners, boundary objects and the mutual organizational boundary changes.

Findings: We find that the shaping and shifting of organizational boundaries highly influences the process and content of the business model innovation. During the phases of boundary exploration, brokering and boundary changes, there is a pivotal role for boundary objects to deal with uncertainties, to facilitate strategic discussions and to find solutions to different valuation frames, power tensions and role divisions between stakeholders.

Research implications: SBMI can benefit from boundary work, as it helps companies to find value opportunities in the organizational boundaries of their external stakeholders, addressing challenges that emerge from existing organizational boundaries, and establishing boundary arrangements to facilitate this process.

Originality/Value: Boundary work interlinks concepts of identity, power, competences and efficiency in entrepreneurial processes of collaborative SBMI. The framework and methods of this study further our understanding of the co-evolutionary processes of SBMI.

Keywords: Thick Description; Longitudinal Research; Boundary Work; Sustainable Business Model Innovation; Circular Business Model Innovation; Multi-Stakeholder Collaboration

Please cite this paper as: Velter et al. (2021) Boundary Work for Collaborative Sustainable Business Model Innovation: The Journey of a Dutch SME, Vol. 9, No. 4, pp. 36-66

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DOI: https://doi.org/10.5278/jbm.v9i4.6267
ISSN:2246-2465

Introduction

Sustainable business model innovation (SBMI) involves changes in how a company does business to address societal and environmental challenges and has gained increasing attention in the last two decades as a means for sustainable development. To reach its sustainability potential, SBMI necessitates engagement with external stakeholders to develop multi-stakeholder value propositions and value capture mechanisms, making these external stakeholders fundamentally part of a (future) functioning business model (Bocken, 2019; Bocken and Ritala, 2021; Powell, Hamann, Bitzer, and Baker, 2018). SBMI therefore structurally transcends the organizational boundaries of the firm, and requires a redesign and re-alignment of the organizational boundaries of the respective organizations involved (Paulsen and Hernes, 2003; Velter, Bitzer, Bocken, and Kemp, 2020). For example, to address environmental and societal challenges, businesses and their partner organizations may need to develop new competences and activities; constrain or shift their position in the value chain; or even adjust their organizational purpose (Gauthier and Gilomen, 2016; Hahn et al., 2018; Tykkyläinen and Ritala, 2020). All these alterations are changes to what is inside (or part) of an organization – and what is outside (or not part) of an organization. This is subsumed under the concept of organizational boundaries, operationalized in the activities, competences, external relations and identity of an organization (Keränen et al., 2020; Santos and Eisenhardt, 2005).

Research to understand the processes of organizational boundary alignment in SBMI is only in its infancy (Boons and Lüdeke-Freund, 2013; Geissdoerfer, Vladimirova, and Evans, 2018; Schaltegger, Lüdeke-Freund, and Hansen, 2016). It is generally recognized that these processes are highly challenging for businesses: not only do they need to navigate organizational boundary alignment with relevant external stakeholders, but they also need to find new value creation opportunities by actively working on these boundaries (Keränen et al., 2020; Santos and Eisenhardt, 2005). Yet, beyond these insights, it remains unclear how companies engage in such a challenging process that requires openness, interaction, and resolving of conflicts.

Recent studies propose that boundary work theory offers an apt lens to further deconstruct boundary alignment processes in SBMI (Velter et al., 2020). Traditionally, boundary work addresses the interdependencies and interactions between stakeholders of different institutional contexts (Gieryn, 1983; Hoppe, 2010). In the context of SBMI, Velter et al. (2020) frame boundary work as the activity of exploring, negotiating, and re-aligning organizational boundaries around new value propositions. This offers a promising starting point to shed light on how businesses engage in boundary alignment processes in pursuit of SBMI (Breuer et al., 2018; Geissdoerfer et al., 2018; Pieroni et al., 2019). We therefore employ a boundary work lens to empirically trace and analyze the endeavors of a company to align organizational boundaries in its multi-stakeholder network. We pose the following research question: How can boundary work theory help explain SBMI?

To answer this question, we engaged in longitudinal research over a timespan of two years. Our case study is a small Dutch enterprise that seeks to establish a sustainable business model in the Dutch pork sector. This sector, as many industrialized livestock sectors worldwide, has come under intense legal, economic, and public pressure to transform into a more sustainable sector. Our case study portrays a company's idea for innovation, which is dependent on a collaborative reconfiguration of stakeholders in the value network. In contrast to retrospective case studies, we observed the unfolding of the innovation process initiated by the SME, while its outcomes were still unknown at the time of research and publication.

Our case study shows how boundary work is crucial for developing and implementing multi-stakeholder SBMI, with a pivotal role for boundary objects to deal with uncertainties, to facilitate strategic discussions and to find solutions to different valuation frames, power tensions and role divisions between stakeholders. We conclude that SBMI can benefit from boundary work by finding value creation opportunities in the organizational boundaries of their external stakeholders, addressing challenges that emerge from existing organizational boundaries, and by offering a frame for boundary arrangements to facilitate this process.

Theoretical framework

SBMI as a multi-stakeholder process

SBMI fosters the creation of significant positive, and significantly reduced negative impacts for the environment and society, through changes in the way the organization and its external stakeholders create, deliver and capture value (Bocken and Geradts, 2020; Bocken, Short, Rana, and Evans, 2014; Geissdoerfer et al., 2018). In contrast to conventional business model innovation, which focuses on economic value creation for customers and direct stakeholders, SBMI ties the concerns of a broad spectrum of stakeholders and multiple forms of value together in reorganizing their business models (Chesbrough, 2010; Pedersen, Lüdeke-Freund, Henriques, and Seitanidi, 2021; Pieroni, McAloone, and Pigosso, 2019). As the adoption of long-term strategies that create value for all key stakeholders is fundamental for the success of SBMI, knowledge, resources and capabilities need to be shared across organizational boundaries (Bocken, Boons, and Baldassarre, 2019; Boons and Lüdeke-Freund, 2013; Breuer, Fichter, Lüdeke-Freund, and Tiemann, 2018). Not only the initiating business, but also external stakeholders may be forced to structurally change their business model (Boldrini and Antheaume, 2021; Velter et al., 2020). This necessitates a collaborative, multi-stakeholder business modelling process to structurally align normative, strategic and instrumental dimensions of the various stakeholders. For example, alignment is required on organizations' understanding and prioritization of the envisioned value creation, and with regard to the activities, competences, resources between interdependent stakeholders (Breuer and Lüdeke-Freund, 2017; Velter et al., 2020). This multi-stakeholder process for SBMI poses significant challenges for the engaged business(es), as the process is full of tensions and clashes with existing business model configurations which should somehow be dealt with (Bocken et al., 2019; Gorissen, Vrancken, and Manshoven, 2016; Meijer, Schipper, and Huijben, 2019; Sarasini and Linder, 2017). As a result, businesses often seek to collaborate with well-known business partners to reduce complexity, which, however, constrains the potential value creation and radical forms of innovation (Bocken and Ritala, 2021; Brown, Bocken, and Balkenende, 2020). Studies have identified the failure of successful stakeholder collaboration as an important barrier to SBMI (Geissdoerfer et al., 2018). Ultimately, this contributes to the dearth of theoretical and empirical examples of successful, collaborative SBMI processes (Pedersen et al., 2021; Pieroni et al., 2019). There is thus a need to improve our understanding of components and processes of stakeholder alignment for SBMI.

SBMI as a process of reconfiguring organizational boundaries

Organizational boundaries denote who or what is inside, and who or what is outside the organization (Dumez and Jeunemaître, 2010; Gieryn, 1983; Santos and Eisenhardt, 2005). Boundaries have been dominantly studied in social sciences, where they are symbolic distinctions which actors "agree upon and use to define reality" (Dumez and Jeunemaître, 2010, p. 153; Lamont and Molnar, 2002). In management theory, organizational boundaries are often studied in the context of make-or-buy decisions and alliances, merges and acquisitions (Araujo, Dubois, and Gadde, 2003; Poppo and Zenger, 1998). In innovation management specifically, organizational boundaries are the intersections where knowledge is shared and crossed, (e.g. Brown and Duguid, 2001; Miller, Fern, and Cardinal, 2007) and value exchanges take place (e.g. Brehmer, Podoynitsyna, and Langerak, 2018; Keränen, Salonen, and Terho, 2020). Santos and Eisenhardt (2005) offer a comprehensive conception of organizational boundaries by distinguishing organizational boundaries of identity, power, competence and efficiency. These boundary conceptions address alignment on normative, strategic and instrumental levels as needed for SBMI (Breuer and Lüdeke-Freund, 2017; Stubbs and Cocklin, 2008; Velter et al., 2020).

The *boundary of identity* concerns the mind-set and culture of the organization. It emerges from organizational members' work values, attitudes, behaviors and actions, and is typically formalized in the mission, vision and expressed values of an organization (Mdletye, Coetzee, and Ukpere, 2014; Santos and Eisenhardt, 2005). Boundary setting on identity deals with issues of coherence between the organizational identity, its business model strategy and the activities it conducts (Bojovic, Sabatier, and Coblence, 2019; Mdletye et al., 2014; Santos and

Eisenhardt, 2005). The boundary of identity can develop 'grounded' through experimentation with novel activities and business models, but also through 'releasing', where the boundary of identity sets the scope for strategic and instrumental decisions (Berends, Smits, Reymen, and Podoynitsyna, 2016; Bojovic et al., 2019; Breuer and Lüdeke-Freund, 2017). In SBMI, the boundary of identity should be based on sustainable value creation and multi-stakeholder responsiveness (Breuer et al., 2018; Geissdoerfer et al., 2018). An organizational identity which is set on a narrow perception of value and stakeholders leads to a constrained framing of the problem and its subsequent strategic opportunities, which may result in shifting negative externalities to other stakeholders in the value chain or the societal context (Diepenmaat, Kemp, and Velter, 2020). This coherence between a boundary of identity set for SBMI with its strategic and instrumental practices potentially avoids issues as 'green washing' (Delmas and Burbano, 2011; Tinne, 2013).

The *boundary of power* deals with issues of autonomy and is set at the point where the organization can maximize strategic control over its crucial stakeholders. SBMI typically requires a focus on network performance instead of power accumulation of individual organizations and sharing or retaining ownership of materials to enable service-based business models (Curtis and Mont, 2020; Yang and Evans, 2019). This might result in the need to constrain the influence of one organization towards empowering other organizations that are crucial to the sustainability of the innovation (Avelino and Wittmayer, 2016; Bolton and Landells, 2015; Köhler, Geels, Kern, Markard, Onsongo, Wieczorek, Alkemade, Avelino, Bergek, Boons, Fünfschilling, Hess, Holtz, Hyysalo, Jenkins, Kivimaa, Martiskainen, McMeekin, Mühlemeier, Nykvist, Pel, Raven, Rohracher, Sandén, Schot, Sovacool, Turnheim, Welch, and Wells, 2019).
The *boundary of competence* deals with the optimizing an organizations resource portfolio vis-à-vis market opportunities. Resources consist of intangible knowledge, skills and network relationships, but also of tangible materials and machinery that can be possessed or deployed by an organization (Barney, Wright, and Ketchen, 2001). The boundary of competence can be managed through dynamic capabilities, defined as the ability to "integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Eisenhardt and Martin, 2000; Teece, Pisano, and Shuen, 1997, p. 516). SBMI requires deployment of resources such as sustainable product design (Bocken, de Pauw, Bakker, and van der Grinten, 2016; Whalen and Peck, 2014), cross-sectoral collaboration (Luzzini, Brandon-Jones, Brandon-Jones, and Spina, 2015; Patala, Albareda, and Halme, 2018), remanufacturing and repair skills and facilities (Jensen, Prendeville, Bocken, and Peck, 2019; Lüdeke-Freund, Gold, and Bocken, 2018), the installation of take-back systems (Bocken et al., 2014; Ranta, Aarikka-Stenroos, and Mäkinen, 2018) and the ability to measure environmental and social performance (Bradley, Parry, and O'Regan, 2020; Luzzini et al., 2015). SBMI studies point at the need to strengthen dynamic capabilities as a way to integrate societal and environmental opportunities into processes of SBMI (Antikainen and Bocken, 2019; Bocken and Geradts, 2020; Inigo, Albareda, and Ritala, 2017).

Finally, the *boundary of efficiency* deals with the distribution of activities in the value network as a means to create, deliver and capture value (Tykkyläinen and Ritala, 2020; Zott and Amit, 2010). Choices of efficiency are typically in 'make or buy decisions', in the extent to which the value of an offering can be measured, and in differences in knowledge that create coordination costs despite best intentions of the different actors (Nickerson and Silverman, 2002; Poppo and Zenger, 1998; Santos and Eisenhardt, 2005; Williamson, 1975, 1981). While SBMI does not take a stance on where efficiency boundaries ought to be set by individual organizations, it does require the adoption and alignment of novel activities such as reversed logistics, repair and remanufacture, and the tracing of materials in the value network (Bocken et al., 2014; Brown, Bocken, and Balkenende, 2019; Evans, Vladimirova, Holgado, and Yang, 2017).

Empirical examples of SBMI have shown that organizational boundary alignment leverages or impedes value creation (Velter et al., 2020). SBMI thus requires actors to engage in processes to de-stabilize and re-stabilize organizational boundaries (Depeyre and Dumez, 2009), but organizational boundaries are

ambiguous, hard to specify, and subject to change as a result of interaction of the firm with its external environment (Abbott, 1995). In addition, organizational boundary change is accompanied by high uncertainties about the potential captured value, and conflicts with existing configurations of assets, processes and activities (Amit and Zott, 2012; Chesbrough, 2010; Linder and Williander, 2015). This complicates organizational boundary alignment between stakeholders (Bocken et al., 2019; Schaltegger, Lüdeke-Freund, and Hansen, 2012; Velter et al., 2020). When aiming for multi-stakeholder engagement, this complexity enhances synchronically (Powell et al., 2018). We therefore expect that boundary work in SBMI helps to investigate and address the challenges for stakeholder alignment (Table 1).

Boundary work for SBMI

Boundary work approaches SBMI as a highly iterative and continuous process full of tensions among stakeholders rather than a linear, consensus model of collaboration (Hargrave and Ven, 2009). Destabilizing and re-stabilizing strategies occur intertwined as some actors challenge existing boundaries while others defend existing boundaries (Depeyre and Dumez, 2009; Dumez and Jeunemaître, 2010). Previous research has identified boundary work as an analytical lens to understand processes of organizational boundary reconfigurations in pursuit of SBMI, and has specified three iterative phases (Velter et al., 2020; Aka, 2019):

1. *Exploring boundaries and boundary changes*. This phase includes the first activities an organization undertakes in response to a triggering event or problem (Roome and Louche, 2016). In this phase, the organization attempts to define the problem(s) at hand, and explores potential opportunities to respond to this problem. This includes initial stakeholder engagement. Rather than searching for the solutions closest at hand, the challenge lies in creating ambitions for fundamental and systemic change in both the boundaries of the organization and its external stakeholders based on novel conceptions of value creation (Bresman and Zellmer-Bruhn, 2013; Evans, Fernando, and Yang, 2017; Roome and Louche, 2016). Such a process draws on experiences from within as well as from outside the organization (Roome and Louche, 2016).
2. *Brokering boundaries*. This phase is about negotiating and reconciling critical boundaries through the creation of incentives for critical stakeholders. Boundary brokering can adjust the understanding of the innovation, such as rhetorical closure, use and functionality adjustments (Bijker et al., 2012), but it can also comprise a shared effort to strengthen the value proposition for critical stakeholders. Brokering activities can be conducted by companies themselves, but often this is done by intermediary actors (Aspeteg and Bergek, 2019).
3. *Implementing boundary changes*. This phase involves the agreement on, experimentation with and embedding of boundary reconfigurations (Velter et al, 2020). Formal and informal agreement might lead to the formulation of experiments, an innovation strategy that is increasingly adopted in SBMI (Baldassarre, Konietzko, Brown, Calabretta, Bocken, Karpen, and Hultink, 2020; Bocken and Antikainen, 2019). Experimentation might lead to the actual implementation of boundary changes in SBMI; for example, by adopting a novel organizational purpose, contracting with external partners, developing novel competences, and implementing novel actions and material flows (Roome and Louche, 2016; Salvador, Barros, Mendes da Luz, Piekarski, and Carlos de Francisco, 2019).

Boundary work can be conducted by individuals or organizations that take an active role in reaching out to stakeholders and help attain a common understanding of specific problems or solutions as a basis for boundary reconfigurations. These individuals or organizations can be seen as 'boundary spanners' who often use 'boundary objects' (Fleming and Waguespack, 2007; Lee, 2007). Boundary objects are working arrangements that facilitate (inter-)action, reflection, tailoring and 'backstage work' as a means for collaboration, knowledge production and creative congruence across multiple stakeholders (Benn and Rusinko, 2013; Carlile, 2002; Leigh Star, 2010; Parker and Crona, 2012). Boundary objects do not necessarily have a material character – they can also be concepts

Table 1.

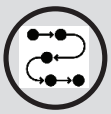
		ORGANIZATIONAL BOUNDARY THEORY			SUSTAINABLE BUSINESS MODEL INNOVATION		
		Demarcation of	Boundary setting	Organizational issue	Typical reconfigurations in SBMI	Typical tensions for reconfiguration in SBMI	Boundary indicators defined for this study
	Boundary of Identity	The dominant mind-set of "who we are"	At the point that maintains coherence with organizational activities	Coherence: conscious versus unconscious	Based on sustainable value creation, for-profit to inclusion for-benefit	Existing business logics, diverging value frames, mind-sets, cultural differences	Values, vision, mission, purpose, mind-set
	Boundary of Power	Sphere of influence of the organization	At the point that maximizes strategic control over crucial relationships	Autonomy: ownership versus control	(Re)alignment in network context, empowerment of particular actors	Compromising current power division, competitiveness	(Access to) resources, external relationships, material ownership and contracting
	Boundary of Competence	Resources possessed by the organization	At the point that maximizes the value of the organization's resources	Growth: possession versus deployment	Development of novel competencies and external relations	Lack of capabilities, financial trade-offs, lengthy experimentation, technology innovation	Capabilities (e.g. patching, product development), machinery, network relationships, roles
	Boundary of Efficiency	Activity distribution for efficiency	At the point that minimizes the governing cost of activities	Costs: market versus hierarchy	Adoption of novel processes and activities	Division of material interests, resource division, information flows and transaction- and coordination costs	Processes, activities, information flows

Table 1: Interlinkage between organizational boundary theory and sustainable business model innovation. Based on Berger et al. (2004); Bocken & Geradts,(2020); Breuer et al. (2018); Breuer and Lüdeke-Freund (2017); Evans et al. (2017); Geissdoerfer et al. (2018); Gieryn (1983); Hörisch et al. (2014); Powell et al. (2018); Santos and Eisenhardt (2005)

(ill-structured or well-structured) depending on the required knowledge production. Well-structured objects shape knowledge production according to the elements of the object, such as quality standards, whilst ill-structured objects invite users to contribute to the knowledge production in a more open way. Whether or not a phenomenon functions as a boundary object depends on its scope and scale of analysis. A boundary object comprises a certain functionality for guided action on a certain level (e.g., organizational), but could also spark controversies (Aka, 2009; Stark, 2010).

Research gap

SBMI faces the challenge of exploring, brokering and re-aligning organizational boundaries of different stakeholders. However, the processes through which businesses navigate such boundary work for SBMI remains little explored. We address this gap by providing an empirical, detailed description of the boundary work processes for SBMI as a basis for further theoretical and practical work.

Methods

Approach

The aim of this study is to further the theoretical understanding on boundary work processes for SBMI through a rich description of a qualitative case study (Eisenhardt, 1989; Geertz, 1973; Stake, 1995). We analyze the actions and perceptions of a Dutch small-sized enterprise (SME) engaging in SBMI over a timespan of two years. Following phenomenological inquiry, we explore and describe the activities of boundary exploration, brokering and change in multi-stakeholder collaboration for SBMI. We observed the unfolding of the innovation process while its outcomes were still unknown at the time of research. This approach avoids post hoc rationalization through a rich description based on the stories of the stakeholders involved, offering a more detailed understanding of the activities and influences of boundary work for SBMI (Geertz, 1973; Ven and Poole, 1990).

Data collection

Nijsen/Granico – a Dutch SME in the pork sector – was chosen as our case study because the company's innovation is dependent on a collaborative reconfiguration of stakeholders in its value network. Despite many organized attempts to reconcile stakeholders in the past, the Dutch pork sector is still highly fragmented and under great legal, economic and public pressure to move towards sustainable practices. This led Nijsen/Granico to conduct boundary work with different stakeholders. Due to this particular character, a single case study design is considered appropriate (Yin, 2013).

We attended and recorded meetings and strategic sessions between the company and its stakeholders, and we interviewed the stakeholders involved in the innovation process to collect data (Table 2). We also drew on personal correspondences shared with us, internal documents concerning the company and its sector, web sites, annual reports and other publicly available reports. The interviews were semi-structured and aimed to elicit the participants' perspectives on the business model, the required boundary shifts and the collaboration process, including topics of negotiations, and whether and how they found some kind of common ground. We used these a priori concepts (of business model innovation, boundary work, boundary objects and organizational boundaries) to write discovery memos, and included 'in vivo' codes of related quotes and terms used by the participants to enhance and detail their grounding (Corbin and Strauss, 2013; Creswell, 1998). We subsequently applied axial coding to categorize the codes into subcategories of theory-related concepts, for example, the idea of 'boundary challengers' (Corbin and Strauss, 2013; Creswell, 1998; Glaser and Strauss, 1967).

Data analysis

Following Ven and Poole (1990), we started with developing track codes as sensitizing codes based on the literature. As this study aims to deepen our understanding of the manifestation of the track codes in the process of SBMI, we empirically derived indicators of the three different boundary work phases using inductive coding (Table 3). The manifestations of these indicators are called 'incidents' and functioned as coding elements for the phases.

Per phase we discerned topics relating to the boundary work activities. We subsequently coded

Table 2.

Data sources		Amount	Length	Collection method and data preparation	Data analysis
Semi-structured interviews:				Recorded and transcribed	Discovery memos, coding exercises
NG1	*Nijsen/Granico – General Director*	*1*	*75 min*	*Face to face 19-05-2017*	
NG2a *NG2b*	*Nijsen/Granico – Business Development Manager*	*2*	*110 min*	*Face to face 6-5-2019* *Face to face 20-9-2019*	
MPM	*Municipality Peel & Maas – Policymaker Strategy & Development*	*1*	*61 min*	*Face to face 3-5-2018*	
NGO	*NGO Nature & Environment – Project employee*	*1*	*45 min*	*Phone 3-5-2018*	
KI	*Kipster – General director*	*1*	*60 min*	*Face to face 19-05-2017*	
Bilateral meetings, including multi-actor modelling sessions		4	550 min	Recording, field notes, participatory observation	Multi-actor model, discovery memos, coding exercises
Multi-lateral project meetings		3	300 min	Recordings, field notes, observation	Discovery memos, coding exercises
Phone calls		9	165 min	Notes	Discovery memos, coding exercises
E-mail correspondences		20	n.a.	Notes	Discovery memos, coding exercises
Case study reports		14	n.a.	Notes	Discovery memos, coding exercises
Partner websites		12	n.a.	Notes	Discovery memos

Table 2: Overview of empirical data-collection and analysis

Table 3.		
Exploring boundaries and boundary reconfigurations	**Brokering boundaries**	**Implementing boundary changes**
inventing, conversing, discovering, investigating, drawing, exploring, sketching,	creation of choices, discussion, distribution, setting priorities, confronting, proposing	agreeing on, experimenting with, determining, changing, shifting, embedding

Table 3: Phases and examples of their indicators

and classified the data descriptively as incidents, e.g. 'inventing' and its elements of information, e.g. 'value creation'. Afterwards, we interpreted the data according to its theoretical event from boundary work, e.g., 'future boundary setting', its organizational boundary, e.g., 'power', and its business model elements, e.g. 'value creation and delivery'. This led to a 'qualitative datum', i.e., a string of words capturing the basic information about an occurrence and integrated these as a unique record into the data file. All data strings have related quotes, such as "We are in a process of collaboratively inventing the highest possible creation of value". In the next step, we integrated the inductive qualitative datum into the different phases to be able to find patterns of incidents. Finally, we returned to the track codes framework and redesigned the framework according to the findings of the data. As a result, we did not just include the manifesting organizational boundaries, but also integrated the drivers and tensions for boundary reconfigurations from within the organization, between organizations and from wider contextual factors such as consumer demands as perceived by the case study companies. To enhance the rigor of the study, we returned the description of the paper to the participants of the case study. This helped to empirically assess whether our classifications and constructed meaning corresponded to the focal case study's perceptions of the process.

