Towards a Unifying Understanding of Digital Business Models

Completed Research Paper

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Abstract

Continuing digitalization and its impact on business models lead to various streams of literature that emerge parallelly and provide different types of digital business models (DBM's). Furthermore, it results in synonymously used terminology and concepts what leads to a lack of clarity. There is, therefore, a need to find a consensus of the Information Systems literature in order to provide a unifying understanding of DBM's and its adjacent concepts. Thus, our method of choice is a rigorous Systematic Literature Review. The in-depth analysis of 104 articles leads to a working definition of DBM's and three significant findings. First, we identified research streams of DBM the, so defined, generic subtypes, namely Data-Driven and Digital Platform Business Models and an additional hybrid type, the Data Platform Business Model. Second, we identified a conceptual hierarchy between the concepts, and third, as both subtypes are not exclusive, we propose a typology of DBM's which is useful to map DBM's.

Keywords: Digital Business Model, Typology, Ideal Types, Literature Review

Introduction

Continuing digitization in cooperation with significant declining prices for hardware and simultaneous miniaturization drives the transformation of established companies and Start-Ups (Yoo et al. 2010). As *"digitization is affecting almost all areas of business and society"* (Bärenfänger and Otto 2015, p. 58), companies are forced to use digital technologies sensibly in their strategy as well as in their business model (BM) to innovate accordingly, generate novel offerings or to optimize internally (Bharadwaj et al. 2013; Yoo et al. 2010). The emergence of digital technology and the ever-increasing importance, availability, and usability of data leads researchers to explicitly investigate the effects on BM's (Engelbrecht et al. 2016). Even though the BM concept itself is yet a relatively new field of research, it has gained significant traction with academics and practitioners (Burkhart et al. 2011) and has since been accepted as an object of interest in Information Systems research (Osterwalder et al. 2005; Veit et al. 2014). The economic leveraging of these novel technological opportunities in a dynamic and uncertain digital world requires companies to implement adequate BM's, from now on referred to as digital business models (DBM's) (Al-Debei et al. 2008; Chesbrough 2010; Veit et al. 2014). In short, the BM is a tool to conceptualize the *"blueprint how a company does business"* (Osterwalder et al. 2005, p. 2) and to explain its revenue logic, i.e., how it generates money from its actions (Zott et al.

2011). As of yet, only a few publications explicitly investigate what makes BM's digital, so only a few articles are seeing DBM's as an independent and delimitable research object. In their recent article Bock and Wiener (2017, p. 4) observe this fact and state that *"extant research provides only little conceptual guidance in terms of what characterizes a digital BM in general as well as what distinguishes different digital BMs from each other"*.

The term DBM is often used so generally that it can easily be confused with the conventional BM (Al-Debei et al. 2008; Bock and Wiener 2017) and, as of now, lacks understanding (Bärenfänger and Otto 2015). We can observe that various streams of literature emerge parallelly, providing different types of DBM's and corresponding terminology and concepts that are used synonymously, which leads to a lack of clarity (Hilbig et al. 2018). The resulting research strands deal, for example, with *DBM's* (Bock and Wiener 2017; El Sawy and Pereira 2013; Remane et al. 2016; Remane et al. 2017; Weill and Woerner 2013), *data-driven business models* (Engelbrecht et al. 2016; Hartmann et al. 2016; Sorescu 2017; Zolnowski et al. 2017) or *(digital) platform business models* (Staykova and Damsgaard 2015; Täuscher and Laudien 2018). As each concept emphasizes leveraging data, using platforms, and, more generally, harnessing the potential of digitization and digital technology, there is currently a lack of research into the similarities of these concepts on the one hand and differences on the other (e.g., Bärenfänger and Otto 2015; Hartmann et al. 2016; Srnicek 2017). Subsequently, we can observe a conceptual overlap making the application of each concept imprecise. For example, digital platforms are commonly seen as central elements of DBM's (Remane et al. 2017; Törmer 2018), which strongly overlaps with research explicitly dealing with digital platform business models (Täuscher and Laudien 2018). We argue that clear definitions and conceptual delimitation are a prerequisite for establishing a legitimate discipline and are the foundation for linguistic clarity. Thus, they are highly relevant in fostering conceptual consensus (Belnap 1993) and sharpening the understanding of DBM's, as "*The awareness of these opportunities and risks is particularly important for managers from traditional industries as the underlying logics of digital business models are often fundamentally different from what they have been used to"* (Remane et al. 2017, p. 47). Building on the aforementioned, our first research question reads as follows:

Research Question 1 (RQ1): How is the DBM concept used in the literature in Information Systems research, and how can it uniformly be defined?

Secondly, we pursue the development of a generic typology of business model to offer a clear demarcation between the different (sub-) concepts of data-driven and (digital) platform business models. We argue that this is needed to advance the structure of the research field and the further development of a conceptual foundation for business model theory. That leads us to our second research question, which reads as follows:

Research Question 2 (RQ2): Which generic types of digital business models exist?

Our goals require an in-depth analysis of the contemporary literature on digital business models and adjacent topics. Subsequently, our method of choice is the *Systematic Literature Review*. Adhering to established principles for rigorous literature reviews by Vom Brocke et al. (2009) and Webster and Watson (2002), we construct a database of articles relevant to the digitization of BMs in Information Systems.

After we hitherto conducted the introduction, the next chapter proceeds to explain BM theory, develops the conceptual framing, and discusses digital technology and its implication for BMs. Following, we detail our research methodology and discuss our findings. First, we present a working definition for DBM's, second the research streams and DBM subtypes, third the typology of generic DBM's. The paper then concludes by discussing our contribution, limitations, and possible research endeavors to be continued.

Theoretical Background

Business Models

The BM concepts lack a consistent definition, as *"there are almost as many definitions of a business model as there are business models"* (Teece 2018, p. 41) and many scholars have taken it upon themselves to list and compare various definitional approaches (e.g., Al-Debei et al. 2008; Sorescu 2017; Zott et al. 2011). Deviating definitions are to be explained insofar as the respective users shape the concept in their specific application domains, which results in the notion of the BM concept developing in *"silos"* (Shafer et al. 2005; Teece 2018; Zott et al. 2011). Even though a consensus does not exist, the dissemination in science and practice of Osterwalder et al. (2011)'s *Business Model Canvas* gives it a position as the *de facto* standard of BM conceptualization (Spieth et al. 2014). While the harmonization of the concept is a widely pursued goal in BM research (Al-Debei et al. 2008), others point out that this objective involves a disproportionate effort and that benefits are unclear (Groth and Nielsen 2015). The shape and nature of definitions may vary drastically, as they may be graphical, textual, or a listing of characterizing components (Burkhart et al. 2011). Even though ambiguity yet exists, it is clear that the BM is a stand-alone object of research and differs from adjacent concepts like *Strategy* (Seddon et al. 2004; Zott and Amit 2008) or *Business Process Model* (Gordijn et al. 2000), as it acts as a conceptual interface between the two concepts (Al-Debei et al. 2008; Burkhart et al. 2011; Shafer et al. 2005).

As a strategic management tool, a BM enables the analysis of the business logic for sustainable competitive advantages and thus extends, for example, the single view of resources alone (e.g., Amit and Zott 2001). That is of particular importance as the sole consideration of resources or capabilities delimits an enterprise's room for maneuvering its actions flexibly in a competitive business environment and is not sufficient to explicate a firm's comprehensive business logic (DaSilva and Trkman 2014; McGrath 2010; Teece 2018). Chesbrough (2010) illuminates this issue and highlights that merely developing novel technology is not sufficient for achieving economic success but necessarily requires the embedding in a suitable BM.

Scholars have produced various approaches for conceptualizing the BM, e.g., the Business Model Canvas (Osterwalder et al. 2011), the Business Model Navigator (Gassmann et al. 2017), or the V^4-Framework (Al-Debei and Avison 2010).