Case study: SME-driven SBMI in the Dutch pork sector

The Dutch pork sector produces over 1.38 million tons of meat annually, of which 60% are exported (Berger, 2016). This makes it the fourth biggest livestock producer in the European Union. The pork sector is

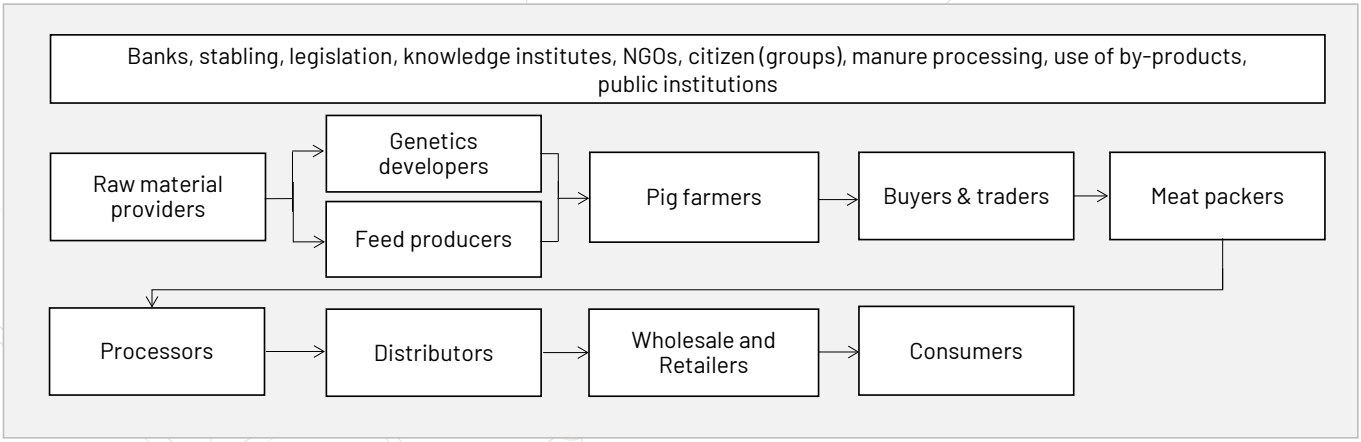


Figure 1: Configuration of the Dutch pork sector

organized as follows: suppliers of raw materials (e.g., soy scrap, cereals, wheat middling, rape seed meal, and additives such as vitamins and minerals) deliver to pig feed producers such as Nijsen/Granico, who sell the produced pig feed to pig farmers. The farmers sell their pigs for processing and distribution to wholesale and retail businesses (the latter are often governed by (conglomerates of) supermarkets, such as SuperUnie in the Netherlands). Surrounding this chain there are several NGOs, public institutions, banks and knowledge institutes (Figure 1).

The pork sector is known for its efficiency, but the associated economic gains come with downsides and the sector faces major challenges in maintaining its 'license to produce'. The main pressures are an increasing human demand for food and protein, standards for food safety, public demand for animal welfare, sustainable production, a circular bioeconomy and less pollution of water sources, soil, and air, as well as land use competition between humans and animals (Nijsen/Granico, 2017). As a result, calls for transformation are mounting. However, large sector stakeholders in particular, such as supermarkets and meat processors, have been rather unresponsive and have attempted to keep prices low while posing higher demands on pig farmers and feeding companies.

Nijsen/Granico is a regional SME which collects residual products (from bakeries, food production factories, and primary sources such as cereals and co-products from the food and biofuel industry) to produce pig feed, which they then sell pig farmers. Annually, Nijsen/Granico brings over 100,000 tons of residual products back into the food cycle (Nijsen/Granico, 2019). This strategy has recently gained attention as a means for improving the sustainability and 'license to produce' of the pork sector. At the same time, residual products are increasingly popular for biomass, and Nijsen/Granico's customers - the pig farmers - are facing increased public and legislative pressure on animal welfare, environmental restrictions, food safety, and intense pricing competition from retailers. It is within this context that Nijsen/Granico realized that further scale-up of production and efficiency was insufficient to provide a long-term outlook for the pork sector, and that there was a dire need for novel approaches to pork production.

A direction for this novel approach emerged in 2014, when a sustainable poultry company called 'Kipster' approached Nijsen/Granico with the request to produce 'circular' chicken feed. Nijsen/Granico had not made chicken feed for over thirty years, and they wondered why Kipster approached specifically them. Kipster answered that that they could only imagine Nijsen/Granico as a potential partner to deliver sustainable feed, as Nijsen/Granico collects residual waste. This brought Nijsen/Granico to the idea to for a similar business model in the pork sector, which they called 'Food for Feed for Food' (FFF). In this model, the firm aimed to collect residual products from retailers, process this to pig feed for Nijsen/Granico's customers, from which the meat would be sold in the same retail stores that delivered the residual products. As a small actor in a large value chain, Nijsen/Granico has realized that they are dependent on external stakeholders to co-create FFF, making it necessary for them to engage in collaboration in the early stages of the innovation.

Results

This section describes and elaborates on the boundary work processes by which Nijsen/Granico's FFF business model was innovated over six years (2014-2020). The boundary work processes were characterized by phases of exploration, brokering and implementation, based on indicators from Table 3. For each phase, we describe the dominating boundary work processes, organizational boundary changes and the boundary spanners and objects used in interactions between Nijsen/Granico and their external stakeholders. The different phases were not fully sequential, as some implementation and brokering activities interacted with exploration activities and vice versa. We therefore included a visualized timeline of the full SBMI process in Appendix B and synthesized the boundary work processes in Figure 2.

Exploration phase

Boundary work processes

Nijsen/Granico's trajectory for a circular pork model began with an emphasis on exploration. Together with Kipster, Nijsen/Granico's managing director and business development manager started with

Boundary work processes in the Nijsen/Granico case

Exploration phase	Brokering phase	Implementation phase
Exploring stakeholders, reconfigurations and tensions	Negotiating reconfigurations	Agreeing on reconfigurations
Exploring value propositions and potential partnerships	Negotiating value propositions	Experimentation with new reconfigurations
Setting-up first partnerships	Setting-up critical partnerships	Embedding reconfigurations

an initial value proposition idea from which they sketched their current multi-stakeholder network, changes required and points of tension that could help or impede the idea. On the one hand, pressure on the pork sector was high and NGOs were campaigning against the scale and ways of pork production. On the other hand, the pork sector was characterized by price-focused actors, such as retailers and processors. *"The meat price is a very sensitive item in the sector, and also an important element for retailers. If Aldi changes the meat price, Lidl will follow within 4 hours." (NG2b).* Simultaneously, Nijsen/Granico expected others to be searching for added value to strengthen their position. Particularly pig farmers were producing a non-distinguishable product in a global, competitive market, leading to thin margins and uncertainty about the selling price of pigs. Nijsen/Granico envisioned a novel role for their farmers: *"Our customer used to be the pig farmer. We just sold pig feed to the pig farmer, who made pork out of it, which goes to the meat processor. Now, the retailer, the consumer is my customer, and my current customer becomes my customer-oriented partner" (NG1).* With this as a basis, Nijsen/Granico's managing director started to think about potential value propositions for the different stakeholders. *"I offer a solution to a retailer's problem. The retailer wants to be circular, he feels the heat of NGOs, that is my interpretation for the moment, he is tired of those advertisements of cut-price meat and the lame pig. Well, I can solve that problem, and I can do it circular. [...] I can tell the retailer, if you supply certain raw materials, then I can ensure that they are made into Feed, which in turn comes to you as Food. Then, we have a circular food concept" (NG1).* Initial success in finding value propositions spurred further conversations with their external stakeholders: *"Through conversations, we increasingly discover the design of the value chain, which seems to be more rigid than we thought it was, and should be" (NG2b).* Nijsen/Granico realized they were not in the position to align all stakeholders by themselves, and that they needed to explore potential partnerships to develop FFF. Such network building activities were new to them, so they asked Kipster for assistance.

The identification of potential partners was a search process. Nijsen/Granico scanned many actors on their position in the value chain and their ambitions for sustainability: *"It is very important to investigate the position of actors in the chain. Who is really interchangeable? Who shows some sort of ambition for sustainability?" (NG2b).* Around that time, a business partner introduced Nijsen/Granico to SuperUnie, a large-scale purchasing conglomeration for retail in the Netherlands. Nijsen/Granico tried to convince SuperUnie to join the collaboration. While SuperUnie supported the idea, they wanted Nijsen/Granico to organize the process. As Nijsen/Granico had hoped and expected that SuperUnie would use its powerful position in the market to align other stakeholders, they were disappointed by the rather passive support that they received: *"That [the value] was seen by SuperUnie, but the reproach I have for retail is*

that eventually, they don't take any responsibility. SuperUnie said 'fine, just take care of it'. But I told him, 'you should take responsibility because you must use your position in the market to steer the processor, you determine the positioning, the price and the appearance of the product. That is your responsibility, you cannot put that on us' (NG1). As a result, Nijsen/Granico searched for alternative stakeholders to engage with.

This is where we see Nijsen/Granico contacting stakeholders with less prominent economic interests. Nijsen/Granico reached out to the regional municipality and an environmental NGO. They envisioned that the NGO would function as an intermediary towards retailers, which the NGO was willing to do. At the same time, Nijsen/Granico learned that the municipality had experienced pressures from its citizens to help the local pork sector as they faced severe continuation problems. They found that every farmer discussed sustainability in isolation based on their individual interests (e.g., on improving specific aspects of animal welfare such as tail cutting). This made them realize that the sector required structural rearrangements in which the municipality played a crucial role. The municipality stated that FFF would enable them to achieve their ambition for a sustainable pork sector in their region in a way that creates a sense of ownership of market actors towards sustainability.

After these conversations, Nijsen/Granico set up initial partnerships with these stakeholders. They established a project group with the environmental NGO, the municipality and Kipster, in which research, development, as well as involvement of a retailer (which is not yet involved at this stage) was planned. The project team established a WhatsApp chat group for small updates regarding new insights, connections, meetings etc. The boundary work processes in the exploration phase thus developed from internal explorations towards joint explorations with external stakeholders.

Organizational boundaries

During the boundary work processes, we have seen Nijsen/Granico touching upon changes in their own organizational boundaries. On the boundaries of identity and power, Nijsen/Granico wants to change their role from 'feed producer' to a strategic partner for sustainable feed concepts. *"We want to sell good behavior in the pig meat sector to the retailer, while strengthening our supply and demand network" (BG2b)*. When Nijsen/Granico started to engage in network building and partnerships, they were conducting novel activities on the efficiency boundary while developing their competences to sell added value in a new, sustainability-minded stakeholder network (Figure 3).

When Nijsen/Granico engaged in external boundary work to initiate partnerships, we have seen that boundary issues became more prominent and visible. The emerging boundary work issues were particularly focused on the boundaries of power and the distribution of roles and activities between the external partners. When potential partners refused to utilize or change their boundaries – as was the case with SuperUnie – Nijsen/Granico discontinued the cooperation.

Boundary spanners and objects

Initial boundary work processes took place internally in Nijsen/Granico through conversations and actor modelling activities, where they physically drew the multi-actor field on an A3 sheet. When reaching out to external stakeholders, Nijsen/Granico's managing director and business development manager acted as the main boundary spanners, assisted by Kipster. Nijsen/Granico's business development manager pointed out that non-verbal communication was very important to discover the true perspectives of external stakeholders; *"I refuse to speak by phone, I want to be able to see non-verbal communication, I want to see how others react" (NG2b).* At this stage, ill-structured language was used in external communication with stakeholders, such as, 'circular pig', 'banquet pig', 'circular food concept', and 'back door, front door'. The importance of using 'circular pig' was mentioned explicitly in the project meeting with the municipality and the NGO.

Brokering phase

Boundary work processes

With a project team in place, the team members started to discuss the ambitions of FFF and the

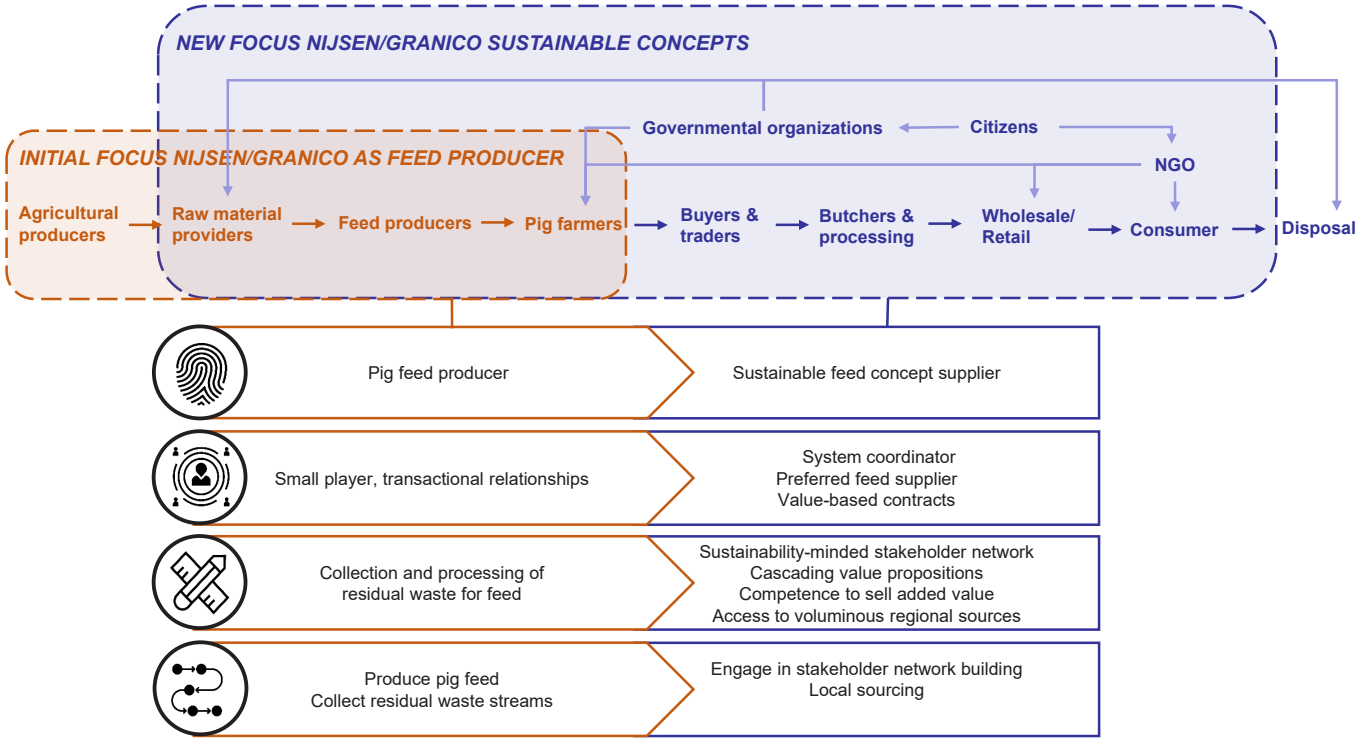


Figure 3: Organizational boundary changes of Nijsen/Granico

implications for the different stakeholders. The team members agreed that ultimately, FFF should aim to eliminate the 'feed-food competition' as regards to be able to feed the world's population in 2050. They expressed the need for research to avoid making sustainability claims that were not (fully) true, for which they decided to involve a Dutch university. The discussion continued towards the question of how the pork sector could look like once sustainable meat was the standard. They reasoned that, due to the available waste-feed resources, the meat sector would have to shrink by forcing the consumer to eat less meat or pay a higher price. They discussed that this would be a task for retail, which would have to establish long-term contracts with a fixed price based on the added value of FFF and supply their waste materials to Nijsen/Granico. In return, they stated that FFF enabled the retailer to offer their consumers good behavior in the production of pork, including transparency about animal welfare and environmental benefits. This would mean that the retailer could improve its image, get rid of NGO campaigns, and offer a distinguishable product at a higher price. The project partners found that the NGO would have to play a major role through certification and promotion of FFF. The NGO had preferred to eliminate meat production altogether, but realized that they had to compromise on their ambitions to a level that was acceptable for the other partners. As such, they demanded local sourcing from Nijsen/Granico, and significant environmental and welfare improvements from the farmers: *"It is possible that choices are being made, which could us say - well guys, if we do it this way, we will no longer be able to attach our name to it" (NGO).* Upon discussion, the partners decided to aim for a one-star ranking (out of three stars) on a Dutch animal welfare certification scheme, within a sourcing radius of 30 km around participating farms.

The discussion on the consequences of FFF also revealed major complications for farmers. The municipality expressed that *"The project will not deliver a sustainable future for all pig farmers. Perhaps for some" (MPM).* Nijsen/Granico explicitly accepted this consequence and was aware that these actors could try to oppose the situation. They had seen this happening before when farmers boycotted Kipster suppliers after Kipster had published a column in which they pleaded for largely abolishing livestock farming in the Netherlands due to its animal-unfriendly way of farming and its negative impacts on the natural environment. While the partners agreed on many

aspects, such as that the priority should be on empowering farmers through increased margins on their selling price, there was discussion about the involvement of farmers. The NGO stated that they aimed to collaborate only with farmers who were willing to improve their environmental performance and animal welfare. Kipster proposed to involve farmers only once the project partners had established a contract with a retailer so they would be in a better position to align these farmers, stating: *"If you aim for an inhibiting factor, you should ask a farmer to join the table" (KI).* They decided that as first steps, Kipster and the NGO would reach out to their retailer network to discuss potential partnerships. The partners also drafted a project proposal on FFF as means of communication to internal and external stakeholders.

Via Kipster, Nijsen/Granico learned that Van Loon, a meatpacker, was the only pork supplier for Lidl, a large-scale retail discounter. They pitched the FFF model to Van Loon. Although Van Loon's managing director told Nijsen/Granico that sustainable pig feed was an interesting story, he saw several barriers; Nijsen/Granico was a (very) small player in the sector; not a single Nijsen/Granico customer supplied pigs to Van Loon; and it would be difficult to 'force' pig farmers to purchase Nijsen/Granico feed. Also, Van Loon's director said: *"I would like to join, but I do not have any money".* Still, they became involved over a longer period of time, in a corrugated process. Van Loon arranged that Nijsen/Granico could present the FFF idea to Lidl, under the condition that Nijsen/Granico would not mention specific numbers and costs. However, Nijsen/Granico was convinced that specific numbers on economic and non-economic parameters would help to convey the value proposition. Hence, Nijsen/Granico presented to Lidl: *"Imagine if 520.000 pigs are being fed with circular Nijsen/Granico feed, this saves 20.000 soccer fields of agricultural land, prevents carbon emissions of 7650 cars, and saves as much energy as could be generated with about 752.000 solar panels, which equals 71.000 households"* (NG2b). Nijsen/Granico indicated that this was all possible for a small increase in the price of the meat, so that feed producers and farmers would receive a better margin to improve their sustainability. *"That was the straw that broke the camel's back for Van Loon, who found Nijsen/Granico untrustworthy, stepping out of line, and stated 'know your position'!"* (NG2b). After this confrontation, it remained silent for a while.

Several months later, Van Loon returned to Nijsen/Granico with the question: *"Can you provide circular feed for the same costs?"* (NG2b). Nijsen/Granico responded to that they could, Nijsen/Granico, Kipster and Van Loon jointly developed a (second) presentation to Lidl. When Van Loon saw the draft, he became angry as Nijsen/Granico had again included slightly higher prices for fully circular feed. Nijsen/Granico had found an inventive way to deal with this by reframing the proposal into cascading value propositions, providing the retailer choices on the degree of sustainability and related costs: *"For the same costs, you can get a part of the feed circular. For more investment, we can increase the circularity. By presenting it this way, the choice lies with the retailer"(NG2b).* During the presentation to the retailer, Nijsen/Granico mentioned *"We want the entire value chain to benefit, and that has the consequence of an X amount of costs per pig" (NG2b).* Afterwards, Van Loon indicated that Nijsen/Granico's model could help Van Loon to become "preferred supplier" of feed and to date, Van Loon is in further discussion about the possibilities of FFF within Lidl.

Organizational boundaries

The boundary work processes in the brokering phase elicited boundary issues that were previously unexplored. We have seen that the organizational boundaries of the project partners were partly aligned for the model; for example, by utilizing existing networks, knowledge about environmental issues, and certification skills within the competence boundary of the NGO. This made the brokering phase relatively uncomplicated with only a few issues to be negotiated, such as the NGO who was defending the credibility of the model to maintain their identity. The partners also identified the needed changes in the organizational boundaries of their external stakeholders. For instance, they identified a needed shift in the boundary of power between the retailer and their suppliers, and a shift in farmers' activities on the boundary of efficiency (see Table 4 for a full overview). They subsequently developed a strategy

Table 3

		Needed boundary reconfigurations	Tensions for boundary reconfigurations (internal and external)	Drivers for boundary reconfigurations (internal and external)	Value propositions	Brokering on	Reconfiguration implemented?*
Farmers (not yet involved)		Sustainable farmer	Willingness to become sustainable			n.a.	n.a.
						n.a.	n.a.
		Strategic partner of Nijsen/Granico	Called for a boycott of Kipster and its suppliers	Current global market competition	Eliminate global competition Enable long-term value contract Receive increased margin	n.a.	n.a.
		Use Nijsen/Granico feed Improve stable sustainability and animal welfare Less farmers needed	Financial implications		Municipality funds improvements and alternative for dropouts	n.a.	n.a.
Van Loon		Rethink position in pork sector					yes
		Access to Lidl					yes
		Nijsen/Granico preferred supplier for Van Loon Van Loon in more powerful position to retailer	Current price-focus NG is a very small player Van Loon cannot 'force' their farmers to buy NG feed Van Loon determines pricing, not NG	Current price-focused contracts with retailer on non-distinguishable product, putting margins under pressure	Ability for value-based contracting with retail Remain preferred supplier for Lidl	Position, volumes, pricing	no
		Separate NG farmers from other suppliers	No NG farmers supply Van Loon Costs for separate handling		Possible use of block chain	Processes	no

Table 4: Identified needed organizational boundary reconfigurations, emerging tensions and drivers for reconfiguration and its potential value propositions in the multi-stakeholder network

Table 3

		Needed boundary reconfigurations	Tensions for boundary reconfigurations (internal and external)	Drivers for boundary reconfigurations (internal and external)	Value propositions	Brokering on	Reconfiguration implemented?*
Retail		Ambition to become more sustainable and circular			Enable a sustainable corporate positioning		yes
		Sell good behavior and offer transparency to the customer		Current NGO campaigns Customers demanding good behavior	Getting rid of NGO campaigns		no
		Value-focused contracting to empower value chain actors Adjust pricing to consumer & promote less meat consumption	Current price-focused contracting		Enable offering distinguishable product and concept to customers at increased pricing	Value propositions and contracting	no
		Supply certain raw materials			Eliminate certain raw material waste streams	Activity	yes
Municipality		A sustainable and diverse municipal organization	Avoid sustainability claims that cannot be made (fully) true	Current pressures on the regional pig sector	Enable addressing the current pressures on regional pig sector		yes
		Help farmers to adjust financially Provide novel outlook for farmers		Enable self-management of market actors			yes
							n.a.
		From individual, isolated talks to integrated approach					yes

Table 4: Identified needed organizational boundary reconfigurations, emerging tensions and drivers for reconfiguration and its potential value propositions in the multi-stakeholder network

Table 3

		Needed boundary reconfigurations	Tensions for boundary reconfigurations (internal and external)	Drivers for boundary reconfigurations (internal and external)	Value propositions	Brokering on	Reconfiguration implemented?*
NGO		Strengthen identity	Avoid sustainability claims that cannot be made (fully) true		Strengthen NGO's purpose	On value proposition	yes
		Organize certification Provide access to retail and consumers					yes
		Remain credible to external partners	Collaborate only with parties willing to align Demands on sourcing and sustainability		Sourcing as local as possible	On value proposition	yes
		Influence retail, consumer attitude and behaviour through certification and campaigns Conduct research					not yet yes
SuperUnie		Ambition for a more sustainable sector					yes
							
		Use powerful position to align partners				On power	no
							

* At the time of research (November, 2020)

Table 4: Identified needed organizational boundary reconfigurations, emerging tensions and drivers for reconfiguration and its potential value propositions in the multi-stakeholder network

to align these stakeholders, which was focused on the ability to shift the power of the retailer and subsequently, the competences of the farmers.

Stronger boundary issues were displayed in the brokering processes with meatpacker Van Loon. Van Loon mentioned barriers that were situated on their own organizational boundaries (the influence on their own farmers), and of Nijsen/Granico (their limited power position and supply network). We consider the conflict over the use of numbers to be positioned on the boundaries of power between Lidl, Van Loon and Nijsen/Granico, as these numbers would affect contracts and price agreements between these stakeholders. Nijsen/Granico addressed these boundary issues by coupling elements of power (the required monetary commitments) to elements of the identity (the responsiveness of retail to the added sustainability value). Interestingly, Van Loon became more engaged after understanding the consequences of this model for their own power boundary.

Boundary spanners and objects

In the brokering phase, Nijsen/Granico remained the main boundary spanner, although the project partners now also conducted boundary-spanning activities (e.g., reaching out to potential partners). The project proposal functioned as a semi-structured boundary object in which the project partners could attribute their perspectives to and distribute internally. They discussed frames of evaluation of the project in terms of values, ambitions and rating schemes, but addressed the costs and benefits only qualitatively. Between the project partners, ill-structured language was used as a means to guide communication and distinguish business model options, such as 'Pigster', 'Food for Feed for Food', 'Food, Feed, Future', 'new pig farming'. The representative from the municipality perceived the talks between the partners as open and informal: *"Because we entered this challenge together and didn't focus on the solution of a pre-defined problem, we created space for each other to create new values" (MPM).*

Nijsen/Granico tailored their language to the purpose of the negotiation, and comprised words representing a novel, collective paradigm, such as using 'the whole chain' rather than 'us', and 'both' and 'share'. In negotiations with Van Loon and Lidl, Nijsen/Granico favored concrete language and quantitative elements, whereas Van Loon preferred avoiding any talk of prices and costs. In the first presentation, Nijsen/Granico did not have a way to deal with these issues of power yet. In preparation of the second presentation, we observe Nijsen/Granico tailoring their language by coupling qualitative elements (perceptions, feelings, and ambitions) to quantitative elements (monetary investments, volumes). In these brokering activities, the language was much more concrete and closer to stakeholders' boundaries in terms of frames of evaluation (values, schemes, ratings, costs and benefits).

Implementing phase

Boundary work processes

After the period of predominantly negotiating activities, we observe Nijsen/Granico agreeing on, and testing aspects of the model, as well as embedding changes in their own organization. For example, despite the negotiations with the NGO on the region of sourcing, there appeared to be a tension in establishing a steady supply, and the NGO needed to compromise further on their ambitions: *"Nature and Environment is expanding their perspective [on a local circular cycle]. First they wanted to source 30km around the farm. Then it became the Netherlands. Now they say, as close as possible and as far as they need to" (NG2b).*

In addition, the presentations to Lidl triggered a series of experimentation. The director of Kipster explained to Lidl that the availability of residual flows was a limiting factor for the Kipster model, and that not all residual flows from Lidl's stores and suppliers were going to Nijsen/Granico. As a result, Lidl invited Nijsen/Granico to provide a list of their products which could function as input for feed, stating that they had to help Nijsen/Granico to make Kipster feed. This was previously out of scope for the retailer and considered to be Nijsen/Granico's problem, and Nijsen/Granico hoped that this would open avenues for the FFF model as well.