Digital Technology and Implications for Business

According to Yoo et al. (2010), conventional technology differs from digital technology in the following ways, namely re-programmability, homogenization of data, the self-referential nature of digital technology, and through the integration of digital capabilities in formerly purely physical objects (Yoo et al. 2012). Re-programmability refers to the layering of digital technologies in modules, separating *form and function*, as a physical device may execute an almost infinite amount of possible algorithms on digital data and is thus able to flexibly derive novel digital services (Huang et al. 2017; Yoo et al. 2010). The decoupling of functionalities and resulting services from the specific technology allows the dynamic expandability and scalability of a product. For example, the iPhone is a device established in Apple's product and service ecosystem. Still, Google can provide applications such as google maps on the Apple device. Thus, enterprises can compete on one level of abstraction, e.g., on the device level (iPhone vs. Google phones) but complement each other on the service level (Um and Yoo 2016; Yoo et al. 2010). The homogenization refers to data being fundamentally stored digitally, i.e., in bits. Data is stored digitally means that this data can be used and processed independently of the specific device, e.g., PC or mobile end device (Bock and Wiener 2017; Yoo et al. 2010). Lastly, the self-referential nature describes the generative diffusion of digital technologies, as the use and participation in digital innovation require digital technology. That goes hand in hand with the stimulation of the production of digital devices as well as peripheral products.

The understanding of digital technologies explained so far is a mode of explanation for the relevance of digital platforms for digital business, as digital technology *"creates a powerful basis for building platforms that span industrial boundaries"* (Constantinides et al. 2018, p. 383) and *"has several*

important implications for organizational inquiry" (Yoo et al. 2012, p. 1400). Similarly, digital platforms consist of a core remaining stable over time, dynamic peripheral components experiencing change over time, and of interfaces enabling the integration of third-party innovation (Baldwin and Woodard 2008; Reuver et al. 2017). The opening of digital platforms through technological interfaces (e.g., APIs) is accompanied by a *"steady stream of innovations"* (Tiwana 2015, p. 266) through external contributions from users of the platform (Ghazawneh and Henfridsson 2013). These types of complements far outweigh conventional complements, for example, monofunctional complementary bits for screwdrivers, as their function is neither device bound nor predetermined. Instead, the function is determined by, among other factors, the individual use of the users (Constantinides et al. 2018).

A fundamental view that goes hand in hand with digital technology and digital platforms is that of ecosystems as they evolve around platforms as central hubs (Parker et al. 2017). Digital platforms facilitate the acquisition of complementary capabilities, assists in the identification of collaborated business opportunities, and fosters innovation due to internal competition (Moore 2006). The consideration of the ecosystems and digital platforms in DBM's at different levels of abstraction is of particular importance as competition will increasingly take place between ecosystems and not individual companies (Evans and Gawer 2016). Furthermore, ecosystems can be seen as an additional pillar beside markets and hierarchy in an economic organization (Moore 2006). When talking about digital platforms, the ecosystem perspective revolves around the creation of generativity through the use of APIs, the integration of complementary third-party offerings (Ghazawneh and Henfridsson 2013; Tiwana 2015), and the assignment of roles (Fuller et al. 2019), defining the positioning of actors relative to the ecosystem (Iansiti and Levien 2004).

The above concepts have an impact on BM's, as that *"advances in IT have become the primary driver of business model innovation in recent years"* (Dos Santos et al. 2014, p. 335) and *"These digital technologies are fundamentally reshaping traditional business strategy as modular, distributed, crossfunctional, and global business processes that enable work to be carried out across boundaries of time, distance, and function (...)"* (Bharadwaj et al. 2013, p. 472). Referring to Al-Debei and Avison (2010)'s business model elements, the Digital Platform is part of the value architecture and enables interactions within the value network.