Nijsen/Granico also explained that they struggled with issues of legitimacy of their new role. The

general director of Nijsen/Granco expressed that *"Nijsen/Granico wants to change their role from 'feed producer' to a strategic partner for sustainable feed concepts. This is still a struggle, as we are often introduced as the feed supplier" (personal communication, 22-3-2018).* To address this issue, Nijsen/Granico named their new identity 'Nijsen Concepts' and embedded this in their mission and vision statement, logo, website, and other communications.

Organizational boundaries

In the implementing phase, we see Nijsen/Granico shifting their boundary of identity as a follow-up to their changing boundaries of efficiency and competences. Nijsen/Granico started to conduct network-building activities at the very start of FFF, which shifted their boundary of efficiency. After the exploring and brokering phases, a preliminary sustainability-minded network was set up, and experimentation with taking back the waste streams from Lidl further developed Nijsen/Granico's boundary of competence in terms of network relationships. These seeds ultimately resulted in a change of their boundary of identity, by redefining their purpose as a pig feed producer into a provider of sustainable, circular meat concepts. Nijsen/Granico had hoped that this would change their power position as well so that they would be able to become preferred supplier for value-based models.

Boundary spanners and objects

Nijsen/Granico functioned as the main boundary spanner in the implementing phase. As one of the earliest partners, Kipster played an important role in aligning Lidl too. Although the other partners were still involved in this phase, we did not observe boundary-spanning actions from their side at the time of the research. The project partners used more definite and well-structured versions to come to agreements and experimentations. For example, the project proposal developed earlier now contained the agreed upon vision and numbers of impact, Nijsen/Granico updated their website with their novel name, mission and vision, and the concrete list of resources created by Lidl and Nijsen/Granico served as means for experimentation.

Discussion

This study provides a detailed story of how a firm has engaged in boundary work to develop and negotiate new value propositions, and create a value creation and delivery system in a multi-stakeholder setting. By means of the study, we make four contributions to the literature on SBMI.

First, a boundary work lens clarifies the interaction process between an initiating firm and its external stakeholders needed for SBMI. In this way, it further develops emerging theory on boundary work for SBMI introduced by Velter et al. (2020) by detailing the processes through which a business navigates its boundary work for SBMI and by identifying typical boundary reconfigurations for SBMI. The boundary work lens is particularly important for the search for new value propositions and value capture mechanisms for all stakeholders involved. Our case shows that boundary alignment is required from the initiating firm and from external stakeholders, including non-business partners such as a local municipality and an environmental NGO. The breakdown into phases of exploring, brokering, implementing helps to better understand the process and reduces the complexities of boundary work for SBMI. Specifically, it helps to elicit less tangible aspects that affect stakeholder alignment, such as power issues (Avelino and Wittmayer, 2016; Eweje, Bolton, and Landells, 2015; Hawkins, Pye, and Correia, 2016), development of capabilities (Bocken and Geradts, 2020; Inigo et al., 2017; Luzzini et al., 2015), and changing values and identity (Bojovic et al., 2019; Breuer and Lüdeke-Freund, 2017). This assists in grasping the complexities, tensions and interdependencies in a multi-stakeholder system, which are known to be overwhelming (Oskam, Bossink, and de Man, 2020; Rohrbeck, Konnertz, and Knab, 2013).

Second, a boundary work lens helps to illuminate the required organizational boundary changes (e.g., changes in activities, competences, external relations and identity of an organization) as well revealing underlying issues of nonalignment. This may be particular important in sectors where unsustainable business models are highly institutionalized and

exacerbated by price pressures such as the food sector (Bocken and Short, 2021; Reinecke et al., 2019). Boundary work with partners is necessary to develop new propositions and break down unsustainable business models (Bocken and Short, 2021). For example, between Van Loon and Nijssen/Granico, the discussions first centered around price, but, becoming more aware of the ingrained problems and possibilities of SBMI Van Loon turned to helping Nijssen/Granico to become "preferred supplier" of feed. Boundary work might help companies to see the bigger picture of the change, and where they could (positively) be positioned in a future competitive landscape.

Third, and related to the above, reconfigurations on the *power* boundary proved crucial in the studied SBMI case, for which the initiating business engaged in cross-sectoral collaboration (Pedersen et al., 2021; Rohrbeck et al., 2013), identity work (Bojovic et al., 2019; Mdletye et al., 2014), and adapting boundary objects (Carlile, 2002; Hawkins et al., 2016) as strategic actions for reaching alignment. The boundary work perspective enables the development of strategies to deal with boundary issues. However, the results also suggest that the entrepreneur can only offer a piece of the solution and might need support from other actors to reach agreement on boundary alignment, such as intermediaries or institutional actors (Kivimaa, 2014; Kivimaa, Boon, Hyysalo, and Klerkx, 2019; Zietsma and Lawrence, 2010).

Fourth, for practice, the boundary framework can support businesses in developing the required strategies for boundary alignment. The case study showed how alignment was required across (a) different stakeholders and (b) across different types of organizational boundaries, which suggests the need for a holistic alignment approach when pursuing SBMI. It also reveals partners' position on sustainability and who needs to be involved the SBMI process. Space to create new values with value chain partners is necessary. Boundary objects can help to deal with uncertainties, to facilitate strategic discussions and to find solutions to different valuation frames, power tensions and role divisions between stakeholders. In our case, a project proposal functioned as a semi-structured boundary object in which the project partners could attribute their perspectives to and distribute internally. They discussed frames of evaluation of the project in terms of values, ambitions and rating schemes, but addressed the costs and benefits only qualitatively. The complexity of the topic requires a boundary object such as a vision or project plan which everyone can relate to; which is not too specific and leaves room for differing perspectives; and which is adjustable to facilitate joint experimentation and solution-finding.

Limitations and implications

This study and the boundary work perspective has its limitations. First, the company studied in this research was in early and mid-level phases of innovating its sustainable business model. Further research could select a case study where the critical boundaries have been reconfigured (implementation phase) and where value capture is also integrated to assess the feasibility of the sustainable business model, and its strategic actions for boundary reconfigurations (Lepak, Smith, and Taylor, 2007). Second, as this study comprises a single case design, alternative cases initiated by different type of actors (e.g., an intermediary or an NGO) and/or cases of international corporations conducting boundary work in global networks can be inquired and compared to one another. This can advance theory development on boundary work processes, strategies, and potential other boundary conceptions relevant for successful SBMI (Kivamaa et al, 2019; Van de Ven, 2007). Third, this work focused on organizational boundaries, but this can be extended to include physical and geographical boundaries. For instance, one of the case discussions centered around what was still considered to be 'local' in the circular economy, which resulted in a joint view focused on: 'as close as possible and as far as they need to'. An extension of boundaries beyond those of the organizational context (e.g., physical, regional) but related to strategic joint decision-making in SBMI may be an interesting source for future research. Finally, for practice, the framework of this study can function as a basis for developing a practical tool that assists companies in starting multi-stakeholder SBMI (Geissdoerfer et al., 2018; Rohrbeck et al., 2013).

Conclusion

This paper traced the efforts of a small firm engaging with strategic partners and non-traditional stakeholders in the daunting task of transforming the Dutch pork industry. The endurance and creativity of the firm suggests that there is no blueprint for SBMI, but rather requires a process of boundary work to collaboratively explore and negotiate value opportunities in the organizational boundaries of each stakeholder. The case makes transparent and nameable the intrinsic complexities of projects which are neither purely transactional nor relational.

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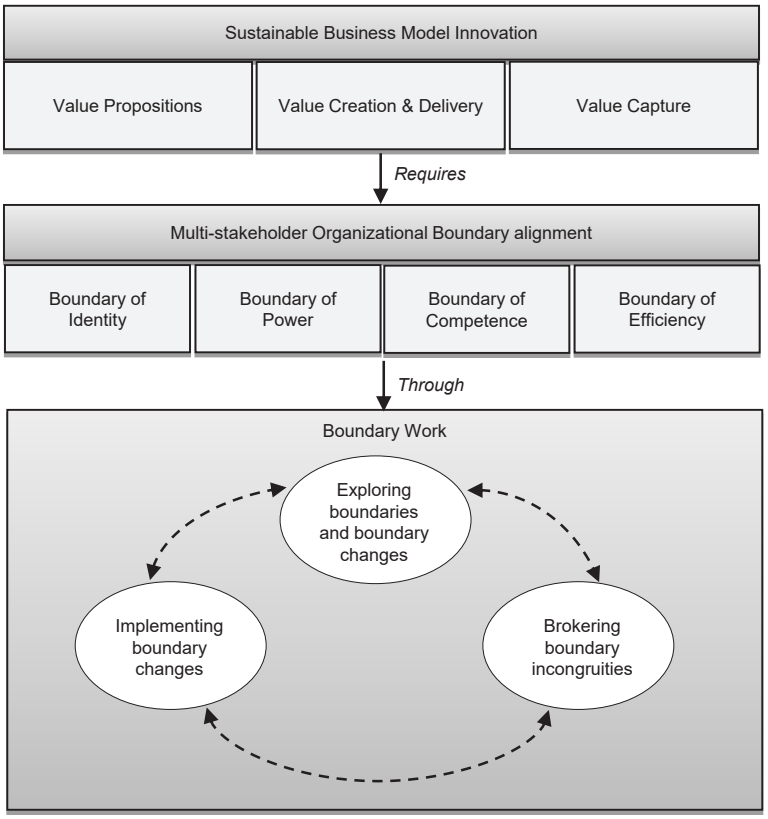
Appendix A: Theoretical framework of boundary work in SBMI, as developed in Velter et al, 2020



Appendix B: Timeline of the SBMI process

2014

- Traditional business model Nijsen/Granico under pressure due to small margins, commodity position and scarce supply of residual flows.
- Kipster asks Nijsen/Granico for circular chicken feed

2015

- Coincidental connection SuperUnie
- Value-research feed i.c.w. Wageningen University
- Sketch businesscase Kipster
- Idea Food for Feed for Food

2016

- Exploratory meetings Kipster, to align retail and NGOs
- Exploratory meetings NGOs Natuur & Milieu, Milieudefensie and Dierenbescherming
- Initial exploring critical stakeholders and barriers: SuperUnie required to align butchers as butchers cannot work in badges
- Conflict SuperUnie on responsibilities

2017

- Novel roles and activities, particularly for retailer and pig entrepreneur
- Barriers for alignment critical stakeholders
- Prioritizing collaboration partners
- Financers show interest
- Start Kipster

2018

- Modelling stakeholder network as-is and to-be, in collaboration with the focal researcher and a consultant
- Define key-stakeholders, their characteristics and envisioned barriers for alignment
- Define potential partners and defenders (Knowhouse, Municipality, pig farmers)
- Development of three business model strategies and preferred strategy
- Envisioning future role Nijsen/Granico: from 'feed producer' to 'circular concept provider'

2018

- Project proposal drafted by NGO's, Ruud Zanders and Municipality.
- Realisation that company growth is limited when sticking to the societal value proposition
- Discussion about certification schemes
- Realisation of dropouts (limited amount of pig farmers)
- NG requests the independent consultant to be an external broker

2018

- Process split up in 3 projects:

1. The Pigster consortium, about circular pig farming. Participants: 1 customer (Albron), BOM, Kees Schepers. Experiment with pigs "the Duke of Berkshire"
2. The Banquet Pig, a project aimed at large retailers
3. The Circular Pig, project of offering the concept to other retailers

- Acceleration Banquet Pig due to meetings Lidl and Van Loon
- Nijsen/Granico proposes its new role as a strategic partner for circular food concepts in addition to pig feed producer to Lidl

2019

- Kipster opens 3rd stable
- Supply problems Nijsen/Granico for Kipster, Lidl helps with list of potential residual products

Circular Pig:

- Negotiate priorities value creation
- NGO agrees on sourcing process
- Exploring structure and sensitivities in the sector: pricing, feed-farmer relations
- Conflict over concreteness pricing
- Improved understanding power and position of Nijsen/Granico's new role
- NGO makes explainer Circular Pig

Banquet Pig:

- Presentation Nijsen/Granico to Lidl and butcher, mentioning specific numbers pricing, value propositions, costs
- Critical publication Kipster, revealing emerging discontent existing farmers

2020

- Nijsen/Granico starts talking to international partners
- Conversations with Van Loon and Lidl continue
- Lidl continues to supply residual products for Kipster

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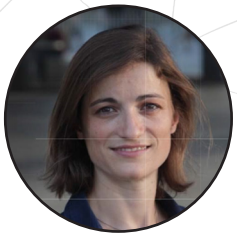

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Journal of Business Models (2021), Vol. 9, No. 4, pp. 67-93

JOURNAL OF BUSINESS MODELS

Platform-Based Business Models in Future Mobile Operator Business

Seppo Yrjölä, Petri Ahokangas, Marja Matinmikko-Blue

Abstract

Purpose: As an emerging field, the fifth generation, 5G, mobile communications technologies related business models have only been discussed to a limited extent in the literature, and platform business models in general have seldom been examined. The purpose of this paper is to explore how to understand and capture the evolution of future mobile operators' platform-based business models in the 5G/6G context?

Approach: Building on economics and engineering traditions, this study utilizes the 4C (connectivity, content, context, commerce) and the as-a-Service (aaS) digital service business model typologies. This research follows a cyclical process of research-oriented action research, collecting data in two phases from the future-oriented World Cafe workshops held at Nokia RadioActive! user group event in Espoo in November 2017 and 6G Wireless Summit in Levi in March 2019.

Findings: The paper uncovers the extended ecosystemic platform architecture for the business model and ecosystem research consisting of components, interfaces, data and algorithms.

Value: We are currently lacking a coherent approach for researching ecosystemic platform-based business models as the extant discussions tend to focus either on ecosystem(ic) features of business models or platform business models that, however, share common characteristics. The study adopts a value-based and service-dominant lens focused on business model research at the ecosystemic level. For the first time, the study introduces the extended ecosystemic platform architecture, investigating how this business framework can enable the transformation of the 5G.

Keywords: action research, business ecosystem, business model, platform, 5G, 6G

Acknowledgement: The research has been supported by the Business Finland 5G-VIIMA program. In addition, the authors would like to acknowledge the support of the 6G Flagship programme at the University of Oulu.

Please cite this paper as: Yrjölä, S., Ahokangas, P., Matinmikko-Blue, M. (2021) Platform-Based Business Models in Future Mobile Operator Business, Vol. 9, No. 4, pp. 67-93

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DOI: https://doi.org/10.5278/jbm.v9i4.6222
ISSN: 2246-2465

Introduction

Recent discussions on platform-based business models have started to converge and build a basis for a more unified research agenda (Gawer, 2014; de Reuver, Sørensen and Basole, 2018; Helfat and Raubitschek, 2018) for understanding and capturing such business models. With roots in economics and engineering, platform research has an intrinsically dualistic perspective to business (Gawer, 2014). In the economics tradition, platforms have been seen as two- or multisided markets connecting supply and demand, whereas, in the engineering tradition, they have been seen as modular technological designs for facilitating innovation. Moreover, there is also a tendency in these works of literature to see platforms and ecosystems as intertwined (Teece, 2018), as both traditions acknowledge platforms to be consisting of a complex networked/layered system of modular components and interfaces the scope and scale of which go beyond the immediate platform actors.

The business model concept has emerged as a solution to deal with this duality of perspectives—the increased platformization of businesses is well exhibited in extant business model discussions. For example, the demand-side business models have come to complement supply-side business model discussions (Priem, Wenzel and Koch, 2018), and open and mixed business models have come to challenge traditional closed business models (Casadesus-Masanel and Llanes, 2011; Langley, van Doorn, Ng, Stieglitz, Lazovik and Boonstra, 2021). Platform interactions and convergence have emerged as an increasingly important topic (Zhao, von Delft, Morgan-Thomas and Buck, 2020), and the discussions on ecosystemic business models have fundamentally influenced how the environment of the organization is seen (Demil, Lecocq and Warnier, 2018). However, we are currently lacking a coherent approach for researching ecosystemic, platform-based business models as the extant discussions tend to focus either on the ecosystem(ic) features of business models (Iivari, Ahokangas, Komi, Tihinen and Valtanen, 2016; Gomes, Iivari, Pikkarainen and Ahokangas, 2018) or platform business models (e.g., Fehrer, Woratschek and Brodie, 2018; Täuscher and Laudien, 2018). These two streams of literature, however, share common characteristics.

Researching platform-based business models call for a systemic approach that considers both platform and ecosystem viewpoints to business models and can delve into the phenomena discernible in this kind of research setting. In addition, an appropriate research context is needed. As the fifth generation, mobile communications technologies are expected to transform the future wireless communications services and networks businesses—including business models—it serves as a research context foundational to new theory development and deriving managerial implications. (Yrjölä, Ahokangas and Matinmikko-Blue, 2020a; Ahokangas, Yrjölä, Matinmikko-Blue and Seppänen, 2020)

Mobile networks, such as 5G and 6G, can be regarded as connectivity-focused platforms (Pujol, Elayoubi, Markendahl and Salahaldin, 2016) or ecosystems (Basole and Karla, 2011; Ahokangas et al., 2020) where the mobile operator has the focal role as the platform owner. Beyond engineering, the 5G- and 6G-related businesses and business models have been discussed only to a limited extent in the literature (Ahokangas, Matinmikko-Blue, Latva-aho, Seppänen, Arslan and Koivumäki, 2021b) as multi-faceted, mobile platforms are difficult to categorize. Gawer and Cusumano (2014) identify company-internal platforms that serve firms' internal purposes, supplier-network platforms that integrate firms and serve information flow purposes, and ecosystem platforms that serve various purposes of changing partners. Later, Gawer (2020) differentiated between innovation and transaction platforms. In turn, Zhao et al. (2020) coin pipeline platforms that serve buyer-seller relationships, manufacturing platforms that operate within a network of suppliers, and multisided platforms that enable (as an intermediary) interaction between users. Thus, considering platform categorizations, mobile platforms can be seen as hybrid platforms (c.f., Ahokangas, Matinmikko-Blue, Yrjölä and Hämmäinen, 2021a), characterized by each of the types presented by Gawer and Cusumano (2014) or Zhao et al. (2020). Existing 5G/6G business model research in the engineering context highlights the research's overly technical starting points, pointing out the importance of platforms (c.f., Camps-Aragó, Delaere and Ballon, 2019; Hmoud, Salim and Yaakub, 2020).

Recently, the evolution of future platform businesses and business models has raised various interests. For example, Zhao et al. (2020) pay attention to competitive battles and Jullien and Sand-Zantman (2021) to competition policy. Wallbach, Coleman, Elbert and Benlian (2019) examine multisided platform diffusion in a competitive business-to-business context. Gawer (2020), in turn, pays attention to scope, sides, and interfaces when combining platforms. In close connection to platforms, Langley et al. (2021) are interested in the role of smartness and connectedness on business modes, and Climent and Haftor (2021) examine industry evolution and business models. In the mobile communications context, Ahokangas et al. (2021a) pay attention to platform convergence in a multi-platform context and Yrjölä, Ahokangas and Matinmikko-Blue (2020a, 2020b) in the 5G/6G transition context. However, scant research beyond engineering research considers mobile operators' platform business models (Ahokangas et al., 2021b).

Building on the above, a practical challenge that we identify is how future platform business models unfold, especially in the context of 5G/6G business transformation, giving rise to the research question addressed in this paper:

How to understand and capture the evolution of future mobile operators' platform-based business models in the 5G/6G context?

Qualitative and exploratory research methods are recommendable in occasions where the aim is to add theoretical knowledge on phenomena that deserve more detailed research (Eisenhardt, 1989), which is the case in this research. To answer the research questions, we follow the cyclical process of research-oriented action research (Eden and Huxham, 2006). In action research aiming at theory development, the nature of the research problem guides the action research cycle, giving primacy to the flowing cycle: foreknowledge, emergent theory, action/data generation, reflection, theory exploration, and development (Dickens and Watkins, 1999). Following the action research cycle, the data for the research was collected in two phases starting from future-oriented World Cafe workshops held at Nokia RadioActive! -user group event in Espoo in November 2017 and 6G Wireless Summit in Levi in March 2019.

Our discussion is organized as follows. The following section presents the theory framework for the paper and next one provides a discussion on the 5G context and business models. These are followed by the research method section. The results of the two phases of data analysis are presented after the method section. Finally, the empirical implications, theoretical contributions, limitations, and avenues for further research arising from the study are discussed in the concluding section.

Framing the Discussion on Platform-Based Business Models

Ecosystemic platform business models

The question is how the business model might be utilized as an approach to examining businesses. Conceptually, one can distinguish between the design of the business transaction's content, structure, and governance in the business model (Zott and Amit, 2010) or their focus, modus, or locus (Onetti, Zucchella, Jones and McDougall-Covin, 2012). Practically, the technology, offering, and network architecture can also be considered the major constituent parts of a business model (Mason and Spring, 2011). Gatautis (2017) found that information and communication technologies (ICT) based infrastructure platforms have become the basis for ecosystems to orchestrate and organize activities of many companies. Weil and Woerner (2015) proposed four types of business models for the digitalized context: the supplier model works in the value chain of another company; the multichannel model makes firms restructure across several digital and physical touchpoints to serve their customers; the modular model builds on plug-and-play interfaces to complement firms' offerings; and finally, the ecosystem model builds a customer-centric platform to facilitate ecosystemic interaction among customers. In turn, Gawer (2014) categorized platforms in three categories: as a company and its internal units, i.e., the internal platforms; a network of company and its suppliers, i.e., the supply chain platforms; and an ecosystem keystone actor and its supplement actors in a technology or business ecosystem, i.e., the ecosystem platform.

Ecosystem platform architecture may be seen as a conceptual blueprint that describes how the ecosystem is partitioned into a relatively stable platform, a complementary set of varying modules, and the design rules binding on both (Baldwin and Woodard, 2009; Cusumano and Gawer, 2002; Katz and Shapiro, 1994; Sanchez and Mahoney, 1996; Ulrich, 1995). Decomposition of a platform ecosystem into constituent atomic subsystems minimizes interdependence among the evolution processes within components of the platform ecosystem, supports change and variation, and helps to cope with complexity (Simon, 1962). Schilling (2000) sees the platform ecosystem as a complex system composed of interacting subsystems that are always to some degree interdependent and interoperate exclusively using predefined, stable interfaces (Eisenmann, Parker and van Alstyne, 2006). *Modules* can be defined as an add-on software subsystem that connects to the platform to add functionality to the platform (Baldwin and Clark, 2000; Sanchez and Mahoney, 1996). Katz and Shapiro (1994) defined *interfaces* as specifications and design rules that describe how the platform and modules interact and exchange information using well-documented and predefined standards like application programming interfaces (APIs). Baldwin (2008) found that modularity decreases coordination costs and transaction costs across the module boundary while interface standardization decreases asset specificity of modules (Schilling, 2000).

Attempts made to look at ecosystemic platform business models can be found in software, web-scale, e-commerce business, cloud, Internet-of-things (IoT), the platform business, and wireless communications contexts. For example, in the digital services domain, *everything-as-a-service* (XaaS) (Lenk, Klems, Nimis, Tai, Sandholm and Alto, 2009) enables a large number of digital service providers to offer a variety of cloud-based services across the cloud stack layers. Within XaaS, the most widely deployed digital as-a-service business models are *infrastructure-as-a-service* (IaaS), *platform-as-a-service* (PaaS), and *software-as-a-service* (SaaS) (Mell and Grance, 2011).
Wirtz, Schilke and Ullrich (2010) proposed a typological 4C business model framework for the Internet age to make the business model analysis more straightforward and structured. Each of the four types of business models has varying value propositions and revenue models: *connection* (e.g., wireless), *content* (e.g., data), *context* (e.g., search or location intelligence), and *commerce* (e.g., marketplace and platforms). Thus, the typology can be interpreted as a set of nested layers from the platform ecosystem perspective, where lower layer business models are required as enablers and value levers for the higher layers (Yrjölä, Matinmikko, Ahokangas and Mustonen, 2016).

A transformation of business models and entire industries from vertical or horizontal linear towards two-sided and networked has been found (Van Alstyne, Parker and Choudary, 2016). Furthermore, with the emergence of platforms, Iivari et al. (2016) defined an "*oblique*" business model that has a focus on value sharing through value co-creation and co-capture, while the traditional vertical control-oriented business models have aimed at controlling value creation and the horizontal business models controlling value capture. In these emerging value-sharing-oriented platform ecosystems focusing on the co-creation of complementary new services, the critical issue (Casadesus-Masanell and Llanes, 2011) is the openness of the business model. Notably, they see the openness of a business model starting from closed and extending toward the open edge, open core, and open source.

Themes relevant to examine ecosystemic platform business models

The engineering approach to platforms highlights *innovation* as modularity makes managing innovation in complex technical systems more manageable and incremental (Schilling, 2000). Teece (2018) discusses profiting from innovation through enabling and general-purpose technologies in the wireless world, raising several concerns for value appropriation and positive spillover effects related to enabling and general-purpose technologies. Casadesus-Masanell and Llanes (2011) discuss closed, open, and mixed business models. They see the *openness* of a business model starting from closed and extending toward the open edge, open core, and open source. The openness of business models boils down to discussions on open innovation (Chesbrough, 2003;

2006), and in platform contexts, this brings the ecosystem and its stakeholders close. An equally important aspect to innovation and openness is *complementarity*, related to production, customers, asset prices, inputs, technologies, or innovation (Teece, 2018). Complementarity raises business model-related concerns. More importantly, it puts forth the question of the platform type–whether internal, supply-chain, or industry (Gawer, 2014)—as different types of platforms may exhibit different *configuration* types and levels (lightly or loosely coupled) of complementarity. Helfat and Raubitscheck (2018) focus on dynamic and integrative capabilities in platforms and argue that when designing platform business models, on top of the usual business model elements, attention should be paid to the core product innovation, functionalities, and features, number of sides of the platform, degree of outsourcing as related to complementarity, and governance.