Research Design

Creating knowledge commonly builds on existing research published by scholars (Schryen et al. 2015). Due to almost infinite amounts of publications, a systematic procedure is required to focus. Therefore, we apply a methodology that follows accepted principles of systematic literature reviews disseminated in the Informations Systems community (Vom Brocke et al. 2009; Vom Brocke et al. 2015; Webster and Watson 2002). We focus on the analyzation of publications in the top IS journals and conference proceedings (c.f. Ferratt et al. 2007) within the AIS eLibrary (AISeL) database (Vom Brocke et al. 2009; Webster and Watson 2002) to concentrate our activities on pivotal publications thematizing theoretical and conceptual contributions. Additionally, as IS is inherently interdisciplinary (Webster and Watson 2002), we also use Scopus to cover a broader field of disciplines with intersection points to IS. We searched with the generic phrase "Digital AND 'business model'" to include a wide array.

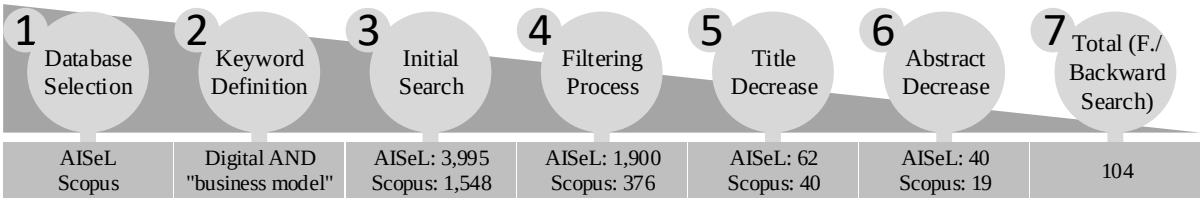

Figure 1. Search Process and Quantification

The initial database of contributions is reduced using a multi-level filtering process, which filters out contributions that are not relevant to our goal. Because of the considerable amount of different data sources in Scopus, we first filter by subject area to remove contributions from other disciplines that obviously cannot be included (e.g., Medicine or Psychology). Subsequently, we exclude the literature of both databases manually (see Figure 2). Following Webster and Watson (2002) and Vom Brocke et

al. (2009), we extend the nucleus of our database through a forward (documents citing our sample) and backward (documents cited by our sample) search. Publications added via forward and backward search, naturally, are subject to constraints and need to thematize relevant BM concepts in a non-marginal and non-trivial manner. As our goal is to find mostly theoretical contributions, we follow the advice of Levy and Ellis (2006) and refrain from including publications that have not undergone peer-review procedure and only include these selectively if it is deemed appropriate through consensus finding in the discussion by the team of authors.

A Working Definition for Digital Business Models

To achieve a precise, sharpening of the term "digital business model", we construct a working definition that homogenizes the currently existing definition we identify. Following the example of the highly cited article by Al-Debei et al. (2008), we construct our unifying definition based on central and condensed core statements of existing definitions in order to achieve harmonization. This procedure follows the compositional approach of definition construction and is based on the paradigm that *"the meaning of any complex expression is determined by the meanings of its parts and the way they are put together"* (Pagin and Westerståhl 2010). The statements distilled and condensed from the literature are listed in Table 1.

Table 1. Exemplary Statements on Digital Business Models

Statement	Sources
… relies on digital technology and leverages effects of digitization	(Ahmad et al. 2020; Bärenfänger and Otto 2015; Otto et al. 2015; Veit et al. 2014; Wißotzki et al. 2017)
… focuses on digital offerings, i.e., digital products and services or everything that is experienced digitally	(Haftor 2015; Wißotzki et al. 2017; Zhang et al. 2015)
… uses digital platforms as a central element for value delivery	(El Sawy and Pereira 2013; Hodapp et al. 2019; Remane et al. 2017; Weill and Woerner 2013)
… takes on an ecosystem perspective	(El Sawy and Pereira 2013; Fruhwirth et al. 2020; Hodapp et al. 2019; Kurti and Haftor 2014; Remane et al. 2017)
… aims explicitly towards scalability through facilitating network effects or leveraging the non-materialistic nature of digital offerings, i.e., zero marginal cost	(Veit et al. 2014; Zhang et al. 2015)
… intersects with conventional business model conceptualizations and does not replace them	(Brousseau and Pénard 2007)