The increasing volume of *data* has transformed today's business practices (McAfee, Brynjolfsson, Davenport, Patil and Barton, 2012; Bharadwaj, El Sawy, Pavlou and Venkatraman, 2013; Jeble, Kumari and Patil, 2018). In terms of defining new business strategies to deal with digital technologies, expanding business networks and collaborating to build interconnected relationship business models, and then figuring out new insights for the value creation strategy have been found essential (Bharadwaj et al., 2013). The *algorithmic* revolution and enabling cloud computing can be seen as the foundations of the platform economy. Computing power is converted into economic tools using algorithms operating on the raw material of data. The software layer that stretches across and is interwoven with the economy is a fabric of algorithms. That software layer, that algorithmic fabric, is being extended to cover manufacturing, giving birth to the Internet of Things, the Internet of Everything, or the Industrial Internet, with its implied webs of sensor networks (Kenney and Zysman, 2016). However, the existing literature has not yet proved how different business models can align with data-oriented systems. Also, to date, there is only limited research found on how to link the big data with the business model thinking, as the previous research efforts focused on the technical aspects of data related to data monetization, clustering, and data lifecycle, ignoring customers and business requirements (Khaloufi, Abouelmehdi, Benihssane and Saadi, 2018).

Competition in platforms may appear at three levels, between platforms, between the platform and its partners, and between complementors (Teece, 2018). Inter-platform competition has resulted in winner-takes it all outcomes in cases of great demand, supply-side economies, multi-homing costs, or no niche specialization. However, competition between platforms leads also to increased openness. However, all platform contexts require careful balancing of *cooperation* and competition at the three identified levels. Casadesus-Masanel and Llanes (2011) found that open and mixed business models have come to challenge traditional closed business models. Priem et al. (2018) complement supply-side business model discussions with the demand-side business models. Furthermore, how an organization's environment is seen has been fundamentally influenced by the discussions on ecosystemic business models (Demil, Lecocq and Warnier, 2018).

Gawer (2014), de Reuver et al. (2018), and Teece (2018) all raise the question of how to *organize and govern* platforms, discussing what types of platforms exist, how to deal with the openness of interfaces in the platform, what capabilities (i.e., services) are accessible by or through the platform, and whether the governance of the platform is based on ownership (managerial authority), contractual relationships, or ecosystem governance. The traditional engineering discussion on platforms has been directed to economies of scale in service provisioning, i.e., on the supply-side (Teece, 2018), while in business model discussions, attention has been paid to business model scalability (Nielsen and Lund, 2018). In addition, network effects of the platforms have been seen to increase the value of platforms, but Gawer (2014) also relates economies of scope regarding service provisioning and innovation to platforms.

5G business models as the research context

The application of big data, new algorithms, cloud computing, and 5th generation (5G) wireless connectivity will change the nature of work and the structure of the economy. As basic mobile broadband

connectivity service becomes increasingly commoditized and is under significant pricing pressure, mobile network operators (MNOs) are exploring ways to diversify their businesses. These might involve bundling connectivity subscriptions with utility services, providing platforms for e-commerce, increasing focus on the business-to-business (B2B) market, or emphasizing new areas such as enterprise cloud and the Internet of things (IoT) verticals (Yrjölä, Ahokangas and Matinmikko-Blue, 2018). As a result, MNOs worldwide are reinventing their businesses to better position against digital transformation and take them beyond the traditional communication service provider role. That shift requires more focus on innovation, disruption, and experimentation to build and execute platforms and ecosystems that drive new business and establish an agile corporate culture that embraces change (Ahokangas et al. 2020).

5G architecture and key enabling technologies

Compared to today's 4G technology, initially designed for high-speed mobile broadband, 5G is a complete redesign of network architecture with the capabilities, flexibility, and agility to support an array of future service opportunities not available in previous generations of network technologies. 5G will enable networks to go beyond traditional human-to-human interaction, connect further billions of connected things and reliably control machines in real-time. Consumer entertainment will be enhanced with super-fast download of high definition (HD) video in seconds and new virtual reality experiences. Connectivity for billions of IoT devices will enable smart factories, where robots, sensors, and remotely located human operators work synchronized.

A critical aspect of the 5G network is creating customized network slices that enable services tailored to specific customer needs with service level agreed (SLA) and performance on demand (Ordonez-Lucena, Ameigeiras, Lopez, Ramos-Munoz, Lorca and Folgueira, 2017). Network slices enable mobile operators to generate new revenues through customized industrial automation and enterprise services while exploiting the benefits of a common network infrastructure. Third-party application and service providers will use the sub-set of the network capabilities flexibly in a configurable and programmable manner and use network resources needed for their service offerings. Moving from hierarchies to the marketplace for the connectivity and underlying network resources can more efficiently balance supply and demand, raise the utilization of infrastructure, and ultimately maximize economic value within the industry.

Increased network elasticity and scalability introduced with 5G and adaptation of resource usage to needed capacity and service level on demand will improve business agility and reduce capital and operational expenses. Furthermore, software-based networks enable efficient infrastructure sharing by different network users, open the ecosystem to new players, and accelerate time to market by reducing service creation and activation times. The service orchestrator acts as the logical interface between network and business applications by providing an abstraction of the network towards applications and interfaces for easy service creation and optimization and exposes actionable network insights to application and content providers, enterprises, and industry verticals (Ahokangas, Matinmikko-Blue, Yrjölä, Seppänen, Hämmäinen, Jurva, and Latva-aho, 2019).

5G business models

Due to the transition from mobile voice services to mobile data services (Kallio, Tinnilä and Tseng, 2006) and industry convergence and digital disruption in telecommunications industries (Ghezzi, Cortimiglia and Frank, 2015), the value is rapidly migrating across industries and between firms (Hacklin, Björkdahl and Wallin, 2018). However, the existing 5G studies focus on traditional mobile network operator business models and discuss 5G in rather technical and general terms, mainly at the industry level. From the technical perspective, the focus has been on analyzing the cost, coverage, and rollout implications of 5G networks, e.g., highlighting the impact of the spectrum and infrastructure deployment (Oughton and Frias, 2018), network densification to increase capacity (Bouras, Kollia and Papazois, 2016), strategies for infrastructure sharing (Meddour, Rasheed and Gourhant, 2011), fixed-mobile substitution (Briglauer, Gugler and Haxhimusa, 2016), neutral host deployments of small cells for local services (Fund, Shahsavari, Panwar, Erkip and Rangan, 2017), and integration of utilized radio frequencies (Nikolikj and Janevski, 2015). Table 1 presents the

Table 1.

- Partnerships and collaboration (Camponovo and Pigneur, 2003).
- Context level mobile services' business model designs from service, technology, organizational, and financial domain perspectives (Reuver and Haaker, 2009).
- Characterization of various core components and roles in mobile communications includes platform types as enablers, system integrators, neutral, or brokers (Ballon, 2009).
- MNOs' capabilities to adopt web-based software-as-a-service and platform-as-a-service models (Gonçalves and Ballon, 2011).
- Envisioning aggregator- and service-centric models in addition to telco- and device-centric models (Kuoa and Yub, 2006; Ballon, 2009; Zhang and Liang, 2011).
- The impact of the Internet on the telecommunications industry, predicting integration between Internet companies and the telecommunication networks, and the Internet companies building networks themselves using unlicensed spectrum technologies or acquiring telecommunication companies (Feasey, 2015).
- Recommendation for MNOs to move from market protection to specify and manage the implementation of an innovative ecosystem (Ghezzi et al., 2015; Weber and Scuka, 2016).
- The nature of 5G services is local (Ahokangas, Moqaddamerad, Matinmikko, Abouzeid, Atkova, Gomes and Iivari, 2016).
- Transformation is needed to utilize IoT opportunities (Palattella, Dohler, Grieco, Rizzo, Torsner, Engel and Ladid, 2016; Sarfaraz and Hämmäinen, 2017).
- Listing antecedents and perspectives that are needed to understanding business models and their success factors (Neokosmidis, Rokkas and Xydias, 2017; Chochliouros, Kostopoulos, Spiliopoulou, Dardamanis, Neokosmidis, Rokkas and Goratti, 2017).
- Introduction of the local 5G micro-operator concept, its related roles and stakeholders, and business models (Matinmikko, Latva-aho, Ahokangas, Yrjölä and Koivumäki, 2017; Matinmikko, Latva-aho, Ahokangas and Seppänen, 2018).
- Presenting key business opportunities for local 5G micro operators: hosting local connectivity to MNOs, offering secure local networks for verticals, providing differentiating local services, and acting as a data operator governing application and user data for various customers (Matinmikko et al., 2017).
- Transformation of MNOs towards value creation in content and applications and increasing competition with verticals in supplying these utilizing network sharing, multitenancy, and wholesale models (Cave, 2018).
- Proposition of novel resource orchestration and configuration-based business models and decentralized marketplace concept for the supply chain of data and virtualized network resources utilizing distributed ledger (Yrjölä, 2019).
- Vision papers on future communication needs, enabling technologies, the role of AI, and emerging use cases and applications (Viswanathan and Mogensen, 2020; Latva-aho and Leppänen, 2019; Saad, Bennis and Chen, 2020; Letaief, Chen, Shi, Zhang and Zhang, 2019).
- Presentation of 6G indicators of value and performance (Ziegler and Yrjölä, 2020),
- The role of regulation and spectrum sharing in 5G (Matinmikko-Blue, Yrjölä and Ahokangas, 2020).
- The antecedents of multisided transactional platforms (Yrjölä, 2020) and 6G ecosystems (Ahokangas et al., 2020).
- Presentation of exploratory scenarios of future 6G business (Yrjölä et al., 2020).
- Analysis of the convergence of connectivity and data platform configurations (Ahokangas et al., 2021a)

Table 1. Discussions related to 5G business models.

key discussions related to 5G business models.

The research method

This research applies the anticipatory action learning (AAL) approach that is a particular type of action research (AR) conducted in a future-oriented mode (Inayatullah, 2006). AR is an iterative, participatory, and collaborative research method developed to address the management of change and develop foresight utilizing cross-disciplinary knowledge, involving practitioners and researchers, which impacts participants and organizations beyond the research project (Coghlan and Brannick, 2010). This research method was chosen to provide rich data to characterize a multi-stakeholder environment where different stakeholders can also have conflicting goals. In addition, action research provides contextual relevance in future-oriented situations.

This research follows the cyclical process of research-oriented action research (Eden and Huxham, 2006). In action research aiming at theory development, the nature of the research problem guides the action research cycle, giving primacy to the flowing cycle: foreknowledge, emergent theory, action/data generation, reflection, theory exploration, and development (Dickens and Watkins, 1999). Following the cyclical process of research-oriented action research, the data collection comprised two phases. The results from phase one (RadioActive! World Café workshop, Espoo in November 2017) were utilized as a foreknowledge for the second phase of data collection from the 6G Wireless Summit World Café workshop at Levi in March 2019. World Café is a structured conversational AAL process intended to facilitate open and intimate discussion and link ideas within a larger group to access the collective intelligence represented by the participants (Carson, 2011). The participants in the 5G workshop in 2017, representing business and technology management of the 32 MNOs worldwide, were divided into ten heterogeneous groups that moved between a series of roundtables where they continued discussion moderated by the organizers in response to a set of questions. The groups focused on 5G opportunities with a potentially significant techno-economic impact on the mobile industry: technology innovations on architecture, telco cloud, artificial intelligence, use cases, and business models. The moderated questions were: *What include the major emerging architecture and technology triggers that can have a significant techno-economic impact on the 5G industry? What are the business drivers for Telco cloud? What are the 5G business opportunities and use cases that will generate the most revenue? How to capture the value? How and why do business models change due to 5G?*

The 6G Wireless Summit (6Gsummit, 2019) event was organized by the Finnish 6G Flagship Programme (6G Flagship, 2018) with 300 participants from 29 countries, including significant infrastructure manufacturers, operators, regulators, and academia. In conjunction with the summit, a 6G White Paper Workshop was organized with 60 participants to launch the process for drafting the first 6G White Paper (Latva-aho and Leppänen, 2019). The workshop's target was to identify the key drivers, research requirements, challenges, and critical research questions related to 5G evolution. The workshop was run in 6 groups: *use cases, societal and business drivers, radio hardware progress and spectrum bands, new air-interface opportunities, new network technologies, and enablers for new services.*

At phase one, the first author facilitated the phase one RadioActive! World Café workshop, Espoo in November 2017. In the second phase of data collection, the authors facilitated the societal and business drivers World Café workshop as a part of the 6G Wireless Summit at Levi in March 2019. The ideas presented by the participants were written down on post-it notes and placed on the whiteboards. Also, numerous connections were drawn between the items written or drawn on the whiteboard. The objective was that each subsequent group would build on the results of the previous group and themes. The World Café ended with a wrap-up summary where the participants also got an opportunity to assess and provide responses on their collective results. Participants were encouraged to create new, shared knowledge through a set of questions with a specific focus on the next three to five years.

In qualitative foresight-focused future research, external validity is challenging to control (Yin, 2009). Although particular attention was paid to arranging

workshops to engage practitioners from different parts of the ecosystem and researchers from different research disciplines, other researchers could have interpreted the data differently. Furthermore, this research focused on studying business models, platforms, and ecosystems—business models should always be calibrated to context (Teece, 2010). To increase construct and external validity of the research, after each workshop, all the systematically documented raw data, as well as outputs in forms of use cases and business opportunities, were analyzed, using the theoretical framework of the widely appreciated futures research methodology, the causal layered analysis (CLA) (Inayatullah, 1998). Furthermore, the integral futures four-quadrant method within the business model framework was applied to deepen the foresight and ensure the quality of the research (Inayatullah, 2006). In this method, the futures were backcasted against the past and present experience and knowledge of the participants by discussing alternatives and transforming the futures to identify technologies, use cases, and business models to connect the future to the present. The participants' integral futures four-quadrant results were validated in the assessment phase of the workshops, in which key results such as business drivers and scenarios were summarized and documented.

Data analysis and results

In the following, the results of the World Café workshops will be presented as structured and summarized. In phase one, the results are presented in four scenarios; market penetration, market development, service development, and diversification scenario named based on Ansoff (1957). In addition, this study applied the exploratory scenarios approach by Schwartz (1991), and Suchman (1995), representing a foresight method that provides a means to depict, make sense of, and assess alternative future events, trends, and choices holistically. In phase two, the discussion will build around platform thinking by looking at components, interfaces, data, and algorithms.

Results – Phase one

The participating mobile network operators (MNOs) find it increasingly difficult to grow their revenues in a situation where the internet and mobile markets are nearly saturated. As subscriber growth slows down and price levels fall, many MNOs are focusing on acquiring customers from competitors. In emerging markets with growth potential but lower average-revenue-per-user (ARPU), most creative operators make headway by tapping into new revenue sources and engaging their customers in unique and non-traditional ways.

New 5G technology enablers and business approaches allow MNOs to fine-tune or change their traditional operations, making their existing systems more efficient and cost-effective. In the face of disruptive new competition, many operators are adopting disruptive strategies and are in the process of reinventing their business models. They start looking at their services and infrastructure in a new light, shifting away from core telco connectivity services to innovative new offerings made possible by emerging technologies and business models.

As a result, MNO's top objectives comprise achieving a better experience for enhanced mobile broadband services, enabling digital transformation in different industries, and finding new revenues in enterprise and IoT. These are followed by the clear expectation of lowering the total cost of ownership compared to current technologies. Most operators are not looking to identify killer applications, but the flexibility to drive multiple services and support a wide variety of new revenue streams and user bases. Four different business opportunity scenarios for operators were identified with a different set of success factors in each: making more out of existing markets (market penetration), expanding the business into new segments or offerings (market or service development), and doing both: entering new market segments with entirely new offers (diversification).

An MNO enhances the established mobile broadband connectivity service offering to current consumer and enterprise market segments to gain revenues at a lower total cost of ownership in the *market penetration scenario*. Keys to a profitable business are spectral efficiency, lower site deployment costs, the network's energy efficiency, and the fast time-to-market, which enable significant market share gain, although time-to-market may not be a prime strategic concern. This business opportunity is

considered mandatory for an established MNO to grow and protect its core business. 5G is seen as a solution for three challenges: First, overcoming capacity constraints of the 4G. Overall, it is expected that 4G networks will not be able to meet the demand for capacity by 2022, and in some markets and hotspots even faster. Second, overcoming cost issues, depending on the used spectrum bands and the radio configuration, 5G provides the same capacity 2.5 to 7 times more cost-efficiently than 4G. Third, dealing with energy costs, the inherent technological advantages of 5G are estimated to lead to 10% overall network operational expense savings.

The business case for the opportunity largely depends on the timely availability and the cost of the spectrum. Beyond the general investment and rollout approach, the viability of the 5G business case depends on the general readiness of the ecosystem (i.e., tested and 3GPP compliant network gear and a range of 5G devices), which will be a potential bottleneck for an early mover advantage. In addition, the business case is seen to depend on a set of vendor-specific technological capabilities like the implementation of novel antenna innovations, infrastructure site acquisition and solution deployment for the multi-spectrum band, multi-technology, and multi-capacity equipment, deployment costs of the network infrastructure, and efficiency of end-to-end network scalability.

The *market development scenario* builds on MNOs' capabilities to serve new dedicated user groups or locations which form new target market segments in the content provisioning domain. Differentiation will be based on unique services like smart stadiums, coverage of enterprise campuses, enhanced mobile broadband in vehicles within public transportation, and video surveillance for smart cities. Success factors for the business opportunity are similar to the enhanced mobile broadband for consumers scenario. The MNO could win revenue from high-value passengers and governments by supplying 5G bandwidth to public transport. However, many use cases such as smart stadiums will require localized edge cloud implementations. Furthermore, 5G ultra-low latency performance will be needed to support virtual reality, gaming, and other delay-sensitive applications.
An operator wanting to provide good video quality would not realistically use 4G as this would reach too few subscribers and incur too high a cost. In contrast, 5G can simultaneously deliver high-definition video to many subscribers, e.g., within the stadium as a free or almost-free service covered by the cost of the stadium entry ticket. Moreover, many new target segments need ultra-high capacity in specific locations.

Diversification brings challenges to traditional telco business processes and platforms when adding new technologies. Collaboration with third-party services and ecosystems such as cloud services, content distributors, and mobile payment/identification platforms is essential. That will require a unified front-end system for billing and other customer-facing processes that bring together all the underlying services, along with a single integrated product catalog and a streamlined approach to integrating new technology acquisitions. As an example, the emergence of over-the-top (OTT) offerings has caused classical media distribution to plateau. With so much content running through mobile networks, many MNOs see the aggregation, advertising, sell-through, or even exclusive distribution rights for TV, movies, and sports, whether through partnerships or vertical integration, as a key potential area for growth and differentiation. To take on a more significant role in content and media, accessing and understanding a broad range of audiences will be critical to the success of any media venture emphasizing the need for enhanced user data management and analytics systems to gain insight into the behavior and allowing the network to evolve accordingly.

The *service development scenario* stems from existing market segments with new context services leveraging 5G beyond enhanced mobile broadband, particularly the low latency capabilities providing intense consumer experience, e.g., for augmented, virtual and mixed reality, cloud gaming, and fixed-mobile services. Such services require the proficient deployment of edge clouds distributing processing of the applications and technical openness to collaborate with the ecosystem. In this scenario, the business opportunity will not necessarily

rely on direct traditional average-revenue-per-user (ARPU) increases but on collaboration with global web-scale companies and application developers to serve their local customers. These new services add low latency localization to the equation. These use cases rely on openness and massive deployment of edge clouds.

In the *diversification scenario,* diversification leverages 5G slicing and service-oriented architecture (SOA) capability for dedicated services and applications. The offering of new customized services to vertical enterprise markets requires an MNO to transform its business model from connectivity centric comfort zone into a new digital service provider (DSP) role, utilizing platformization and commerce business models extensively. The critical success factors for this role are the close link between IT and the network domain, adaptation to business-to-business customer's processes and new partnerships, and radically improving go-to-market to enterprise verticals.

Compared to the other 5G business opportunities found and discussed above, the DSP deep-slicing business heavily relies on capabilities on top of the network, in particular, network management and orchestration and business support systems. Therefore, it requires the capabilities of providing high availability and reliability needed for many operations from the network, also from a management and orchestration point of view. Furthermore, end-to-end security automation is needed to protect critical business processes, and openness is needed to include third-party components, bring close-to-zero-touch automation, and integrate the network with business support systems.

Several MNOs engage in various network sharing and virtual network operator agreements as a new source of revenue. These lower the traditionally high barriers to entry into the telecoms industry and open the door to out-of-industry players whose non-traditional thinking and aggressive pricing may have significant potential to disrupt the marketplace. As outside players disrupt and leapfrog established players, MNOs are being forced to accelerate their digitalization efforts by creating new digital ecosystems for services and focusing on innovative customer-facing areas like sales and service. Further, MNOs should explore opportunities to deploy converged fixed-mobile infrastructure to enable new offers and service bundles to their customers.

To summarize, four assets were seen as essential in capturing value to achieve MNOs key objectives: a better experience for existing services in enhanced mobile broadband, enabling digital transformation in different industries, and finding new revenues in enterprise and IoT: 1) the new differentiating performance level of 5G networks, 2) new control point at the edge cloud, 3) the billions of transactional and control data points produced by networks, and 4) dedicated virtual sub-networks and resources, which can be offered as-a-Service that provide tailored capabilities required for different industries and their various use cases.

Results – Phase two

To ensure data richness, building on the foreknowledge of the first scenario phase data collection and analysis on MNOs key objectives and assets essential in capturing value, we run the second phase workshop focusing on the 5G evolution towards 6G. The workshop was to identify the key drivers, challenges, and critical research questions related to the 5G evolution towards future wireless networks and services. The workshop was run in 6 groups: *use cases, societal and business drivers, radio hardware progress and spectrum bands, new air-interface opportunities, new network technologies, and enablers for new services.* The vision statement outcome of the summit was *Ubiquitous Wireless Intelligence*. According to the vision, ubiquitous services follow users everywhere seamlessly; wireless connectivity is part of critical infrastructure; intelligent context-aware smart services and applications are also available for non-human communications.

As discussed above, 5G was mainly targeted to address the traditional MNOs' productivity demand and, to some extent, utilize new technology opportunities driven by the verticals. With the 5G evolution, the need for a substantially more holistic approach was seen essential, including a larger community

into the definition of future wireless networks to address the goals, trends, and demands to avoid merely commercially driven system definition.

The transition to ever higher frequencies with smaller radio ranges and the increasing role of indoor networks will boost network sharing in cities and indoors, drive integration of short-range connectivity solutions with large-coverage cellular systems and introduce a local operator paradigm in the market resulting in new ecosystems. One of the key business-related findings was the transformation from connectivity-driven networks towards more holistic and ecosystemic platforms.

Building on the key outcomes from the phase 1 scenario workshop, it was considered to extend the traditional engineering platform thinking from modules and interfaces (Katz and Shapiro, 1994) to look at the role of data and intelligence. Furthermore, in the phase 2 workshop focusing on identifying the key drivers, challenges, and critical research questions related to 5G evolution towards future wireless networks and services, the role of data access, data ownership, and AI/ML in 5G/6G networks were evident in the workshop results. The workshop results provided a new view to platforms; in addition to components and interfaces, the roles of data and intelligence, especially AI/ML algorithms, were recognized.

Components

Future network targets at 10-100 times better performance in most technology domains at the connectivity layer. Dependable use cases such as wireless factory automation will require ultra-high reliability, ultra-low latency, high-accuracy inter-device synchronicity, high-resolution localization, among others, corresponding to the current requirements for wired industrial control networks. The future wireless networks are expected to seamlessly interface terrestrial, satellite, and airborne networks to support the coverage and capacity requirements. Short wavelength and wider available bandwidth above 100 GHz will enable increased data rates and angular and ranging precision not seen before for imaging and radar applications for localization, 3D imaging, and sensing.

Advances in virtualization, automation, and orchestration, combined with the new networking power, will also enable data, intelligence, and transactional decision-making to be distributed to the edge of the network. These advances in virtualization include the ability to tie mobility, edge cloud, public/private cloud, and traditional security solutions together into a single, seamless, and integrated system that can follow and protect workflows, applications, and services that need to span the network, from the mobile device to data center, regardless of where either is located.

Virtual (VR), augmented (AR), and mixed reality (MR) technologies are merging into extended reality (XR), which encompasses wearable displays and interaction mechanisms that create and maintain perceptual illusions. The users quickly accept an alternative version of reality that enhances their ability to consume media, search the Internet, explore real and virtual worlds, collaborate on work projects, connect with family and friends, and engage in restorative activities. Telepresence will be made possible by high-resolution imaging and sensing, wearable displays, mobile robots and drones, specialized processors, and next-generation wireless networks. Autonomous vehicles for ecologically sustainable logistics of humans and shipments are made possible by advances in wireless networks and distributed AI and sensing.

Interfaces

The need for an open architecture and open collaboration using open common interfaces and toolkits are seen as essential in every level of the network architecture, from hardware to services and applications. The complexity of radio frequency transceivers and digital signal processing will increase substantially at chip and system levels. Dealing with this complexity calls for open-source platforms that enable low-level algorithmic development and possibly go much deeper into specific technologies than any open-source software or hardware has seen before. Via softwarization and virtualization of networks and opening of interfaces, sharing economy concepts will be utilized not only at higher platform business layers but widely in network connectivity and data context layers. Changes in the ownership of spectrum access rights, networks, network resources, facilities, and customers will result in different

combinations depending on the situation as different facilities have different requirements and infrastructures. New incentives will arise, including the functioning of society. The sharing economy will continue to expand, and even the nature of transactions will be further disrupted by digital currencies making trust and security essential. Dynamic networks of everything will be built on the foundation of embedded trust and dynamic data security.

Data

Wireless networks will generate an unprecedented amount and types of information about people, things, and environments at large. Private information collected from the physical world can be of sensitive nature and be used against people, companies, and societal interests in many ways. The protection of private and critical information was seen as a key enabler to realize the full potential of future networks and make them acceptable to society. The data generated by novel devices and elements in public and private networks have value for many societal functions and possibly to other private corporations than the one that collects the data.