Due to the evolutionary and nonrevolutionary nature of the DBM concept, we use the definition of Al-Debei et al. (2008, pp. 8–9) as a definitional bedrock, which is as follows:

"The business model is an abstract representation of an organization, be it conceptual, textual, and/or graphical, of all core interrelated architectural, co-operational, and financial arrangements designed and developed by an organization presently and in the future, as well as all core products and/or services the organization offers, or will offer, based on these arrangements that are needed to achieve its strategic goals and objectives."

Accordingly, we propose our definition as complementary and contextualized with conventional business model definitions, as the basic understanding of business models also applies to DBM's as well. The definition we propose is as follows:

"Digital business models are a conceptual extension of business models and are delimited by the explicit use of digital technologies, data, and, in general, the extraction of potentials from digitization for business conduct. The focus lies on delivering digital offerings and digital experiences to customers

via digital platforms and on the overarching goal of creating scalable business solutions in ICT-enabled ecosystems."

Research Streams for Digital Business Models

As digitalization progresses, a new portfolio of business model terminology is emerging. We distinguish between significant streams of research such as *digital business models* (Bock and Wiener 2017), *data-driven business models* (Hartmann et al. 2016) or *platform business models* (Täuscher and Laudien 2018) and niché streams such as Industrie 4.0 business models (Weking et al. 2018) or *Platform as a Service business models* (Giessmann and Legner 2016). In the following, we will explain the position of the significant streams of research on which the conceptual consensus and maturity of the concepts differ drastically. Table 2 gives an overview of the research strands focusing on digital business models, data-driven business models, and digital platform business models, respectively.

Table 2. Overview of the significant research streams thematizing digital business models.

Key Objects of Consideration	Exemplary Definition	Exemplary Literature
Digital Business Models		
Digital Technology, Digitization	*"A business model is digital if changes in digital technologies trigger fundamental changes in the way business is carried out and revenues are generated"* (Veit et al. 2014, p. 48)	(Ahmad et al. 2020; Bärenfänger and Otto 2015; Otto et al. 2015; Wißotzki et al. 2017)
Digital Platforms, Ecosystems	*"(…) digital business models rely on digital platforms to balance benefits among an ecosystem with multiple organizations and individuals involved…"* (Remane et al. 2017, p. 42)	(Ahmad et al. 2020; Bharadwaj et al. 2013; Bock and Wiener 2017; El Sawy and Pereira 2013; Remane et al. 2016; Remane et al. 2017)
Data-Driven Business Models		
Data as a key Resource	*"A business model of an organization is data-driven, if its core business necessarily requires digital data" (Engelbrecht et al. 2016, p. 5)*	(Engelbrecht et al. 2016; Fruhwirth et al. 2020; Hartmann et al. 2016; Hunke et al. 2019; Zolnowski et al. 2016)
Digital Platform Business Models		
Technology platforms, Boundary Resources	*"extensible codebase of a software-based system that provides core functionality shared by the modules that interoperate with it and the interfaces through which they interoperate"* (Tiwana et al. 2010, p. 675)	(Hodapp et al. 2019; Parker et al. 2017; Parker and van Alstyne 2008; Tiwana 2015)
Marketplaces, Transactions	*"Whenever agents to a transaction (for example, consumers and suppliers) interact through intermediaries or a 'platform' that is controlled by a third party, the agents are operating a two-sided platform"* (King 2013, p. 247)	(Allal-Cherif, Oihab and Heili, Joseph 2009; Barni et al. 2018; Basole and Karla 2011; Fruhwirth et al. 2020; Ghazawneh and Mansour 2015; Kim 2016; King 2013; Zhao et al. 2019)

The understanding of digital platforms and their relevance for business models diverge into two research strands, a technical and non-technical (Asadullah et al. 2018; Schreieck et al. 2016). Firstly, the technical stream sees digital platforms as an *"extensible codebase of a software-based system that provides core functionality shared by the modules that interoperate with it and the interfaces through*

which they interoperate" (Tiwana et al. 2010, p. 675). In that, the digital platforms are layered, as they are subdivided into a stable core, peripheral complements, and interfaces (Baldwin and Woodard 2008). The notion of an extendible codebase enables third-party development via boundary resources (e.g., APIs or SDKs), which is highly relevant for the design of novel business models around digital platforms. An example of that is Apple's IOs AppStore, which is a source for scalability in the form of an *ad infinitum* stream of potential external innovation (Ghazawneh and Henfridsson 2013; Tiwana 2015).

The second branch of research focuses on non-technical aspects of platforms, such as its utilization as a mediator between different actors, for example, buyers and sellers of services or products (Reuver et al. 2017). In that, the first definitional approach characterizing platforms exclusively as a hub for third-party development does not apply to all companies. For example, companies like Uber and Airbnb might certainly offer APIs, but their mode of conduct does not rely on them but simple user interfaces. These platforms are mostly categorized as *marketplaces* or *transaction platforms* (Evans and Gawer 2016; Täuscher and Laudien 2018).

Conceptual Hierarchy and Typology of Digital Business Models

Our findings show that there is a conceptual imbalance between the terms *digital business model*, *data-driven business model,* and *digital platform business model* as they are used in the literature, which is expressed in a hierarchization. We can see that; the *DBM* term is used most generally, typically referencing the utilization of digital technology and digitization in a firm's business logic (Bärenfänger and Otto 2015; Dos Santos et al. 2014; Otto et al. 2015; Veit et al. 2014). For example, Veit et al. (2014, p. 48) propose that every BM *"is digital if changes in digital technologies trigger fundamental changes in the way business is carried out and revenues are generated".* That definition and the level of abstraction is shared by multiple authors, for example, Bärenfänger and Otto (2015, p. 18) define digital business models *"(…) as a business model whose underlying business logic deliberately acknowledges the characteristics of digitization and takes advantages of them (…)".* However, practically every modern BM uses digital technologies, such as personal computers or mobile devices, in some way, which makes that object of consideration obsolete for differentiation of specific DBM types (Bock and Wiener 2017; Constantinides et al. 2018). Another characteristic of DBM, the use of data as resources is also unsuitable for differentiating between different types, as that *"traditional business models also rely on data"* (Kühne and Böhmann 2018, p. 1) and so do platform business models (Evans and Gawer 2016). As virtually all modern business models are digital according to this definition, it makes sense to conclude that both data-driven and digital platform business models are hierarchically subordinate to the digital business model. As a result, we have found that the concepts are inextricably linked and that the interdependencies lie in certain ontological elements of the business model as well as in the content through the setting of focal points, which will be explained below.

Building on the findings above, we can differentiate between different types of digital business models, i.e., the data-driven type **(Figure 2: Type 1)** and the platform-based type **(Figure 2: Type 2)**, which represent the generic subtypes of DBM's. Building on that, we propose a combinatory hybrid type, namely *Data platform business models* **(Figure 2: Type 3),** that both rely on data as the key resources and network effects to create value for themselves and the respective ecosystem. Business Models that neither focus on data nor digital platforms are, per our understanding, not digital **(Figure 2: Type 4).** Hence, following, e.g., Timmers (1998), we derive a two-dimensional typology allowing a qualitative mapping of instantiations of the generic types. Subsequently, we discuss the generic types and exemplary instantiations.