Edge cloud computing elements and interfaces enable a local and instant information service, e.g., for fast discovery of people, services, devices, resources, and any local information near the user that centralized search engines cannot collect. Such edge information service platform could be used, e.g., in the creation of a highly local and dynamic marketplace for services, things, and information. An extreme case for edge computation would be a thin user client, essentially a light, low-energy device capable of interacting with human senses or neural systems, with all user-specific computing occurring in the edge cloud.

Wireless network data markets offer a natural new business opportunity, where data ownership is a source of value creation and control. Data ownership has evolved from specific context data towards big data with the large volume of detailed data, real-time velocity, and wide variety in types and sources. The pervasive influence of AI and digital twins will reflect what something looks like and what constitutes its context, meaning, and function. We will interact with this "*mirror world*" (Gelernter, 1993), manipulate it, and experience it as we do in the real world. For robots, this will be the way they see the world.

Creating a Big Data system that transforms how data are gathered, organized, prioritized, synthesized, and distributed can create strong initial controversy, e.g., by raising serious privacy concerns over location and data. Furthermore, how to do business with data itself becomes a key question. The contractual policies between the actors will define the relative strengths of information and data ownership between parties, for example, how the trust and ownership of information and data will be established in the future's autonomous smart device and service entities.

Algorithms

Artificial intelligence (AI) and machine learning (ML), relying on Big data mined to gain information and knowledge, was seen to play a significant role from link to system and management and orchestration to business-level solutions of wireless networks to "*connect intelligence*." Employment of machine learning algorithms was seen as essential in addressing the design complexity of radio frequency (RF) systems and improving RF characteristics such as channel bandwidth, antenna sensitivity, and spectrum monitoring. More importantly, deep learning-based training models facilitate a better awareness of the operational environment and promise end-to-end learning to create an optimal radio system. New air interface enablers require extensive ML and AI algorithm usage to enhance the optimality of the air interface design. In the semantic communications scenario, the meaning of the messages is utilized in making connectivity and networking more efficient.

In the hyper-flexible and configurable future network, AI and ML can be used in concert with radio for sensing and positioning. For management and orchestration of networks, intelligence needs in self-configuration, optimization, and orchestration of virtual resources meet the dynamic content, contextual, and event defined needs. The programmable network will utilize a Digital twin as an exact digital replica of complex physical assets, processes, and systems, providing a detailed understanding of how the real system is behaving and predict what

it will do next. Resources and assets needed to meet the versatile needs of the wireless network are then provided by different stakeholder roles providing physical infrastructure (facilities, sites), equipment (devices, networks), data (content, context), under the regulatory framework set by the policymakers. Demands and resources are brought together by matching/sharing stakeholder roles, including operators (local or vertical-specific operators, fixed operators, mobile network operators, satellite operators), resource brokers, and various service/application providers such as trust/security providers.

Blockchain or distributed ledgers technology is attracting high hopes as AI/ML complementing technologies. Without central authority in a distributed manner, this technology allows storing and sharing information that does not change too often such that the complete record of the changes is kept as well, giving rise to, e.g., new ways of organizing data markets or helping to maintain trust in an inter-operator setting. The matching and sharing of resources to meet the demands will occur through new activities that ensure inclusion, sustainability, and transparency. Ultimately, the emergence and shape of the new ecosystem are dependent on regulations that promote or hinder the developments.

Discussion and conclusions

This paper has explored the evolution of future ecosystemic platform-based business models in the context of 5G evolution, the 5th generation of mobile communications, applying a research-oriented action research approach in two phases. Our analysis and discussion give rise to both managerial and theoretical contributions. As the 5G mobile communications technologies are expected to transform the future wireless communications services and networks businesses, including business models, it serves as a research context foundational to new theory development and managerial implications.

This paper's practical implications are related to the possibilities of analyzing 5G and future wireless mobile network business models with platform-oriented logic. The study presents the insight for traditional mobile network operators and the novel type of future digital service companies and practitioners to explore new opportunities of creating, capturing, and sharing value in 5G exploiting novel data and algorithm technologies in content, context, and commerce business model layers. The findings coincide with Ahokangas, Matinmikko, Yrjölä, Okkonen, and Casey (2013) and Ahokangas, Matinmikko-Blue, Yrjölä, Seppänen, Hämmäinen, Jurva and Latva-aho (2018) that the 5G business opportunities can be seen to represent two basic mobile operator business models: *connectivity service provider* and its *differentiation*. Moreover, the paper shows that collaborative business models introduced by Noll and Chowdhury (2011), brokerage business model by Rasheed, Radwan, Rodriguez, Kibilda, Piesiewicz, Verikoukis and Moreira (2015), and the cloud-assisted business model by Zhang, Cheng, Gamage, Zhang, Mark and Shen (2015) can be applied through *diversification* that leverage 5G deep slicing and service-oriented architecture capability for dedicated services and applications. The offering of new customized services to vertical enterprise markets requires an MNO to transform its business model from the connectivity-centric comfort zone into a new digital service provider role utilizing platformization and commerce business models extensively. The critical success factors for this role are the close link of the IT and the network domain, adaptation to B2B customer's processes and new partnerships, and radically improving go-to-market to enterprise verticals. More precisely, the findings illustrate the majority of emerging positions in a highly collaborative type of business around the context- and commerce-related requirements in the 5G context.

Theoretical contributions

In the second phase of the study, business opportunity scenario work was expanded to 5G evolution towards future wireless networks. The novelty value of the research relates to the introduction of two new complementing elements into the platform architecture: ***data*** and ***algorithms***. The findings agree with Baldwin and Clark (2000) and Katz and Shapiro (1994), demonstrating that in 5G, modules can be defined as an add-on software subsystem that connects to the platform to add functionality to the platform defined interfaces as specifications and design rules that describe how the platform's ***components*** interact and exchange data and other information using well-documented, and predefined standards like application

programming ***interfaces***. This finding is supported by Lenk et al. (2009), who claim that everything-as-a-service business models enable a large number of digital service providers to offer various cloud-based services across the network layers. Also, the 4C-typology of business models (Wirtz et al., 2010) can be seen as a set of nested layers (Yrjölä et al., 2016), where the lower-layer business models are required as enablers and value levers for the higher layers to existing. Connectivity (e.g., 5G) enables sending and receiving content (e.g., data, radar), context (e.g., search or location AI/ML algorithms) is needed for making sense of the content, and commerce (e.g., marketplace AI/ML algorithms) are needed for doing seamless business. One of the key findings was the transformation from connectivity-driven 5G towards a more holistic and ecosystemic future network as a platform, seen as a continuation of the 5G diversification scenario discussed above.

With roots in economics and engineering, the academic contribution of the study is the proposition of an ecosystemic platform architecture for the business model and ecosystem research to complement the existing modular perspective (Schilling, 2000) and the 4C ecosystemic framework (Wirtz et al., 2010) and the as-a-Service (aaS) digital service business model typologies (Lenk et al., 2009). The framework integrates supply- and demand-side thinking and describes and explains the logic of how ecosystem platform architecture configurations enable complementarity and novel services as companies can choose to focus on any element or combination of elements to do business in an ecosystemic manner. The proposed novel architecture and framework consists of components, interfaces, data, and algorithms, as depicted in Figure 1 below.

We aimed at forming and utilizing a framework or approach for understanding platform business models. Our attention paid to innovation, openness, complementarity, competition and cooperation, organization and governance, economies of scale and scope, and type of business models. Our findings agree with Ahokangas et al. (2019), who found three generic business models for future wireless networks: vertical, horizontal, and oblique, each of them having a different logic of ***innovation***. The engineering approach to platforms highlight innovation as modularity makes managing innovation easier and incremental. The ***openness*** of business models boils down to discussions on open innovation, and in platform contexts, this brings the ecosystem and its stakeholders close. For example, a software-based, service-oriented cloud-native network enables efficient infrastructure and resource sharing by different tenants, can open the ecosystem to new players, and accelerate time to market by reducing service creation and activation times. Our findings are supported by Helfat and Raubitscheck (2018), who claimed that when designing platform business models on top of the usual business model elements, attention should be paid to the core product innovation, functionalities, and features, the number of sides of the platform, degree of outsourcing as related to ***complementarity***, and governance. The orchestration layer can incorporate an exposure function opening the assets of a network to other service providers like mobile virtual network operators, micro-operators, industry verticals, enterprises, and third-party applications. Exposing valuable infrastructure and data assets to the developer community through a set of interfaces and setting up effective partnerships will allow service providers to grow their

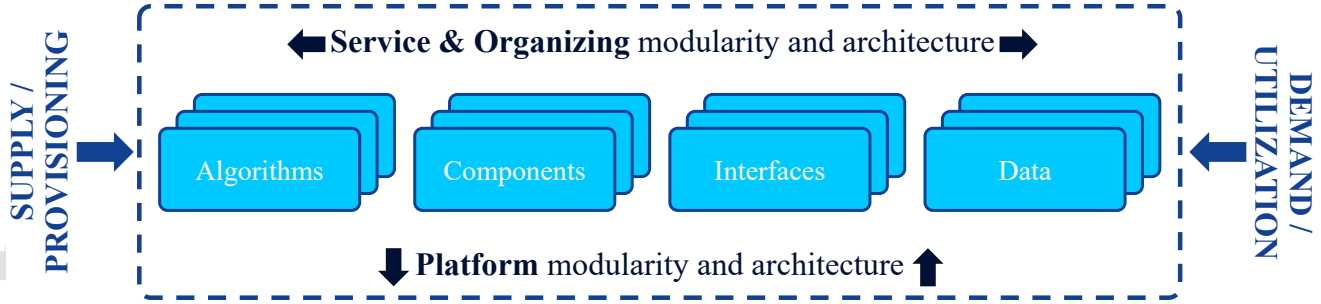

Figure 1: The elements of ecosystemic platform business model approach in future mobile operator business.

businesses by sharing their services with these external partners. Future wireless system architecture enables different levels of exposure to resources and network functions between business actors. Depending on the relationships between business actors and customers, there are different transparency levels in network slice provisioning and other different forms of ***cooperation*** models.

Regarding ***organization*** and ***governance***, our findings draw attention to discussing different types of platforms, the openness of platform interfaces, accessibility of capabilities (i.e., services) in the platform, and the basis of ownership of governance in the platform, whether managerial authority, contractual relationships, or ecosystem governance. The standardization of wireless technology has been essential for the global success of the wireless network and the related ecosystem. Standardization ensures global (multi-vendor) interoperability between networks, devices, and operators and economies of scale. Furthermore, it minimizes the complexity and thereby reduces the cost of interfaces. Developing a new telecom standard within a standardization organization is based on a consensus of different parties across the ecosystem: vendors, operators, users, interest groups, academia, and governments. The key domains of the future wireless system are wider than previous generations, including support for virtualized network function, slicing, converged wireless and wired access, transport, cloud, applications, and orchestration. With the further diversity in use cases and standardization, open-source platforms are foreseen to become an essential new cross-domain collaboration and interoperability tool for the industry and business agility to provide tailored solutions.

Platformization works hand-in-hand with virtualization that will enable separation of the software from the hardware and offer the possibility to instantiate many functions on a common infrastructure leveraging commodity-of-the-shelf. Introduced network elasticity and scalability enable network and resource usage adaptation to needed capacity and service levels on demand that, in turn, improves business agility while reducing both capital and operational expenses. The findings are in line with (Teece, 2018) regarding platforms offering economies of scale in service provisioning and Gawer (2014) regarding economies of scope related to service provisioning and innovation on platforms. Finally, our study anticipates the increase ***in two- or multisided business models***. Traditionally, the context of wireless networks has been dominated by supply-side business models. In the future, different types of distinct demands will be placed on mobile networks. Future consumers will demand contextualized video, smart home services, highly interactive gaming applications, and high-resolution immersive content, all delivered from the cloud. On the enterprise and industrial front, "physical" industry sectors will be massively transformed by gaining the ability to become automated and to exist independent of physical space and infrastructure—essentially to become virtualized. The nature of applications will range from millions of simple low-power sensors to mission-critical operations technologies (OT), putting unprecedented demands on tailoring and scalability (Yrjölä et al., 2018). Likewise, different third-party services can seamlessly be integrated and provided to end-users.

With respect to the limitations, the study limits its research context to the mobile telecommunication domain, focusing on business models. On the one hand, this approach offers the advantage of diving deep into a focused context, enabling the research outcomes to have vertical depth. On the other hand, the research has not investigated the applicability of the resulting framework in other contexts based on different industry verticals. Although the study's approach is only tested in the mobile telecommunication domain, the research sees the potential for the insights to be applied in other industries, especially those that require or rely on ecosystemic platform-based business models. Therefore, this study invites scholars to test further, experiment, and evaluate the ecosystemic platform architecture in a broader range of industry and business model contexts.

To conclude, since the findings demonstrate that content, context, and commerce specific platform-based ecosystemic business (c.f., Wirtz et al., 2010; Yrjölä et al., 2016) that utilize data and algorithms is the most potential emerging business opportunity of

MNOs in 5G evolution, deeper investigation in those scopes aiming at clarifying potential businesses opportunities in these specific areas is suggested. Moreover, we recommend future research to study how the MNOs' hybrid business models will evolve towards product-service model building on higher 4C layers, context, and commerce. Finally, we suggest extending the study from mobile network operators' business models to other stakeholders in the business ecosystem, particularly, to actors having a role in resource aggregation and brokering.

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Journal of Business Models (2021), Vol. 9, No. 4, pp. 94-111

JOURNAL OF BUSINESS MODELS

Gaining Trust Advantage for the Vaccination Certificate Platform

Liina Joller[1]

Abstract

Purpose: In the conventional international health and safety policy design, the decision makers rarely think in terms of business models. As an example, the yellow paper-based vaccination certificates, initiated and implemented by the WHO in 1969, have not changed very much since then. In 2020, the Covid-19 crisis accelerated innovation, particularly digitalisation, in many sectors, and the sense of urgency to have a digital immunisation certificate was voiced by many governments, as well as corporations. The new solution must enable international interoperability, but it is a challenging task because the setup of health registries varies across countries and because the common actions have been hindered due to the lack of trust – the trust deficit.

Approach: In this article, the case is discussed in the platform business model framework, and the role of trust in gaining competitive advantage – the trust advantage – in its fast and widespread adoption is particularly exemplified. The case was analysed in parallel with the discussions and actual development, not *ex post*, as common in business model literature.

Findings: The solution that could be capable of overcoming the privacy and security concerns that have been brought up in the international discourse can be described as a decentralised multisided platform, which has a distributed management system. The platform's standardisation would ease its global uptake, and the strategic partnerships with countries, organisations, and firms that are already considered trustworthy (possess trust credit) will have the opportunity to gain trust advantage.

Limitations: This paper was written having the managerial perspective in mind, hence, it does not go deeply into all technical and legal aspects affecting the implementation of the digital vaccination certificate platform. It was written in parallel with the vivid disputes in the international arena. By the time this article was finished, the first pilots had just taken off and it was not clear yet which of the technical solutions and business models will eventually become dominant.

Keywords: business model innovation, platform business model, trust advantage, distributed trust, interoperability, innovation policy

Acknowledgements: The author wishes to thank Mr Marten Kaevats from the Estonian Government Office, who is also a member of the WHO Digital Health Technical Advisory Group, for sharing insights about the development of one of the potential solutions for digitising the vaccination certification data. The author acknowledges financial support from the Estonian Research Council's research project PRG791 "Innovation Complementarities and Productivity Growth"

Please cite this paper as: Joller, L. (2021) Gaining Trust Advantage for the Vaccination Certificate Platform, Vol. 9, No. 4, pp. 94-111

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DOI: https://doi.org/10.5278/jbm.v9i4.6580
ISSN: 2246-2465

Introduction

Platform-based business models are emerging at a fast pace. So far, they have been successfully established in many sectors in order to communicate, co-innovate, exchange data, goods and services. However, in health-related sectors their diffusion has been lagging behind, and one of the main reasons for this could be the trust-intensive nature of health data. The overall increase of trust deficit in society has hindered it even further. It should be emphasised in the beginning that this article does not address the trust towards a vaccine *per se*, but towards a platform-based ecosystem that is handling health data – the individual's vaccination records. The setup and operation of this ecosystem are addressed from the platform-based business model perspective.

This case study focuses on the development of a multisided platform that enables sharing information about the individual's vaccination status[1]. In this article, the 'platform' is defined as a nexus of rules and infrastructure that facilitate interactions among network users (Eisenmann, Parker, and Van Alstyne, 2011), and in this case offering value as a central interoperability service. In the public discourse the vaccination certificate has synonyms, e.g. green certificate[2], immunity passport, etc., but as it is not an official travel document, the word 'passport' is misleading. For the new platform to be able to replace the yellow paper-based vaccination certificates[3], initiated by the WHO and implemented by individual countries in 1969, a commonly accepted global digital approach is needed. As times of uncertainty may provide new opportunities for business model innovation (Aagaard and Nielsen, 2021), the Covid-19 pandemic could be a much-needed trigger here.

[1] Although traditionally the immunity certificates have been used for verification that the individual has received a vaccine, the same data exchange platform can also be used for verification of the existence of antibodies, or that the person has tested negative a few days before the travel.

[2] EU Green Certificate [https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/safe-covid-19-vaccines-europeans/covid-19-digital-green-certificates_en], and several similar regional and national initiatives.

[3] International certificate of vaccination or prophylaxis [https://www.who.int/ihr/ports_airports/icvp/en/]

In order to gain ground, the management (orchestration) of the platform is crucial, as its successful implementation will require a critical mass of users. The tactical steps should therefore consider the platform development phase and respective critical success factors (Trischler, Meier, and Trabucchi, 2021). To take off, the users and all other stakeholders need to have trust towards the platform leader, each other, and the technology. The trust in the whole platform may still be vulnerable to psychological manipulations, even if the technology behind it is proven to be secure. This has given a reason to say that a new form of trust is needed (Werbach, 2018), and this article aims to contribute to building this knowledge stream.

The extant literature predominantly addresses the trust between individuals or the trust between firms (see also the review by Fulmer and Gelfand, 2012), but these streams have not been well interlinked. There are fewer studies about how individuals trust companies, or more specifically, discussing trust towards different types of business models. As the trust has been used to explain human choice (Miller, 1992), it could be claimed, of course, that partly it is covered in marketing studies. However, there it is also usually addressed indirectly.

From the literature, it can be summarised that the precondition for trust to be meaningful rises from risk, which further comes from interdependence (Rousseau, Sitkin, Burt, and Camerer, 1998). The actual or cognitive risks can be associated with change, the deviation from the *status quo*, which in the case of the digital vaccination certificate are exemplified in Table 1. The perceived interdependence-related risks come from digitalisation, data storage and transfer, particularly from sharing the responsibility of ensuring security and transparency in this process. However, objectively the distributed ledger technology (DLT) and decentralised management can actually reduce risks.

In the platform business model, interdependence is unavoidable, moreover, it is actually an enabler of the main source of its competitive advantage over traditional two-sided business models – the network effects. However, it is a business model design and

implementation challenge where the relationships between stakeholders are quite complex, and motivations often intertwined.

So far, the literature (Parker and Van Alstyne, 2018; McIntyre and Srinivasan, 2017; de Reuver, Sørensen, and Bahole, 2018) addresses mainly platform-based interactions where the platform sides are either firms or individuals, leaving the role of governments and intergovernmental organisations aside. Although the individuals, ICT companies, vaccination clinics and large pharma companies are all part of this extended ecosystem, the market uptake and diffusion of the interoperable digital vaccine certification platform depends first on governments and intergovernmental agreements (including global intergovernmental organisations). Of particular importance is their ability to reduce perceived risks, and enable trust to be built and sustained, which is crucial for the emergence of network effects.

If implemented, the digital platform can replace the current yellow printed vaccination booklets on borders, as well as ease domestic travel, access to campuses, large events and corporate buildings. In the long term, the underlying DLT and its multisided platform business model creates even more e-governance opportunities.

In this article, the case was addressed at the meta-model level (Massa, Tucci, and Afuah, 2017), and is based on interviews with the visionary and technical people behind it. The data collection as well as the theory building followed the principles of grounded theory (Strauss and Corbin, 1994), and the researcher was interacting with the platform's team during its development.

The article is set up so that the description of the development of a case is intertwined with relevant theoretical standpoints, especially from the rich literature on the phenomenon of trust, and lessons from commercial platform business models. It starts with explaining the essence of a multisided platform business model and continues by discussing the different facets of trust. Thereafter, these streams merge to bring out the importance of trust – the trust advantage – for the success of a platform.

Background of the Digital Vaccination Certificate Platform

The writing up of this case study occurred in parallel with its implementation endeavours, not *ex post*, as is common in business model literature. The development of the digital vaccination certificate platform started in 2019 (*i.e.* pre-Covid-19) as one of the sub-projects of the Estonian X-Road platform[4]. The idea came from the Nordic Institute of Interoperability Solutions and was promptly picked up by the Estonian government strategy office. The WHO[5] also acknowledged the need, which gave a boost to the IT developers in Estonia and Finland who initially took up the challenge as a non-for-profit side-task. However, the most critical aspect, the approach for bringing it to actual use (Gawer and Cusumano, 2008) with all of its possibilities, was not so clear at the beginning. The term 'approach' is used consciously because people making international health policy agreements usually do not use business model terminology or think in the platform business model framework.

As the first contributors were predominantly ICT firms, many with extensive experience, then technically there was probably quite a good understanding of what the critical features of the solution could be – interoperability, personal data protection, time stamping, etc. However, it is known that inferior technical properties can be overplayed by a superior business model (Amit and Zott, 2015), so the latter required thorough attention as well.

The aim was no less than to create a global standard for exchanging data about an individual's vaccination status, where the international interoperability is based on a distributed data governance model and decentralised management. The key principle and guidance for developers was "the simpler, the better". The envisioned approach would fall under a platform architecture logic, although so far the platforms have been used, as well as addressed in the literature, primarily in the business context.

[4] Nordic Institute for Interoperability Solutions [https://x-road.global/]

[5] World Health Organization [https://www.who.int]

Table 1.

Paper-based yellow vaccination certificate	Digital vaccination certificate platform with de-centralised management and based on distributed ledger technology
Both contain entries about every vaccination event (injection made by whom, where and when, often accompanied with vaccine name and batch number).	
Entries (and vaccine injections) are made by qualified personnel in accredited clinics.	
Requires presenting an official travel ID (passport) to match the person with the vaccination records.	
The border officer can browse the whole paper-based vaccination certificate.	Only the necessary data can be made visible, i.e. if a border officer should check for Covid-19, then only relevant data can be made visible.
An individual covers the costs of issuing the blank paper-based vaccination certificate.	An individual may cover the costs of keeping the digital ledger, but it may be also covered in full by the government. The financial model still needs to be agreed upon and can differ across countries.
Can get lost.	Cannot get lost.
Not tamper-proof. Signature, stamp, batch sticker rather easy to replicate.	Tamper-proof. Timestamped, irreversible, and encrypted data entry and transmission.
Paper-based records can be duplicated in the national electronic health registry and then they are also remotely accessible to doctors in the same country.	Enables international interoperability and communication between national IT systems, accessible abroad and valid in all participating countries around the world.
Needed for travelling to a limited number of countries, mainly in Africa and Asia.	Since 2020 Covid-19 pandemic affects all travellers around the world.

Table 1: Similarities and differences between the digital vaccination certificate platform and the established paper-based yellow vaccination certificate

The Platform Setup

The setup took advantage of the participating ICT companies' existing competences in blockchain and similar DLTs, which enable features that would not have been possible even a decade ago. There is no need for a central global database that could be a target for a cyber-attack. Instead, during the check for vaccination status the inspector makes inquiries to the platform, which further communicates with the national databases that keep the records made by the nationally certified vaccination clinics (Figure 1). Hence, the primary role of the digital vaccination certificate platform is to be a transaction platform, where data is the transaction object. For quick and wide diffusion it is important that no specific hardware or software should be needed to check the vaccination status. Therefore, the identifier, a QR or barcode, which is unique for each injection or vaccine dose, should be readable even with a mobile phone scanner.

The setup is based on the open technological standard and standardised, default contracts, which have been considered as essential elements of the platform business model (Parker and Van Alstyne, 2018; Eisenmann, Parker, and Van Alstyne, 2009) and a cornerstone of its competitive advantage. The paradox of openness (Schmeiss, Hoelzle, and Tech, 2019) has been considered as one of the main challenges in setting up the platform ecosystem – finding the right balance between openness and control for maximising value to all members. In the case of the digital vaccination certificate, the platform would be eventually open to all countries. However, a smaller group would be used for the first piloting round. Similarly, it would be usable to all individuals residing in, or travelling to and from, these countries. Similarly, the platform should be open to all vaccination clinics that are certified and as of today working with paper-based certificates.

The openness does not reduce the value here in any way, in fact, it increases it. The 2nd level complementors, e.g. other ICT firms that wish to build their applications on the same platform later on, should be required to fulfil some credibility criteria, in order not to compromise the trust towards the whole ecosystem. Therefore, it could be said that the digital vaccination certificate is a semi-open platform, i.e. the platform leader retains control over who can become a complementor.

In the business context, the platform technology and created data are usually proprietary (Teece, 2017), and the platform leader prefers to keep control over it, to be able to ensure that the trust towards the platform is not abused. In the case of the digital vaccination certificate platform, there is no creation of proprietary data that could cause ownership disputes between the platform ecosystem participants or be an obstacle for any country joining the system. In legal terms, the individual remains the owner of the data, and the national regulations of its use will prevail.

Forming the Ecosystem

Following the nested hierarchies of systems, as suggested by Massa, Viscusi, and Tucci (2018), compared to the business model of a single firm, the platforms are systems with a higher level of complexity. The

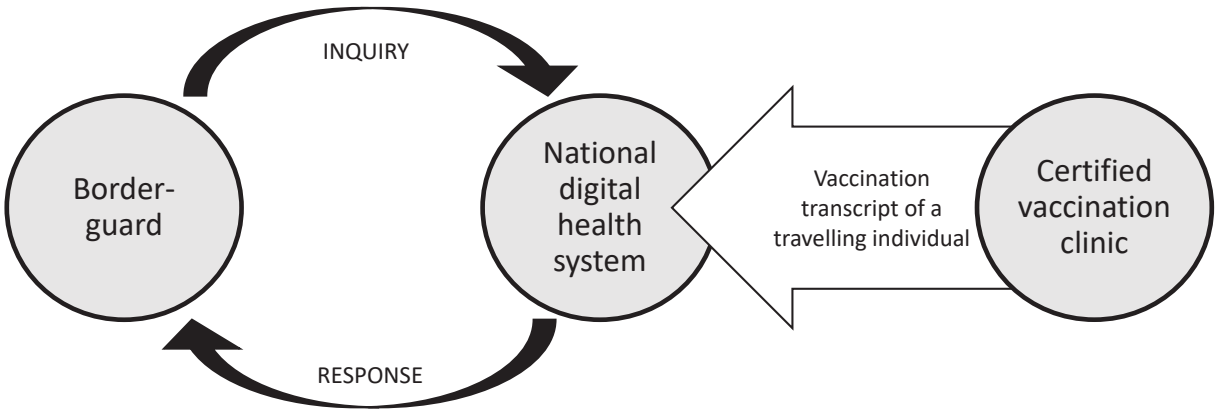

Figure 1. Inquiries and data flows on the digital vaccination certificate platform

stakeholders of a platform altogether form an ecosystem, in which they ideally would be complementors – covering all the crucial competences and resources. The platform typically has a single leader (sometimes referred to as an orchestrator), who is responsible for the governance of the platform ecosystem (Wareham, Fox, and Giner, 2014). The governance comprises mainly execution and secure record-keeping of the transactions, and their validation. It encompasses setting rules, the control mechanisms that would act as a deterrent from opportunism (Rousseau *et al.*, 1998), and creating the incentives that would keep all parties motivated. The appropriateness of the incentives is crucial for the fast emergence of network effects (Casadesus-Masanell and Zhu, 2013).

In the case of the digital vaccination certificate platform, during the launch the leader's role was distributed among the participating organisations, mainly visionary incumbent ICT firms, and untypically, an important role was played by the Estonian government (Figure 2). In this platform, two groups of end-users interact with each other – the national border-crossing unit officials and the individuals who need to travel abroad. The complementors, who build their products and services to be offered via this platform, are no less important. Some of the complementors can be essential for the platform to exist, and some more 'complementary', providing convenience features. In this case, the essential complementors would be the vaccination clinics. In business model terms, this leads to a service-service bundle value proposition, as giving the vaccine is the first service, and keeping a verifiable record of the vaccination data is the accompanying service. The second wave of complementors could include ICT firms with various foci – in principle the open standard would allow building any kind of new e-governance solutions on it.

For the platform to exist and run smoothly, system integrators (external service providers) might also be necessary. These are the ICT support companies that help to install (if necessary) and provide training for the platform users or complementors, e.g. border guards or vaccination doctors.

Even when the core ecosystem members are in place, the selection of additional external partners can be critical as well. They can be particularly valuable in creating trust towards the platform, as we will explain in the next sections with an example of the role of the WHO in launching the certification systems.

Creating Trust Towards the Platform

Trust is a phenomenon that has been described as an antecedent, outcome or moderator (McEvily, Perrone, and Zaheer, 2003). Among the many conceptualisations of trust that can be found across

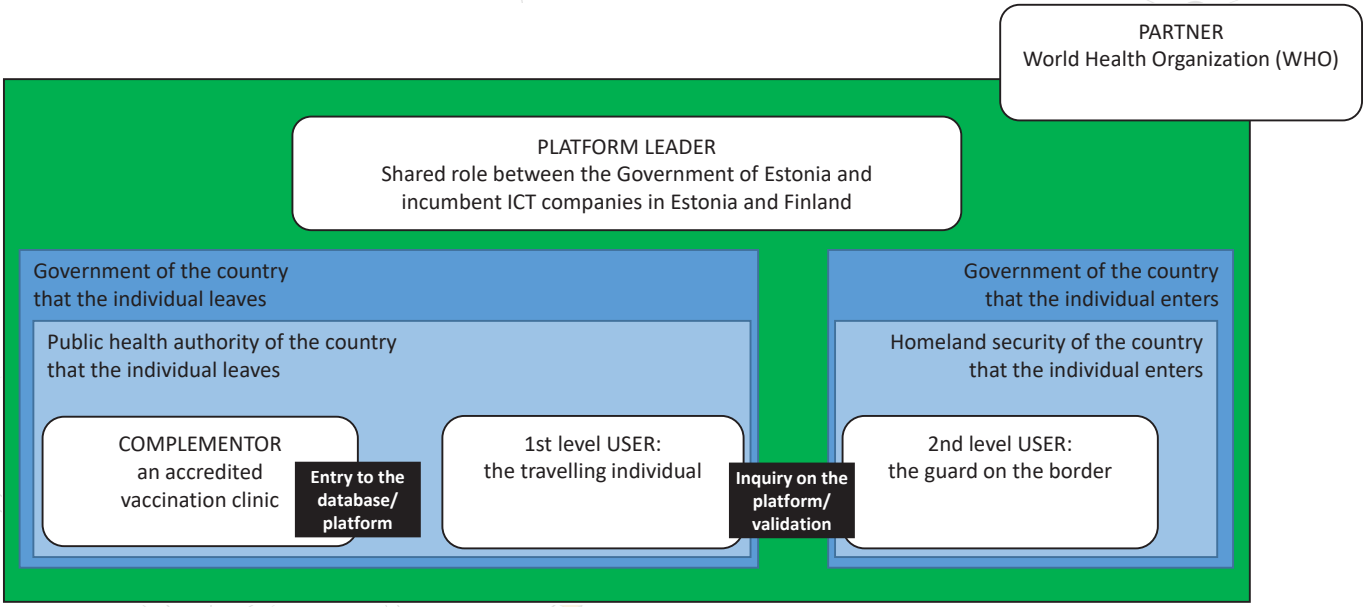

Figure 2: The ecosystem of the digital vaccination certificate platform

disciplines, it has been attributed to the trustor's belief in the trustee's 'ability' (Mayer, Davis, and Schoorman, 1995; Sitkin and Roth, 1993), 'capability' (Jaatun, Pearson, Gittler, Leenes, and Niezen, 2020), 'expertise' (Parmigiani and Mitchell, 2005), or 'competence' (David and McDaniel, 2004) on the one hand, and 'willingness' (Jaatun *et al.*, 2020) on the other. Although with slight differences to the original works, in this study the first four of the above terms can be considered as synonyms, and from here on in the term 'ability' will be used. Furthermore, if we consider the ability to be domain-specific (Sitkin and Roth, 1993), we could reason that so is the trust (Zand, 1972). The willingness has also been related to (avoiding) opportunistic behaviour (Rousseau *et al.*, 1998), which is likely a more general personality trait (not as much domain-specific as the ability).

Although the digital vaccination certificate platform falls into the broader health sector, which *per se* encompasses high requirements for trust, here it is discussed mainly from the perspective of managing personal data. As the impeachment of trust in the case of this platform is not as fatal as could potentially be in the case of some other health-related technologies, the concern about trust is perhaps more related to personal data protection in general. In the increasingly digitalised world, where the concern over privacy can be felt with every new ICT application, the concern related to the processing of personal data is a serious trust barrier in the diffusion of innovations.

This is exactly where the value of the technical architecture of the DLTs comes to the picture – providing transparent, irreversible and encrypted data transmission technology and standardised contracts, which are not dependant on cultural context. The ability to provide this universal value constitutes the technical part of its trust advantage (competitive advantage resulting from being trustworthy).

Already today the vaccination clinics that fill in the yellow paper-based certificates need to be accredited, and often this information is also stored digitally in a national health system. Hence, it could be said that the individuals who are using it have at least some trust towards their own government's ability to handle this. In the case of the digital vaccination certificate platform, it will be leveraged with the need to trust personal data processing, storage and transfer across borders and cultures. We need to be aware that the technological awareness and acceptance of digitalisation is not equally high everywhere, and it differs also between cohorts in a country. Yet, for maximising the value this innovation can create, it is crucial to get the majority of the countries and their accredited clinics aboard.

As emphasised earlier, the success of a platform business model depends on its ability to create network effects. This ability, as argued below, further depends on the ability of the platform and its leader to create trust. The experience from commercial platform business models suggests that incumbents can leverage their existing reputation to jump-start their platform (Fuentelsaz, Garrido, and Maicas, 2015; Eisenmann *et al.*, 2011). Similarly, Estonia's reputation as a small agile country with a pro-innovation mindset was a good starting point for initiating this project. This kind of 'trustworthiness' advantage can hardly be copied by a single firm, especially a newcomer.

In many sectors, the requirement for trustworthiness is much lower for complementors, when compared to the platform leader. However, in this case it is not, as everyone wants to be sure that they get the right vaccine, in the right dosage, that it has been kept in proper conditions prior to the injection, etc. This can be achieved by accrediting the clinics and their doctors (the complementors), and it is done by a government authority.

The trust towards a nascent platform can also be increased by the careful inclusion of external partners and strategic allies. The selection of partners is an important strategic decision (Zott, Amit, and Massa, 2011), and their role is usually connected to scaling the platform for faster emergence of network effects. This role can be dedicated to them due to the possession of some specific technical capabilities, infrastructure, etc., or also coming from intangible assets, e.g. previous experience, reputation, including earned trust. In the case of the digital vaccination certificate platform, the impact of the WHO as

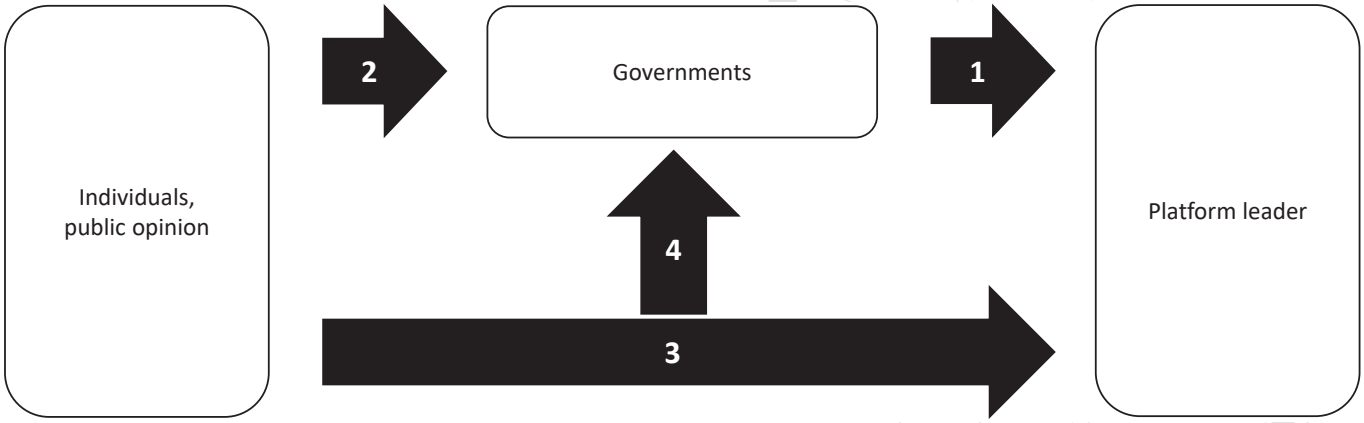

Figure 3: The path for forming trust towards a nascent vaccination certificate platform

a strategic partner[6] cannot be overemphasised. The value certainly comes from the WHO's international network, its information dissemination channels, etc., but likely most importantly from having the global and cross-cultural reputation of being trustworthy.

Formation of Trust in the Case of The Digital Vaccination Certificate Platform

A path for forming trust might not be straightforward for a nascent platform. In this particular case, the opportunity-risk ratio is first evaluated by the governments (arrow 1 in Figure 3), and if a government has decided to join the platform, only thereafter can it be used by individuals (arrow 2). As a feedback loop, the governments usually consider public opinion in making their decisions (arrow 4), and the public opinion about the new solution includes the perceived risk. This perceived risk in the public opinion depends also on whether the individuals trust the platform leader (arrow 3), first that their data will always be available when needed, and second, that it will not be misused. The latter is likely the biggest hurdle for large technology companies to become leaders of such platforms, as the cases of personal data misuse are vividly in people's memory.

In some cultural contexts, the individual's trust can also form through government in that if people have high trust in their own government, then they believe that the government makes good choices on their behalf. They do not feel the need to dive into technical details by themselves, and in a way this discharges individuals from direct liability in the case any of the risks are realised. One way or another, once the triangulation for this decision has reached a positive conclusion, it will be quite hard to turn it back, i.e. in a way they become dependent on it.

In parallel, the platform leader needs to trust the governments, who need to trust the vaccination clinics and personnel in their country. For the latter, the governments have set up registries, standards, and accreditation systems that are effective also today with the paper-based system. As also today, the governments need to trust that all other governments have done the same (i.e. intergovernmental trust). In this case, the trust is connected to validation of the actual vaccination procedure and its matching entry in the national database. If this is in place in all participating countries, and the other governments trust the platform leader and technology developer, then they can trust the whole platform as well. The case of the digital vaccination certificate platform is distinctive, in that the platform leader's role has been shared among the technology developers and the government of the developing and piloting country, i.e. this government has a dual role in the ecosystem.

[6] On October 5th, 2020, the Estonian government signed a Memorandum of Understanding (MoU) with the WHO [https://news.err.ee/1143517/estonia-and-world-health-organization-digitally-sign-cooperation-agreement]

The Nexus of Risk and Trust in a Platform Business Model, and its Effect on The Emergence of Network Effects

In explaining the nexus of risk and trust, scholars have used various terms, which allow us to also explain the risk in the context of a platform business model. These include, for example, the "perceived probabilities" (Bhattacharya, Devinney, and Pillutla, 1998) about failing or succeeding, or lack of "confidence" (Das and Teng, 1998) that the platform can deliver what it promises. Higher trust means that the perceived likelihood of positive outcomes is higher than of the negative outcomes (Figure 4), or that the potential benefits outweigh the risks.

In the case of the digital vaccination certificate platform, the perceived probability of succeeding to provide expected value to all ecosystem members is directly related to the perceived ability to create network effects (McIntyre and Srinivasan, 2017). However, as discussed before, the ability to create network effects depends on the platform leader's ability to form a strong platform ecosystem (including complementors and external partners) and manage (orchestrate) its operations.

The economics behind the platform's value creation is grounded in marginal utility theory, known from the neoclassical roots of microeconomics (see the works of Jevons, Menger, and Walras in the 19th century). For the platform to take off, the direct network effect coming from maximising the participating countries is most important. This would further result in maximising complying border-crossing points and accredited vaccination clinics. At the same time, the number of individual travellers using digital vaccination certificates would be maximised. However, for the platform to become sustainable and competitive in the long term, the indirect network effect that should come from a variety of complements and complementors is equally important (McIntyre and Srinivasan, 2017). If we assume that the first core service would be based on the Covid-19 vaccination, then access to certain public places (i.e. beyond border crossing) could be considered the first complement, as would be the vaccinations for other diseases. Furthermore, the ICT firms providing other e-governance solutions based on the same platform, using the same standard for interoperability, could become complementors as well. Hence, the indirect effect resonates with the possibility to extend the platform, to use it for many more health-related data and functions, and possibly beyond the

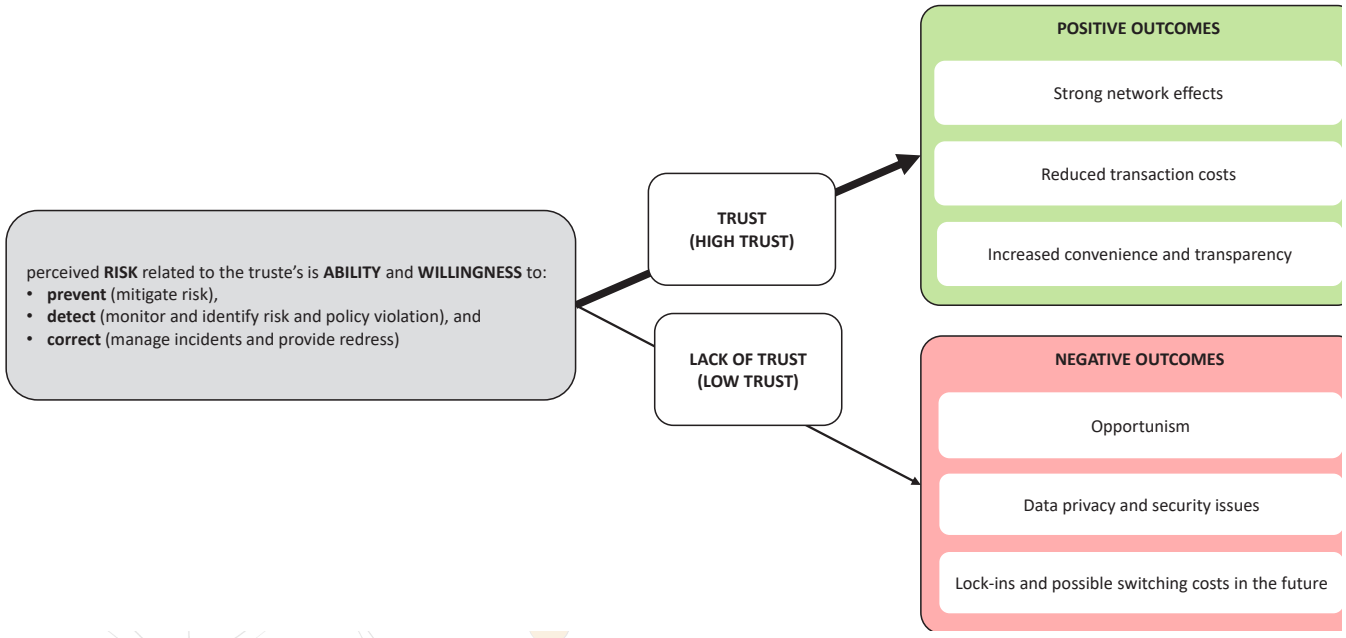

Figure 4: The nexus of risk and trust

health sector as a global e-governance standard. Ideally, both the direct and indirect network effects would emerge quickly and be strong in nature.

An increasingly important source of indirect network effect is also the data itself that accumulates during the platform operations and can provide valuable learning opportunities over time. The gathered data can be used to further improve the platform technology and offered service, and access to the data can be alluring to even more complementors, further strengthening the network effects. However, if this value creation mechanism that is very common in commercial platforms starts to threaten the formation of trust, then in this particular case this optional functionality should be dismissed.

These network effects do not emerge just by themselves. As usual with the platform business models, the initiator and platform leader need to solve the common 'chicken and egg' problem. Therefore, at the launch of a platform, the incentives are set to speed up the process, which is often achieved by subsidising (at least) one of the platform ecosystem members (Rochet and Tirole, 2006; Parker and Van Alstyne, 2005). This is needed until the platform reaches a critical mass of users, and the network effects become self-enforcing. Thereafter, when strong network effects have emerged, the platform can be quickly scaled up, and a sustainable incentives system is established. In the case of the digital vaccination certificate platform, similar effects can be achieved when countries with a common interest collaborate (e.g. the decision of the European Commission on 17.03.2021[7]).

The lack of trust (or low trust) may mean, in the worst case, that no agreement on collaboration will be achieved. But it may also be that because of urgent and severe needs the platform ecosystem will be formed, but the constantly emerging privacy and security issues do not allow it to achieve its full potential. Among the outcomes of joining a platform are also lock-in situations, which at first sight are positive from the platform orchestrator's view, but seem negative from a country's perspective. These may include, for example, technical lock-in, non-technical lock-in (e.g. habits), and possible switching costs. However, when looking deeper into the multi-sided platform business model value creation logic, it becomes apparent that all platform participants together benefit when everybody is locked in – the network effects are sustained.

The Different Facets of Trust, and their Dynamics

Across the disciplines, it can be observed that the (transaction cost) economists view trust as a cause of reduced opportunism among transacting parties, which results in lower transaction costs (Williamson, 1975), whereas organisational science suggests that the trust enables cooperative behaviour (Gambetta, 1988) and promotes adaptive organisational forms, such as network relations (Miles and Snow, 1992). Game theorists suggest that over time cooperative behaviour develops trust (Axelrod, 1984), i.e. emphasising its relative and dynamic nature, and bringing in the importance of the context when investigating the true functioning of trust (Rousseau *et al.*, 1998). Indeed, trust can be viewed in several contextual boundaries – economic, technological, cultural, etc. Moreover, the trust depends on the stakes involved, the balance of power in the relationship, and the alternatives available to the trustor (Mayer *et al.*, 1995). The interorganisational and interpersonal trust are different (Zaheer *et al.*, 1998; Fulmer and Gelfand, 2012), and this raises many challenges for building trust around a digital service like the platform-based certification of vaccinations.

From the rich extant literature stream, it is known that the phenomenon of trust can have many facets and levels (Fulmer and Gelfand, 2012). The trust can differ in the bandwidth (Sitkin and Roth, 1993; Rousseau *et al.*, 1998), where a narrow bandwidth refers to a specific trustee's ability, while a broad bandwidth may cover trust towards the trustee's general execution ability across disciplines or functions. It is possible (and likely) that across disciplines the trust is

[7] European Commission, COVID-19: Digital green certificates. [https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/safe-covid-19-vaccines-europeans/covid-19-digital-green-certificates_en]

not consistent (Lewicki, McAllister, and Bies, 1998). Rousseau *et al.* (1998) highlight the three basic forms of trust – calculus-based or calculative, relational, and institutional trust. These forms are present in all relationships, but their importance and role change over time. Deterrence is not usually considered as a form of trust, however, it certainly affects diffusion processes, and is sometimes mixed up with the utilitarian considerations of calculative trust. In the case of the digital vaccination certificate platform, the deterrence is backed by the underlying DLT. The main forms of trust and the sources of their formulation in the case of the digital vaccination certificate platform are shown in Figure 5.

The case where the trustor and the trustee are both individuals was evolutionally likely the first one. In this case, interpersonal trust matters first-hand through its institutionalising effects on interorganisational trust (Zaheer *et al.*, 1998), as individuals are viewed as representatives of their organisations or nations. Once the interpersonal trust has been achieved and well maintained, the start of any new collaborative project between these individuals (but also their organisations) can benefit from trust credit.

The relational trust emerges from previous experiences of cooperation. As this form of trust also depends on the cultural context, it has varying importance across the world (Dyer and Chu, 2003). It requires time and consistency, and therefore it is difficult to imitate and substitute (Barney, 1991) by competitors, and provides a potential source of sustained competitive advantage (Porter and Siggelkow, 2008). In the case of the vaccination certificate, the relational trust can build on the leading firms' and countries' previous track record in developing and managing reliable e-governance solutions, which by now have also been adopted by several other countries.

Calculative trust is based on rational choice. The quality of the choice further depends on the availability of comprehensive and truthful information,

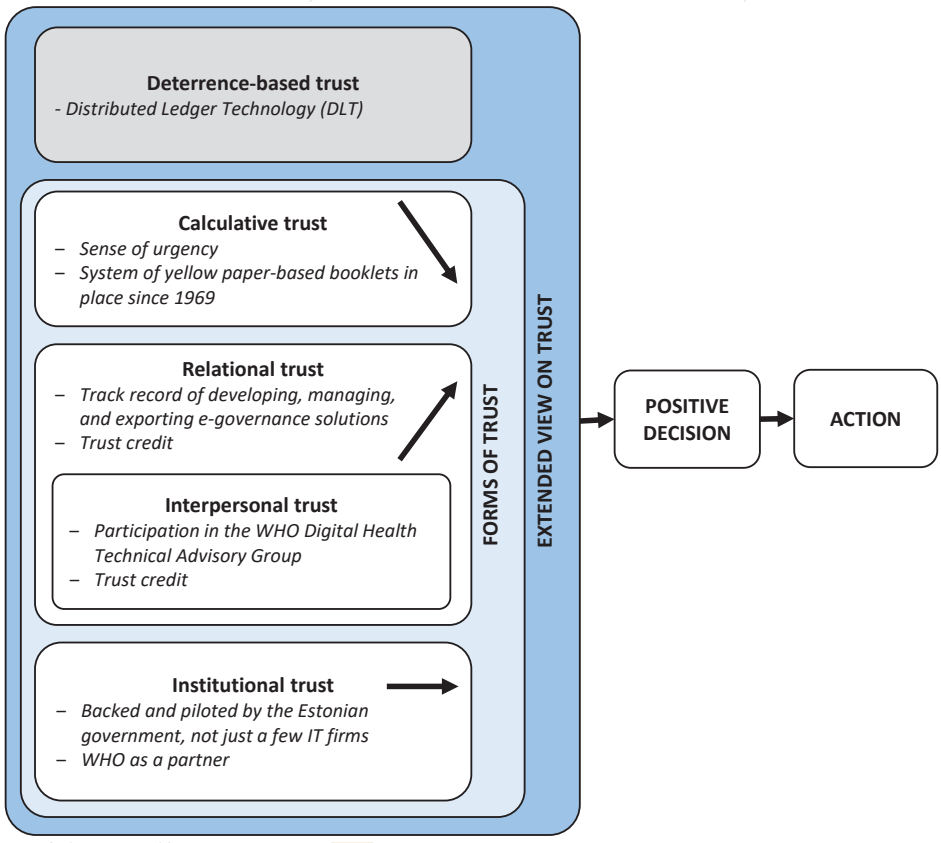

Figure 5: The forms and sources of formulation of trust

which is rarely the case in practice. Even if it were, it has been shown in behavioural economics (e.g. Ariely, 2008) that it would not necessarily be sufficient to predict the decisions and actions. It could be assumed that in the increasingly digitalised world one day the yellow paper booklets would have been replaced anyway because of their inherent inefficiency. But in the case of the vaccination certificate, one of the accelerators is clearly the sense of urgency created by the Covid-19 pandemic, and this feeds directly to the context where the rational choice is made. Although difficult to quantify precisely, it is clear that every day of delay with the decision and action will have a cost on the economy and society at large. The decision needs to be made promptly, and the partners who have a track record proving their ability to execute urgently will have an advantage. In economic transactions, the choice comes down to costs and benefits, and those who can provide a successful pilot or at least a working prototype *pro bono* could get an initial advantage. If wisely managed, this initial advantage can be developed into a sustainable competitive advantage.