Data-Driven Business Models (1) explicitly focus on seeing data as the key resource for value creation. That point of view is shared homogeneously by most authors as the definition of data-driven business models consensually frame the position of data as the key resource as the dominant characterizing feature. Exemplarily, Zolnowski et al. (2016, p. 2) state, that *"when data are exploited as the main resource for innovative service business models, they are called data-driven business models (…)"* and Schüritz et al. (2017, p. 5348) state that *"these new data-driven business models create value for customers through the generation, aggregation, and analysis of data"*. From this, it can be concluded

that the data-driven business model is also a DBM as defined above since both data in general and digital technologies are central components of the business logic, but the conceptual focus is on the creation of value from data. Concerning the development of the ontological structure, one focus of the data-driven business model is the use of data in the value architecture, i.e., formerly in finding and using adequate data sources, as well as in value-creation-oriented data processing. At the conceptual level, this ensures that data resources are taken into account in digital business models and that classification and detailing as a data-driven business model supports an explication of the particular characteristics. Data-driven business models can vary broadly, as Hartmann et al. (2016) identify at least six clusters relying on data as a key resource for their respective value proposition. Exemplary for this DBM type are *Analytics-as-a-Service* (Hartmann et al. 2016; Hunke et al. 2019), such as Sift Science Inc., which offers fraud detection analytics for different applications, e.g., online payment or account defense, via REST API's what makes them easy to integrate into existing systems (Sift Science 2019). Another example is *Data Providers* whose business model is the collection, processing, and selling of data (Hartmann et al. 2016), e.g., through data marketplaces, often within the industrial internet of things ecosystems (Smith et al. 2016; Zhang and Wen 2015). Those BM's depend on, e.g., for the case of dataprovider.com, on web crawling to structure accessible public data and analyze it to answer a specific question.

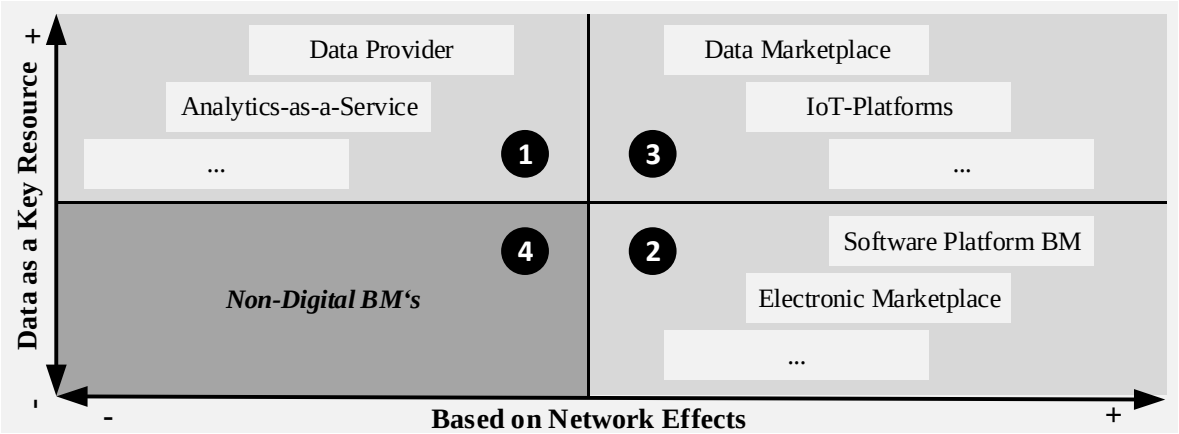

Figure 2. Typology of Digital Business Models with Exemplary Instantiations of the Types (In-depth analysis of (1) see, e.g., Hartmann et al. (2016), (2) see, e.g., Täuscher and Laudien (2018))