The institutional trust can be built on the trust credit of the countries participating in the pilot project if these countries have experience in launching nationwide digital solutions. Despite the actual developers being ICT firms, the governments' role in promoting and sponsoring the initiative during the platform birth phase is crucial. Similarly, the role of the WHO as a strategic partner should not be undervalued, not only because it is a global non-governmental organisation, and therefore reduces the risk of opportunistic behaviour, but primarily because the WHO itself would be directly affected by 'cannibalism'. The WHO can affect the speed of change from both sides – how quickly the digital vaccination certificate platform is adopted, as well as how quickly the old paper-based yellow booklet phases out (is cannibalised).

It has been suggested that during the trust formulation process the share of calculative trust decreases and the share of relational trust increases, and that the role of institutional trust changes little throughout the trust development (Rousseau *et al.*, 1998). This change comes over time from accumulating collaboration experience. In their reasoning, building the trust starts from a blank page, i.e. they do not take into account the possibility to use trust credit.

In the case of the vaccination certificate, during the platform birth phase, trust credit can be a valuable resource for having a head start over the competition. The involvement of governments and ICT firms, which have a track record in e-governance solutions, confirms the domain-specific capabilities and expertise. These domain-specific capabilities do not cover only the technology, but also capabilities of orchestrating the whole ecosystem, including effectively managing any incurring challenges, and designing a business model that is financially sustainable, providing value to all platform sides. The strategic partnerships (e.g. the WHO) provide further trust credit about the achievability of global diffusion. It is reasonable to assume that as long the platform management (orchestration) structure remains stable, the institutional trust does not change much as well.

In the later phases, the initial trust credit needs to be justified. It will be gradually replaced by a rational calculative analysis of competing value propositions (including the switching costs, envisioned reduction of future transaction costs, etc.). The yellow paper booklets will be the first-hand reference for this analysis, but there will also be competition between the many digital newcomers around the world.

The relational trust changes throughout the platform development as well. At the birth, it is based on the ecosystem members' previous experiences with each other, or at least with the platform leader. When new experiences accumulate, e.g. during the piloting phase, the basis for trust becomes even more domain-specific, i.e. specific to this particular platform. The increase of the relational trust over time enables the platform to enter the self-renewal stage.

If a vaccination certificate platform succeeds in achieving leadership, then new questions related to the platform openness, possible new complements, and new areas of application will rise. The openness, which in the platform economy is predominantly seen as a positive feature, should not compromise

the existing platform members' trust towards the leader and the whole ecosystem.

As for the majority in the society, building trust takes time, while the social influence from the pioneer users is also an important part of the trust emergence (Rogers, 2003). The pioneers in this case are the first countries joining the pilot project, but at the same time also the first organisations or individuals (opinion leaders creating interpersonal trust). These pioneer countries are more likely the ones who recognise the existence of this kind of trust credit, or the ones who feel the most severe sense of urgency to have this kind of interoperable data platform in place.

Conclusions: The Role of Trust and Trust advantage in Gaining Sustained Competitive Advantage

The rise of the platform economy has brought to the spotlight competition between digital platforms, more recently also in the health sector. The trust-intensive nature of health data is likely the reason why the multisided platforms have not been diffusing in the healthcare systems as quickly as in other sectors, but it is about to change. As an antecedent of long-term cooperation (McEvily *et al.*, 2003), competitive advantage resulting from being trustworthy – the trust advantage – deserves further attention in analysing its potential diffusion paths.

The logic behind the platform business models challenges our understanding of the competition-cooperation nexus, prioritising between quality and quantity, as well as achieving and sustaining competitive advantage. In the platform economy, in the case of the first entrants to a market, a superior platform quality might be a way to outweigh a smaller ecosystem and weaker network effects (McIntyre and Srinivasan, 2017), as a high-quality platform can later be scaled up, not *vice versa*. The "quality" here is a combination of the platform leader's ability and willingness to orchestrate the platform setup and operations so that it would maximise mutually created value, and trust can also be considered a reflection of the abovementioned platform quality.

Trust is an intangible asset that has been often neglected or included in the broader term of a firm's reputation. Trust is likely one of the imperfectly imitable (Lippman and Rumelt, 1982) resources, in that a firm that does not possess it cannot obtain it (easily and quickly). The trust advantage is a socially complex (Wilkins, 1989) firm resource, which is extremely hard to copy, i.e. if the platform leader itself does not slip, then it can be a cornerstone of the sustained competitive advantage. Taken together, trust as a resource and the capability to gain and sustain trust, form the core of the competitive advantage for the platforms.

This article used the digital vaccination certificate platform as an example of a nascent platform, while announcements of several similar initiatives have been made around the world. Based on the rationale of a free market economy, the best price/value ratio from the end user's perspective emerges in a competitive market situation, while for the society as a whole the competition is perceived as a positive force. However, for simplifying global travel it would be logical that eventually one dominant standard would emerge. So, does this digital vaccination certificate platform offer a service where we can see (or would like to see) ongoing competition in the future, or is its perfect implementation possible only when there is one common global standard? Could the monopolistic status be a threat or would it be beneficial to the society as a whole?

First, it depends on how much, if any, power it has over the ecosystem members' national vaccination registries, or whether it is just an intergovernmental data communication platform. The yellow cardboard vaccination certificates have a common standard also today, but it is hard to see a business opportunity in it, rather they are a public good. However, if we look at the digital vaccination platform as a new data governance standard for e-health, or e-governance more broadly – as an attractive marketplace for providers of complementary goods and services, or as a hybrid platform encompassing also co-creation (Cusumano, Gawer, and Yoffie, 2019), the competition question becomes more relevant.

If a group of motivated participants in a business sector, covering the main ecosystem functions, already

successfully launches a DLT-based multisided platform that is able to provide increasing marginal utility through network effects, it will be very difficult to beat it with a traditional business model. The nature of network effects, which were discussed before, allows only a few dominant marketplaces (Gassmann, Schmück, and Gilgen, 2019), and the initial competitive advantage in this case could come from a first-mover advantage (Liebermann and Montgomery, 1988), assuming that the first-mover could get a lead with creating the network effects. The more countries that join the first platform, the higher the entry barriers (Bain, 1956) to followers will be, as it becomes harder to provide equal value compared to the first-comer, and hence harder also to attract a critical mass of users.

The trust develops over time, and its nature and influence mechanisms change. At the launch, the trust towards the digital vaccination certificate platform depends on the visionary countries, ICT firms and the individuals representing them. The objects of trust are the previous domain-specific experiences and references, which enable the trust credit. Another potential source of trust credit is the carefully chosen strategic partnerships, the WHO in this particular case.

Successful piloting further strengthens the trust, and it is crucial for creating stronger network effects and scaling up. Thereon, in the stabilisation stage, established trust motivates the countries and individuals to remain using the platform, and even apply it beyond international travel. The process is also well aligned with the ecosystem development model phases (birth, expansion, leadership, self-renewal) of Moore (1993), and it is useful in explaining how the trust evolves, and over time changes in its scope and degree.

In the course of the scaling up of the platform, the bottom line of the potential gains and losses becomes the focal point, i.e. the calculative trust in the platform's viability becomes central. In the stabilisation stage, the trust becomes dependent on the experiences in participating in the platform operations (e.g. success of the piloting period), and the platform leader's capability to orchestrate it – preventing, detecting and correcting faults, if necessary.

The global spread of Covid-19 has given the opportunity to harness the momentum of setting up a digital vaccination certificate platform, but it remains relevant far beyond Covid-19 – for travelling to countries where diseases like hepatitis, yellow fever, tuberculosis, rabies, etc. can still be found.

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Journal of Business Models (2021), Vol 9, No 4, pp. 112-124

JOURNAL OF BUSINESS MODELS

Business Models Beyond Covid-19. A Paradoxes Approach

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Abstract

The Covid-19 crisis has undermined and disrupted several business fields. Organizations are called to address the new challenges by rethinking their business models. Employing an EFTE (estimate, feedback, talk, estimate) approach, the paper highlights 50 paradoxes to be taken into consideration in the strategic transformation process.

Keywords: Paradoxes, Post-pandemic business models, Covid-19

Please cite this paper as: C. Bagnoli, F. Dal Mas, H. Biancuzzi and M. Massaro (2021), Business Models Beyond Covid-19. A Paradoxes Approach, Journal of Business Models pp. 112-124.

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ISSN: 2246-2465
DOI: https://doi.org/10.5278/jbm.v9i3.6419

Introduction

The Covid-19 pandemic and related healthcare emergency at the beginning of 2020 disrupted several businesses worldwide (WHO, 2020). Non-pharmaceutical interventions forced many enterprises to close their doors to clients and visitors. Half of the world's population was quarantined. However, paradoxically, pandemics and natural disasters, in general, have also proved capable of changing the course of history, triggering the innovation of religious, political, economical but also technological systems.

To explain this co-existence of harmful and propitious effects, the etymology of the term paradox comes to our aid, according to which something, which apparently contradicts common opinion (παρά-against and δόξα-opinion), proves to be valid instead. The fundamental characteristic of the paradox is, in fact, the co-existence of two opposing poles: one does not exclude the other.

The crisis triggered by the current pandemic is, therefore, paradoxically, a significant threat but, at the same time, also an excellent opportunity to innovate the whole society and, more specifically, individual companies. The real challenge is to use the paradoxical method to stimulate people to review their lifestyle, work and consumption habits and, companies, to rethink their existing business model (Bagnoli, Massaro, *et al.*, 2018; Nielsen *et al.*, 2018; Osterwalder and Pigneur, 2010), developing strategic innovation.

It is necessary to identify the strategic paradoxes that the current crisis has brought out and try to "manage" them, not solve them, by innovating the business model. The business strategies that lead to choosing one of the (apparently) opposing poles that characterize a paradox (e.g. work from the office or remotely) hide the competitive context's real complexity, resulting, therefore, not very useful for winning the competition. A paradox is characterized by only apparently opposing poles (Bagnoli *et al.*, 2021). It is "manageable" only by adopting an approach that leads to uniting, through a circular process, the two poles themselves, which end up acting as an attractor for the other, thus generating a balanced dynamic and supporting the creative creation of new business models (Bagnoli *et al.*, 2021).

The paper adopts a scientific approach based on the management, not elimination, of paradoxical choices to deepen the strategic handling of a crisis. Following an EFTE (estimate, feedback, talk, estimate) approach, the article aims to provide organizations with a methodology to recognize and address the paradoxes that can impact the single building blocks of the business models, following the pandemic restrictions, legal constraints, and new consumer habits. The ambition is not to provide valid erga omnes answers, but to stimulate the individual company to ask itself the correct questions to be addressed, according to the situation. The acceptance of a paradoxical approach leads to rejecting the artificial simplification of the complexity that characterizes real contexts and, therefore, the use of a process for the management of the linear crisis that leads to dichotomous solutions of the "black or white" type or, however, to compromises of "grey." Instead, it leads to the use of a process for the management of the circular crisis to arrive at paradoxical solutions of the "black and white" type. Starting from these premises, it is essential to combine the activities to be carried out "during" and "after" the crisis with those to be carried out "before" and "beyond" the crisis itself.

Approach

An EFTE (estimate, feedback, talk, estimate) approach (Nelms and Porter, 1985) was employed. The methodology allowed to gather experts' opinion on a particularly complex situation, like the one on Covid-19 possible post-pandemic business models. Nine experts coming from academia and the business consulting sector were involved in the analysis. The experts were selected based on their specific expertise. More precisely, the aim was to gather people with a multidisciplinary background, coming from sociology, business strategy, innovation, engineering and business processes, sustainability, marketing and communication, and public policies. Experts were selected and invited within the network of the nine universities shaping the "SMACT competence center," one of the eight highly specialized Industry 4.0 Competence Centers born in Italy on the initia-

tive of the Ministry of Economic Development. The SMACT competence center stands as a public-private body that systematizes the skills in the industry 4.0 field of research, technology providers and early adopter companies (SMACT, 2021).

The protocol described by Nelms and Porter (1985) was employed during the investigation and observation, namely following these steps:

1. Experts were given background information to be used in making opinion judgments;
2. Experts gathered face-to-face in an e-conference room. Questions regarding the background information were resolved by an appointed Delphi manager, who also acted as the Principal Investigator of the study. Discussion among the participants was encouraged. Still, eventual problems of social interaction were avoided due to the different competencies of the participants. Dedicated translation tools (Bagnoli *et al.*, 2021; Dal Mas *et al.*, 2020; Secundo *et al.*, 2019) were employed to facilitate the dialogue, the sharing, and the creation of new knowledge.
3. A Delphi questionnaire was given to each expert, which later needed to be filled and returned to the Delphi leader.
4. The questionnaire results were summarized and shared within the group.
5. The feedback results were discussed freely in the group, still maintaining the anonymity of each individual's survey response.
6. The processes terminated once sufficient stability was found, and a report was created (Bagnoli *et al.*, 2020), to summarize the results.

Key insights

The strategic transformation of the business model

A strategic transformation or innovation takes the form of creating a new market by developing a unique value proposition and, therefore, of a new business model (Bagnoli *et al.*, 2019; Bagnoli, Bravin, *et al.*, 2018; Nielsen *et al.*, 2018; Osterwalder and Pigneur, 2010). The latter can be achieved through the development of:

- innovative products (goods and/or services), presented or combined in a new way, to create a radically different experience in customers, involving them also on an emotional, intellectual and/or spiritual level;
- innovative processes for the production and/or distribution of existing or new products that may lead to the acquisition of new customer groups;
- innovative value chains, to create a new market space which, making the competition irrelevant, allows for an increase in the value for both the company and the customer (Klewitz and Hansen, 2014; Schneider and Spieth, 2013; Teece, 2010).

In general terms, one of the first challenges that companies need to overcome is the classic paradox between pursuing a competitive strategy of differentiation, increasing the value perceived by the customer and, therefore, the selling price of the product, or cost leadership, by lowering the cost of producing the product, leveraging a lower offer, in whole or in part, to that of competitors. Most of the companies resolve the paradox by trying to compromise the two opposing poles, meaning to invest in products that can be appreciated and valued by the target customers, still with an eye on cost reduction to keep a fair or moderate price.

The process for implementing a strategic transformation may consist of four steps.

Step 1. Mapping the current business model using the business model canvas.

The starting point is defined for the (re)design of the business model, considering the company's strengths and weaknesses. The organization should identify the essential elements that distinguish each of the building blocks (value proposition, suppliers and supply channels, resources, internal and external processes, products and distribution channels, customers, and society). Such an analysis should be conducted by filling in the single building blocks of

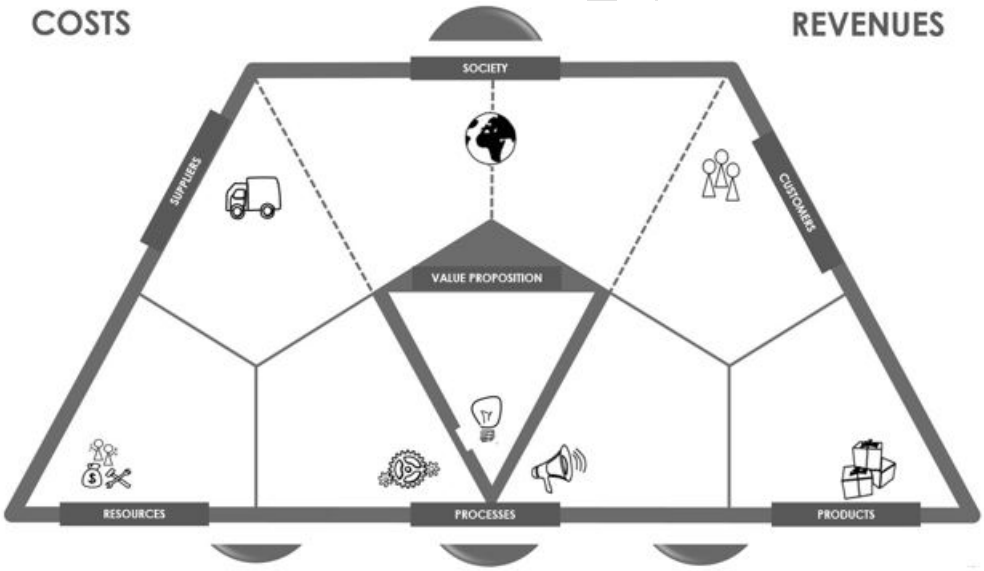

Figure 1. The business model canvas framework (Adapted from Biloslavo et al. (2018))

the business model canvas. While the more traditional and well-known approach by Osterwalder and Pigneur (2010, 2012) would for sure fit the purpose, we would recommend using the revised version by Biloslavo and colleagues (2018), as it includes the social dimension as a central element of today's most successful organizations, allowing to consider sustainability into the picture and develop sustainable business models (Buser and Carlsson, 2020; Cosenz *et al.*, 2020; Glinik *et al.*, 2020; Lozano, 2018; Lüdeke-Freund *et al.*, 2020). The business model canvas allows imagining what the characteristics of the future and desired business model will be, in this case, once the pandemic caused by Covid-19 has passed or come to a "new normal" (Cobianchi *et al.*, 2020). The following Figure 1 shows a possible framework for the analysis.

Step 2. Identifying the uncertainties arising from the crisis by developing a scenario-planning process

A scenario planning process allows identifying and connecting the socio-economic and technological variables that will drive the change and determine the new post-crisis reference context. More precisely, this step describes a specific collection of uncertainties, varying "realities" of what might happen in the future. The areas of reflection must cover all the aspects of the uncertainty: e.g. economic, political, social, legal, environmental. Examples of the uncertainties developed during the study and the pandemic era have been:

- Political: e.g., the role of the European Union (e.g. disintegration of the EU Market and Schengen area) and the Brexit effect;
- Economic: e.g., economic recession following the pandemic and mandatory closure of businesses (Carnevale and Hatak, 2020);
- Social: e.g., the duration of the social distancing enforced measures and the consequent change in consumers' and people's habits (Carnevale and Hatak, 2020);
- Technological: e.g., use of devices like the Internet of Things - IoT for people tracing (Wang *et al.*, 2020) and of social media networks to communicate with the population (Massaro *et al.*, 2021);
- Environmental: e.g., "green waves" and new consumer habits;
- Legal: e.g., protectionism to support and boost local productions.

Step 3. Evaluating the possible impacts of the identified uncertainties on the individual building blocks

Once the existing business model has been mapped and once the sector scenarios have been defined, it will be possible to identify the impacts on the single

building blocks, namely, which processes or actors may be more affected by the pandemic, the environmental changes, the enforced measured, and the new consumer habits. The building blocks which end up more impacted by the new scenarios should lead to new strategic choices, considering how to compromise among opposing options or interests.

Step 4. Redesigning the business model to exploit the opportunity of the crisis

Last but not least, it is necessary to reflect on how to move from a diagnosis phase to a response phase to identify the projects that can guide the change in the business model. Before deciding on any significant changes in the business model, it is essential to think about how the crisis will affect the existing performance metrics.

The following Table 1 illustrates the paradoxes, as identified by the expert panel, that companies should take into consideration in their analysis before the strategic choices are made.

Some examples can be reported (Bagnoli *et al.*, 2020).

Table 1

#		Phases and building blocks	Paradoxes
1	Paradoxes for all the phases of the crisis	All the phases	Practical experience vs theoretical knowledge
2		Phase "before": before the crisis	Scenario planning vs antifragility
3			Prevention vs assurance
4		Phase "throughout": during the crisis	Keeping what is existing vs experimenting new solutions
5		Phase "after": to a new normal	Temporary vs permanent
6			Continuous vs intermittent
7		Phase "beyond": strategic transformation once the crisis is over	Coming back to a "new normal" vs strategic transformation
8			Waiting vs acting
9			Contingent vs structural

Table 1. 50+ paradoxes to rethink post-pandemic business models

Table 1

#		Phases and building blocks	Paradoxes
10	Paradoxes for all the building blocks	Society	Open vs closed
11			Linear economy vs circular economy
12			Global vs local
13			Private vs public
14			Shareholders vs stakeholders
15			Sharing vs exclusivity
16			Digital transformation vs human touch
17			Leadership through gurus vs through sergeants
18		Suppliers	Short supply chains vs long supply chains
19			Concentrated supply chains vs extensive supply chains
20			Partnerships vs markets
21		Resources	Just in time vs safety stocks
22			Human resources vs cyber-physical systems
23			Workers vs IT technicians

Table 1. 50+ paradoxes to rethink post-pandemic business models (*Continued*)

Table 1

#		Phases and building blocks	Paradoxes
24	Paradoxes for all the building blocks	Resources	Physical offices vs virtual offices
25			Local staff vs worldwide talents
26			Cash or guarantees
27		Internal processes	Offshoring vs reshoring
28			Office work vs remote work
29			Isolated productive cells vs humanless production systems
30			Production systems oriented to efficient flexibility vs redundant flexibility
31		External processes	Advertising image vs reassuring truth
32			Offline vs streaming events
33			Physical stores vs e-stores
34			Sanitized "hand" deliveries vs automated deliveries
35		Products	Offline vs online services
36			Shared products vs personal ones
37			Good looking vs safe packaging

Table 1. 50+ paradoxes to rethink post-pandemic business models (*Continued*)

Table 1

#		Phases and building blocks	Paradoxes
38			Self-sanitizing materials vs materials easy to sanitize
39			Safety through innovation vs regulation
40			Quality assurance vs safety assurance
41			Low-cost goods vs sustainable goods
42			Traditional vs smart appliances
43			Products to support physical and virtual interaction with people vs robots
44		Clients and markets	"Made-in" push markets vs Covid-19-pull ones
45			Global vs local markets
46			Traditional market segments vs new consumer tribes
47			Traditional market vs e-marketplace
48			Essential needs vs transcendental aspirations
49			New necessities vs new habits
50		Value proposition	Strengthening the culture and corporate identity vs changing to adapt to the new context

Table 1. 50+ paradoxes to rethink post-pandemic business models (*Continued*)

The mandatory closure of several non-essential factories and offices has had the effect of interrupting many enterprises' production, causing the interruption of the supply by the global suppliers, especially the big ones located in China. Such a disruption, referring to the "Suppliers" building block, imposes companies to question whether short supply chains should replace long ones (paradox #18 of table 1). Organizations will need to compromise between the need to stock up on global procurement markets and use local suppliers, even supporting the national economy's recovery. While the first option seems more convenient from a purely economic perspective, it highlights the risk to suffer one more supply interruption for health or political reasons. Therefore, the pandemic has underlined the vulnerability of global supply chains, starting from the Chinese one.

Again, the enforced closure of many factories and offices has had the effect of interrupting the production even of many western and local companies. Therefore, they stopped the supplies to their customers, impacting the "Resources" building block. To prevent disruptions in the availability of resources and goods, companies should then think of the best strategy to compromise the "just in time" stock management versus having enough safety stocks (paradox #21 of table 1). While, on the one hand, there is the need to encourage production philosophies that aim to optimize the entire production process, inventories may be essential to maintain the business. New "just in case" stock strategies may support to compromise between the two competing needs.

Still considering the "Resources" building block, new frontiers emerge about human resource management. Therefore, the opportunities and tools provided by the smart and remote work allow the company to think about whether to invest in local people or to open up to worldwide talents, who would not need to reside in the proximity of the firm's plants or offices (paradox #25 of table 1). Pre Covid-19, the location of the corporate headquarters in a large and preferably world metropolis appeared as a decisive factor in attracting the best talents, thanks to the possibility of quickly reaching the workplace by train or subway. This might not be more true if companies moved their offices in the countryside, in healthier and cheaper contexts, allowing their employees to work remotely, enhancing the wellbeing and supporting the work-life balance.

The closure of almost all public places like shops, theatres, cinemas, auditoriums, restaurants, gyms, and fitness centres, had that effect of replacing physical interactions with virtual ones, maximizing the use of e-stores and digital platforms and impacting the "External processes" building block. Companies should then think if the pandemic has led to the definitive affirmation of e-commerce and home delivery or if there is still room for customers to enjoy the physical experience of purchase and/or consumption (paradox #33 of table 1). In China, the clerks of many chain stores (ex: Red Dragonfly) have been transformed into online vendors and restaurant waiters in food-delivery porters (e.g. Ele.me, 7Fresh of JD.com and Meituan). New "ghost kitchens" were born; namely, restaurants aimed exclusively at delivery or takeaway, while Deliveroo has announced its intention to invest in home shopping.

Discushesions and Conclusions

The Covid-19 crisis impacts the individual business model's building blocks and the relationships among them and, therefore, on the entire business model of several organizations. The possible choices at the level of the various elements of the business model should be consistent with each other.

The main takeaway message of our study is the approach described in the paper, which should push organizations to identify the strategic paradoxes that the current crisis has brought out in their business model's building blocks. The big challenge is mapping and understanding the most affected building blocks, recognizing the potential paradoxes suggested by the crisis, and rethinking the strategic choices to compromise between the opposing poles, needs, and interests. Paradoxes can hardly be "fixed." Still, companies should try to "manage" them, not solve them, taking the chance to innovate their business model.

Innovating the strategy means, first of all, overcoming the paradox between increasing the value offered and lowering the cost of production, through a new

value proposition, within a new market space. The pandemic crisis will probably lead to the destruction of many established markets, in some cases by accelerating (e.g. digital transformation) and in others slowing down (e.g. globalization) developments that were already underway in the competitive context. The pandemic crisis, therefore, has stressed the need for all companies to redefine their business model. Some can limit themselves to polishing it. Still, most organizations, namely the smaller, more fragile, and less digital ones and those operating in the sectors most affected by the constraints and consequences of Covid-19 (like travels and tourism), are forced to change or rethink it radically.

These reflections suggest a final strategic paradox to be faced for a company but, perhaps, first in importance, as regards its deep essence, the starting point necessary to redefine the business model consistently.

The expert panel involved in the study identified the 51st paradox as the durability vs adaptation of corporate identity. A possible way to manage this strategic paradox is to refer to the concept of continuity. In this perspective, the central aspects of the corporate identity remain nominally the same, assuming, however, substantially, over time and space, different meanings to allow the company to adapt to the changed reference context. Being an innovative company, for example, is an identity feature that can take on substantial and very different meanings over time and space, which require equally different action programs to be implemented. For example, today, developing products with self-sanitizing materials has become a central innovative element during the Covid-19 crisis, which can lead to competitive advantage. Before, this topic was yes present, still not central. Persistence in expressing the corporate identity is also functional to reassure the organization members regarding business continuity, a critical aspect not to lose the best human resources due to the crisis.

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Journal of Business Models (2021), Vol 9, No 4 pp 125-134

JOURNAL OF BUSINESS MODELS

The Business Model Matrix: A Kit for Designing and Innovating Business Models

Nedo Bartels[1]

Abstract

Purpose: How is it possible to systematically develop business model innovations for different domains? This paper provides a novel answer, using a methodological approach called Business Model Matrix (BMM), and addresses business model threats with appropriate strategies and concepts to develop innovative and comprehensive business models.

Design/Methodology/Approach: This paper addresses the idea of a pattern-based development of business models and merges different approaches to offer a business model construction kit for systematic development.

Findings: The approach demonstrates how business models can be developed using relevant issues of a business model that need to be answered (business model questions) with appropriate proposals or patterns that are able to tackle the issues raised (business model answers).

Research limitations / Implictions: The method presented here is primarily aimed at modelers who have developed at least a basic concept of a business model and are looking for systematic ways to innovate the developed concept transparently.

Originality/Value: The added value of the presented approach lies in the fact that both a holistic structure for considering all relevant aspects of a business model and suitable choices for each business model aspect are provided.

Keywords: Business Model Innovation, Business Model Patterns, Business Model Dimensions, Construction Kit

Please cite this paper as: Bartels, N. (2021), The Business Model Matrix: A Kit for Designing and Innovating Business Models, Journal of Business Models, pp. 125-134

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DOI: https://doi.org/10.5278/jbm.v9i3.6239
ISSN: 2246-2465

Introduction

Since the late 1990s, various definitions, conceptualizations, frameworks, and perspectives have been presented regarding the meaning and understanding of business models. Content-related aggregations and reflections about the different approaches can be seen in Centobelli et al. (2020), Biloslavo et al. (2018), Wirtz et al. (2016), Nielsen & Lund (2014a), and (2014b). Moreover, Ritter & Lettl (2018), Ivari et al. (2016), Groth & Nielsen (2015), and Lambert (2015) showed that the theory of business models is even more diffuse when it comes to a commonly accepted classification, taxonomy, and terminology. Due to this heterogeneous and fragmented understanding, many ambiguities exist. On the other hand, a shared understanding and consent are argued by Jensen (2013) regarding three core business model dimensions: value creation, value delivery, and value capture. These dimensions can be found in many definitions and conceptualizations; see, for instance, the business model framework of Amit & Zott (2021), the Value Triangle model of Biloslavo et al. (2018), or the "Magic Triangle" model of Gassmann et al. (2014). Consequently, a business model represents the underlying logic of its business; i.e., to create, deliver, and capture value. Apart from the domain or the market-specific requirements, each business model has to clarify these aspects in order to remain successful on the market (Fielt, 2013; Ovans, 2015; Osterwalder et al., 2005).

The approach presented in this paper uses the identified business model dimensions in combination with some of the most prevalent tools for the development of business models: Business Model Canvas (BMC) and the Business Model Navigator (BMN) (Amit & Zott, 2021; Gassmann et al., 2014; Osterwalder & Pigneur, 2010). BMC provides nine innovative business model blocks with relevant key questions to guide the user by structuring ideas and thoughts (question-oriented triggers). In comparison, BMN provides 55 innovative business model patterns that demonstrate strategies and concepts of successfully established business models as a source of inspiration (answer-oriented triggers). The combination of the guidance questions of BMC and the innovative business model strategies and concepts of BMN leads to the core approach presented in this paper: a construction kit for the systematic and transparent development of business model innovations. The added value and uniqueness of the presented approach lies in the fact that both a holistic structure for considering all relevant aspects of a business model and suitable choices for each business model aspect are provided. The method presented here is called Business Model Matrix (BMM)[1] and is primarily aimed at modelers who have developed at least a basic concept of a business model and are looking for systematic ways to innovate the developed concept transparently.

Approach

Design of BMM

BMM addresses the idea of Lüttgens & Diener (2016) for pattern-based development of business models. The approach presented by Lüttgens & Dieler (2016) offers the idea of allocating the 55 business model patterns identified by Gassmann et al. (2014) to related business model dimensions (value proposition, value creation, and value capture). Therefore, business models can be created by rearranging and composing existing business model patterns. According to Gassmann et al. (2014), 90 percent of business model innovation is based on a recombination of existing business models.

A framework that addresses this pattern-based development should combine (A) relevant issues of a business model that need to be answered (business model questions) with (B) appropriate proposals or patterns that are able to tackle the issues raised (business model answers). To offer this kind of tooling, a construction kit has been developed based on the approaches shown in Figure 1.

[1] This paper provides a novel answer, using a methodological approach called Business Model Matrix (BMM).

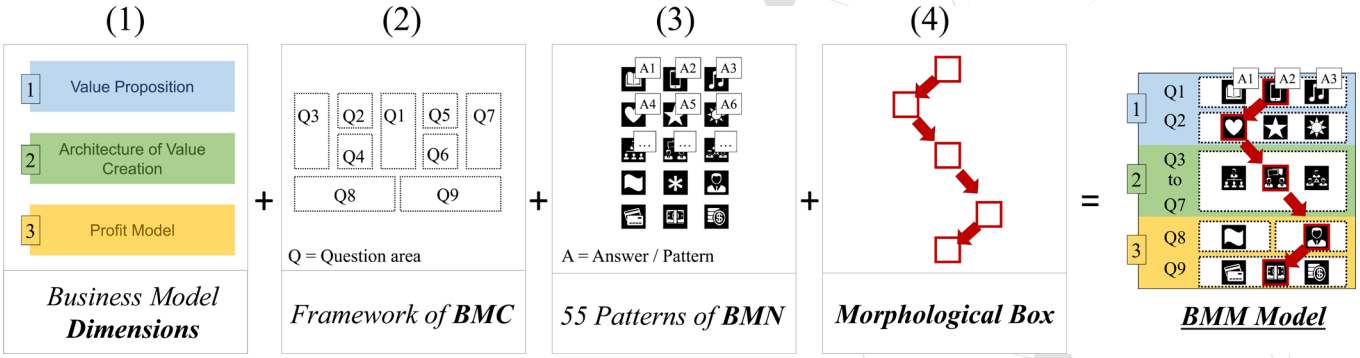

Figure 1: Methodological composition of BMM

The approach shown in Figure 1 is based on four methodical components, (1) - (4), which are described as follows:

1. **Business Model Dimensions** of Stähler, (2002)
   - ***a. Explanation***: Stähler described a business model based on three key business model dimensions to address the creation, delivery, and capture of value:
     - *Value Proposition: This describes the added value a business promises its customers with a certain product or service. Without a clear added value, there is no consumption incentive.*
     - *Architecture of Value Creation: This describes how value has to be created through the business. Moreover, this dimension contains three additional dimensions:*
       - *Product or Service Design*: Width and depth of the product or service offered.
       - *Internal Value Creation*: Structure and arrangement of the core business activities, especially in terms of own effort and relationships to partners.
       - *External Value Creation*: Design of distribution, sales, and marketing channels.
     - *Profit Model: This describes how the created value can be used to generate profit using an appropriate payment, billing, and pricing model.*
   - ***b. Usage for BMM***: BMM is based on these **key dimensions of a business model** that define the overall frame of the model: [1] Value Proposition, [2] Architecture of Value Creation, and [3] Profit Model.
2. Original **Business Model Canvas** of Osterwalder & Pigneur (2010)
   - ***a. Explanation***: BMC is a strategic tool that facilitates the development of business models. For this purpose, the framework provides nine building blocks with 35 appropriate trigger questions: (Q1) value propositions, (Q2) key activities, (Q3) key partnerships, (Q4) key resources, (Q5) customer relationships, (Q6) channels, (Q7) customer segments, (Q8) cost structure, and (Q9) revenue streams. Examples of these key questions are (Osterwalder & Pigneur, 2010):
     - *Key partnerships: 'Which key activities do partners perform?'*
     - *Revenue stream: 'For what value are our customers really willing to pay?'*
   - ***b. Usage for BMM***: Inspired by the question-oriented structure of BMC, BMM uses **20 business model questions** to address relevant aspects within the three key business model dimensions defined by Stähler.
3. **Business Model Navigator** of Gassmann et al. (2014)
   - ***a. Explanation***: BMN is a method that offers 55 descriptions of unique business model patterns that can be used generically to trigger business model innovations for dif-

ferent areas within a business model. Examples of these patterns are (Gassmann et al., 2014):

- *#34 Orchestrator: 'Within this model, the company's focus is on the core competencies in the value chain. The other value chain segments are outsourced and actively coordinated [...]'*
- *#35 Pay Per Use: '[...] The customer pays on the basis of what he or she effectively consumes [...]'*

b. Usage for BMM: BMM uses the business model patterns to enable innovative answers to the questions raised. The overall model offers **108 business model answers** to address all 20 questions. This means that on average, five answers are offered per question. Furthermore, 38 business model patterns can be selected directly as business model answers. The remaining 17 business model patterns that cannot be selected directly result from combinations of several answer choices. Example: 'Supermarket' (#49) is composed of a *large range of different product variants* and a *large range of different product types* offered. Consequently, the pattern 'Supermarket' cannot be selected directly in BMM, but the breadth and depth of the product range can be set.

4. **Morphological Box** of Zwicky (1966)

a. Explanation The morphological box is a one-dimensional classification system for the categorized representation of problem areas and corresponding solution ideas. Through the systematic combination of the different solution ideas within the respective areas, original and novel concepts can be developed.

b. Usage for BMM: The overall model of BMM is structured in the form of a morphological box. Accordingly, all 20 business model questions (inspired by BMC) within each of Stähler's three business model dimensions can be answered by a combination of the 108 business model answers inspired by BMN.

Usage of BMM

BMM is primarily aimed at modelers who have already worked out a basic concept of a business model and are looking for appropriate inspirations to trigger business model adaptations. We recommend that the user should already have used a methodology like BMC (or something similar) to ensure a basic understanding of the considered business model. Since the 22 BMM questions are inspired by the 35 BMC questions, results from BMC can be addressed well with the framework of BMM. Therefore, an individual business model can be developed or adjusted by selecting a single business model answer for a business model question of BMM – similar to a construction kit, the modeler can first get inspired by a range of choices and then choose a suitable variant. An excerpt of BMM's 20 business model questions and 108 associated business model answers can be seen in Table 1.

For each business model question, answers, including business model patterns, are provided in order to get topic-specific inspiration on how to solve the considered business model issue. According to Mettler & Eurich (2012), a business model pattern can be described as an archetypal design solution of a successful business model. Therefore, business model patterns have a reusable and generic character. In this paper, a business model pattern is defined as a proposal or source of inspiration to generate ideas aimed at finding successful ways to solve specific business model issues. Here is an example to illustrate this: In response to question 2 in Figure 1: *How do we develop new products/services?*, the modeler can consider whether it makes sense for the business model to primarily outsource R&D activities regarding *external development* (A11.1), to run *internal R&D* (A11.2) activities, or to use an alternative approach (A11.3-A11.7). This modular approach allows the user to gradually develop and adapt business models.

Key insights

As already shown, BMM is an approach that allows addressing relevant business model issues with appropriate strategies and concepts. For this purpose, the BMM approach assumes that certain components of the 55 business model patterns can be

Table 1.						
Question #3: *What kind of value do we deliver to the customer?*						
A3.1: *Functional Value*	A3.2: *Economic Value*	A3.3: *Simplifying Value*	A3.4: *Hedonistic Value*	A3.5: *Symbolic Value*		
Question #5: How many different variants of a single product or service are offered to the customer?						
A5.1: *Single Variant*	A5.2: *Small Range*	A5.3: *Large Range*	A5.4: *Long Tail* *(#28 Pattern)*			
Question #11: *How do we develop new products or services*?						
A11.1: *External Development*	A11.2: *Internal R&D*	A11.3: *User-Designed* (Pattern #54)	A11.4: *Reverse Engineering* (Pattern #42)	A11.5: *Reverse Innovation* (Pattern #43)	A11.6: *Open Business Model* (Pattern #32)	A11.7: *Open Source* (Pattern #33)
Question #15: *How are we reaching our customers?*						
A15.1: *Word-of-Mouth*	A15.2: *Cross Selling* (Pattern #7)	A15.3: *Direct Selling* (Pattern #12)	A15.4: *Ingredient Branding* (Pattern #22)	A15.5: *Affiliation* (Pattern #2)	A15.6: *Influencer Barter Deal* (Pattern #5)	A15.7: *Freemium* (Pattern #18)
Question #18: *How often is the payment made?*						
A18.1: *One-Time*	A18.2: *Subscription* (Pattern #28)					

Table 1: Example of BMM's business model questions and answers

matched with key areas of a business model, called business model dimensions. Therefore, only a total set of dimension-related answers will lead to a comprehensive description of a business model. First insights can be seen in Figure 2, which shows a simplified version of BMM for the example of Netflix. The complete BMM model in the latest version can be found in Bartels (2019).

Figure 2 illustrates the allocation between business model questions and business model answers and clarifies the core idea of BMM, meaning the gradual development and adaptation of certain business models.

The model shows that the business model of Netflix is characterized by a number of different intersections within the business model answers. The presented composition of Netflix is based on the description according to BMI Lab (2020) (author's spin-off from BMN) and was simply transferred for this representation:

- A3.3: Netflix's offering is available 24/7 (= #20 Guaranteed Availability).
- A5.4: Netflix offers a wide variety of content on its platform.
- A11.1: Netflix content in the form of movies, shows, etc. is usually produced externally (although they started producing their own shows and movies as well).
- A15.1: Netflix gains viewers by word-of-mouth promotions (Fagerjord & Kueng, 2019).
- A18.2: The Netflix streaming service operates on a monthly subscription model.

It can be seen that the business model of Netflix can potentially be better understood and compared when using BMM. The individual development trajectory of each business model represented within the matrix can be used for a transparent and objective evaluation. BMM is able to provide a structured model that enables unique insights in terms of the allocation of business model innovations. Modelers who want to design a business model from scratch can use BMM to get a detailed overview of relevant business model fields and innovative answers to overcome business model threats. Modelers who have already developed a business model but want to adapt it, can use BMM to get appropriate (and topic-related) patterns to trigger new ideas for assigned business model dimensions. Therefore, BMM can be used primarily to (1) extend existing business models but also to (2) create new ideas for business model innovations.

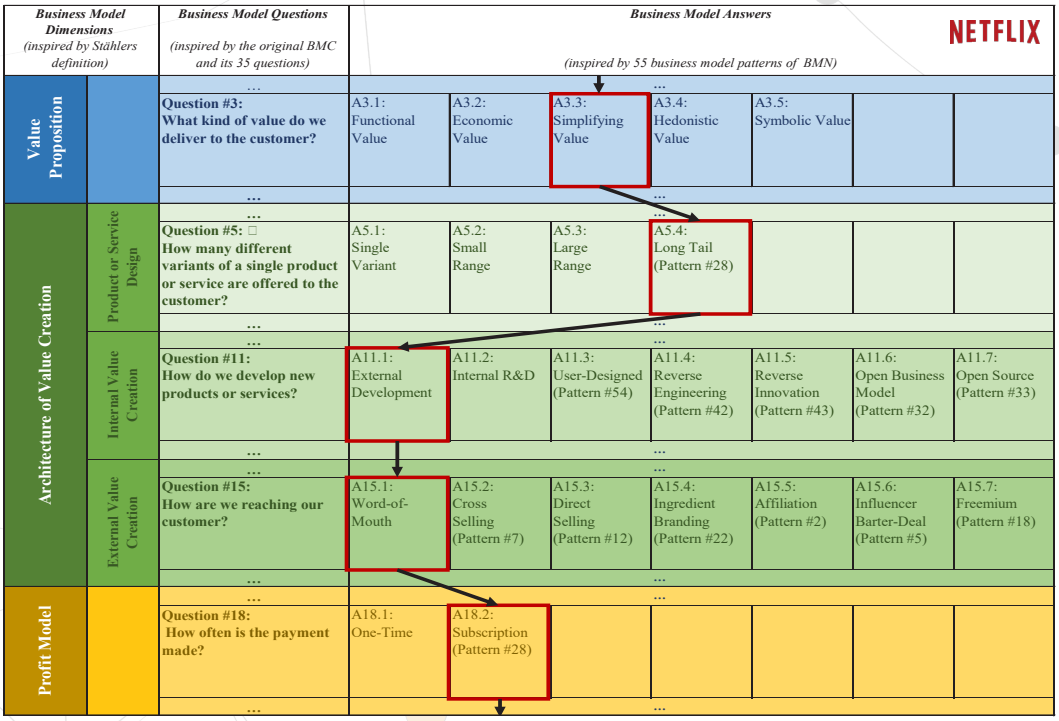

Figure 2: Presentation of an excerpt from BMM using Netflix as an example

Discussion and Conclusions

The BMM approach described in this paper is an attempt to demonstrate the idea of pattern-based development of business models in terms of a combination of a question-based framework (inspired by BMC) with innovative triggers (using BMN). Based on this systematic usage of a pattern-based approach, the overall development effort can be reduced, as can the risk of developing dysfunctional business models. The modeler can react more precisely to changing conditions through the transparent representation of the modeled pattern combinations (Lüttgens & Dieler, 2016). Future work needs to focus on the improvement and guidance of BMM – a new version of Bartels (2019) is currently being revised. Moreover, the allocation between patterns and dimensions has to be critically reviewed and improved, especially regarding the fact that sophisticated business model patterns such as 'Digitalization' (#11) mix different aspects – depending on the point of view, a novel business model can target various digitalization aspects, such as the digitalization of current sales channels, broad payment infrastructure, or single product features. The same applies to other patterns with different issues, like 'Open Business Model' (#32) or 'E-Commerce' (#13). Future work should extract these aspects in order to represent them separately in BMM. Another aim is to modify the model so that only one selection can be made per subdimension. In the future, the developed BMM model could offer a generic business model kit that enables fully transparent and understandable business model development and reproduction of existing business models to enable cross-industry innovations.

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Journal of Business Models (2021), Vol. 9, No. 4, pp. 135-137

JOURNAL OF BUSINESS MODELS

BOOK REVIEW

Business Model Innovation Strategy: Transformational Concepts and Tools for Entrepreneurial Leaders.

By Raphael Amit and Christoph Zott, John Wiley and Sons, Inc., Hoboken New Jersey

Reviewed by Professor Robin Roslender for Journal of Business Models

When two of the founding figures in a field decide to author a textbook, readers' expectations are inevitably extremely high. In this instance these expectations are not simply met, they are greatly exceeded in an addition to the business model literature that both managers and entrepreneurs, and students and their teachers will find of great value. The authors are able to draw on two decades of their own research, some of which has achieved seminal status, skilfully combining it with the broader business model literature to produce an readily accessible volume that delivers a continuous stream of insights on business model innovation strategy.

The book is divided into three parts, the first of which is entitled "Foundation and Mindset for Business Innovation". Its four chapters document the broad foundation for the business model innovation topic, doing so by reviewing three sets of theoretical underpinnings: on understanding business models; on the value creation interface; and on the substance of the business model mindset, which together are identified as the prerequisite for successful business model innovation. In chapter 1 the authors set out their preferred definition of a business model as an activity system or "system of independent activities that are performed by a focal firm and by its partners and the mechanism that link these activities to each other." (p13). Following this the authors discuss the "What, How, Who, and Why" conceptual framework they have developed in the course of their own research careers and which is employed throughout the whole book. Chapter 2 sets out the relationship which exists between the business model concept and the traditional foci of strategy thinking, arguing that the former offers a new means of creating value. The necessity for developing a business model mindset is explored in some depth in chapter 3. The authors conclude Part 1 by drawing together these insights to provide a detailed overview of the busi-

Please cite this paper as: Roslender, R. (2021), Book Review off " Amit, R., Zott, C., Business Model Innovation Strategy: Transformational Concepts and Tools for Entrepreneurial Leaders. John Wiley and Sons, Inc., Hoboken New Jersey"., Vol. 9, No. 4, pp. 1-3

ISSN: 224-2465
DOI: https://doi.org/10.5278/jbm.v9i4.7014

ness model innovation topic together with a formal definition of it. While these chapters are the most theoretical in emphasis, it would be misleading to represent them as constituting the theory chapters, since in common with the whole text use is made of a portfolio of empirical cases and insights to illustrate the various points. Each chapter offers a concise summary of what are regarded to be its key takeaways together with a list of references that readers are encouraged to explore.

Part 2 is entitled "Strategic Design and Evaluation of Business Model Innovation" and is composed of five chapters. The content of these five chapters is marginally more practical in content than that evident throughout Part 1 but for the most part the style of its presentation is not discernibly different. The authors themselves identify what is on offer in chapter nine as an essential "toolkit", a designation which also arguably neatly characterises all five of these chapters. In chapter five the authors argue that in designing innovative business models, managers and entrepreneurs can learn much from engaging with the design literature and embracing a design approach. They direct attention to six business model design drivers, captured in the DESIGN acronym, each of which resonates with key design concepts. Those responsible for designing novel business models in particular initially require to recognise the **D**eployable resources that are available to them and the **E**xternal environment in which the business seeks to operate. The third design driver is that of **S**takeholders' activities performed within the business model. **I**ncumbent templates, or established business models in use within an industry provide the fourth design driver, The final pair of design drivers are identified as a firm's **G**oals and customers' **N**eeds. Complementing these drivers as determinants of successful business model innovation is a concern with mindfulness and robustness.

Chapters six and seven provide an introduction to a number of extant methods of business model design. Designing a new business model using a dynamic design approach focused on process is explored in chapter six. Within such an approach the work of the IDEO design firm plays a central role. Originally the IDEO design company developed a design process for use in new product design, its insights subsequently being incorporated into the design process of both new services and new businesses. The authors explain how it might be further adapted for the purpose of designing new business models. The three fundamental stages within the IDEO approach now become BM*Ideate*, BM*Iterate* and BM*Implement*, with the BM*I* designation intimating business model innovation as a possible outcome. Building on the ideas set out in the chapter, chapter 7 provides an overview of three complementary design methodologies that are widely used by entrepreneurs in their business model innovation activities. Each is characterised by a simple strapline. Discovery-Driven Planning permits a business to "Fail Soon, and Fail Fast"; Effectuation is underpinned by the imperative to "Just Do It"; and the Lean Startup methodology requires users to "Test, Test, Test" in the pursuit of a low-cost indication of possible feasibility. Throughout this pair of chapters there is evidence of extensive borrowing of insights from across the business and management literature, thereby reinforcing the strong theoretical credentials of the text previously acknowledged.

Chapter eight focuses on the core concept of business model thinking, the value proposition, identifying a more complex construct than is often identified in the literature. Initially the authors argue that when talking about value propositions it is necessary to refer to stakeholders as opposed to the more conventional customer focus. In this way sustainable business models should offer a value proposition to all the stakeholders that are involved in the business model and not simply customers. It is then possible to distinguish between the value proposition of a product and the value proposition of a business model, which itself is separate from but complementary to the former value proposition. The value proposition of a service is much less distinguishable from the value proposition of a business model, with the pair of them combining to provide the total value proposition to the customer, as represented in exhibit 8.1. As a consequence of this, the co-creation of value process identified in recent marketing management literature assumes a more complex nature that is presently understood. In the second half of the chapter the NICE framework is discussed. The framework identifies four generic

drivers of value, which in combination maximise the value created for stakeholders. These drivers of value are designated **N**ovelty, Lock-**I**n, **C**omplementarities and **E**fficiency, each of which is discussed by the authors. In the final chapter of Part 2 the authors detail a 13-item toolkit for business model analysis, which they see to form a complement to the content of the previous eight chapters. In introducing this toolkit the authors make reference to the Business Model Canvas and Business Model Navigator, both of which have provided the focus for two of the most influential volumes within the extent business model literature.

The third and final part of the text is entitled "Making Business Model Innovation Happen", and comprises three chapters. These chapters the most practically oriented in the book, and provide a neat balance with its prior content. They focus on the inherent challenges associated implementing business models and business model innovation, and provide an overview of how it is possible to successfully overcome them. Chapter ten examines how business model innovation might be implemented in established organisations, initially identifying resistance from participants and organisational inertia as fundamental obstacles to affecting change, both of which might be engaged by a variety of mechanisms. A comprehensive and robust change management programme should always be in place complemented by the visible involvement of top management. Business model innovation in "young" undertakings provides the focus for chapter 11. In such cases a different set of obstacles are often encountered, in addition with a range of generic risks that all start-ups face, including leadership and governance issues. The authors discuss a series of risk mitigation strategies that have been identified as contributing to a successful launch of new ventures. The concluding chapter provides a synthesis of the various contents of the text by rehearsing the case for adopting a well-conceived business model innovation strategy that is designed to easily complement the various other elements of an organisation's corporate strategy. The authors seek to impress upon readers that the existence of such a business model innovation strategy has become increasingly necessary in the digital age and will present a continuing challenge to those who they designate "entrepreneurial leaders".

In addition to the highly useful end-of-chapter summaries and reference lists, the text incorporates an integrated index, combining concepts, cases and authors. At a length of 20 pages, it readily merits the description of being comprehensive, and serves to further increase the accessibility that characterises the whole volume, which will surely quickly become a must-read for anyone interested in the business model field, and much beyond.

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