Digital Platform Business Models (2), on the other hand, focuses on the use of digital platforms to enable interactions between user groups in an ecosystem (Evans 2003; Gawer and Cusumano 2013) as value is created through, basically, interactions (Täuscher and Laudien 2018). The digital platform, and therefore its BM, hold *"a hub position in a network of interactions"* (Adner 2017, p. 50) in that network effects are sought (Economides 1996; Giessmann and Legner 2016; Kouris and Kleer 2012). As digital platform relies on digital technology, it necessarily relies on data processing (Evans and Gawer 2016; Srnicek 2017). Thus, digital platform business models can be subsumed under the DBM definition and can also be identified as a DBM subtype. Contrary to the data-driven business models, however, the focus here is on the use of the digital platform, while data is a secondary issue. Probably the most discussed instantiation of digital platform business models are *electronic marketplaces* (cf. Bakos 1991), such as Uber, Airbnb, Alibaba, and many others, whose value proposition bases on the coordination of actors on the demand-side and supply-side to allow transactions between those, previously unmatched groups to create network effects (Täuscher and Laudien 2018). Besides the commercial application, DBM's built on *software platforms* as its central element of value architecture, such as Microsoft or Linux (Moore 2006). Complementaries are here easily integrable due to the availability of interfaces and the existence of developer tools (e.g., Tiwana et al. 2010; Tiwana 2015).

Data-Platform Business Models (3), as a hybrid type of the aforementioned, both utilize data and focus on a platform as its key resources. Contrary to the *data-driven* and the *digital platform business models*, which are deducible from the literature, we inductively derive *data-platform business*, from empirical instantiations. We propose the third type to be useful, as the following examples show that

DBM's can both have data as a central element of the value architecture and use digital platforms to generate value through network effects. As discussed in the following, this DBM type occurs if a digital platform business model integrates data-driven services into their business model. Figure 3 depicts the relationship between the two platform-based types.

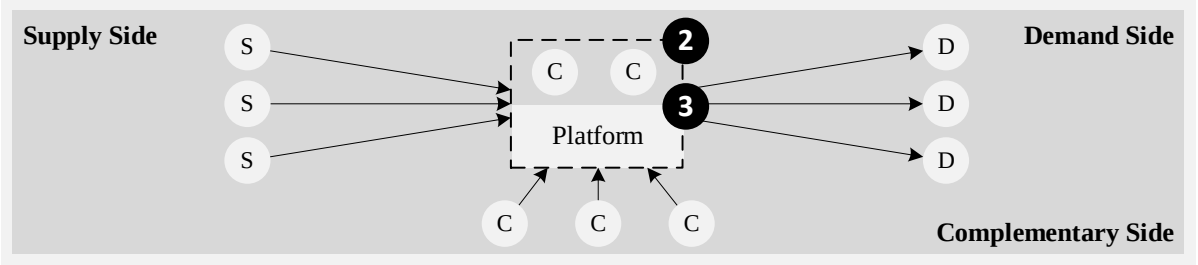

Figure 3. Data Ecosystem, with a (Data- [3]) Platform (2) Matching the Multi-Sided Market

Within this group, we identify *data marketplaces* as an ideal instantiation to show the uniqueness of this subtype. Those marketplaces use a multi-sided digital platform to match supply and demand within an ecosystem and foster the integration of complementary service or technology providers to interact (Koutroumpis et al. 2017). Exemplarily for a provider of complementary services is the notary, which is introduced by Travizano et al. (2018) and defined as a *"system to verify participants information when required, verify data quality and trustworthiness when required, and arbitrate in case of conflict between Data Sellers and Data Buyers"* (p. 3). Beyond pure interactions, a data marketplace offers unique services to aggregate data and assure its quality by integrating complementary services. The latter is exemplified by, e.g., quality guarantees (Fruhwirth et al. 2020). The second example is *IoT-Platforms*, e.g., Microsoft Azure IoT, Amazon AWS, or Siemens Mindsphere. They have in common that they fit neither into digital platform business type nor into the data-driven business type. Since they focus on interactions between actors on the platform to create network effects (Basaure et al. 2019), they can, on the one hand, be seen as subsumable under Type 2. On the other hand, IoT-Platforms integrate different data-driven services on their platforms (Hodapp et al. 2019; Mineraud et al. 2016), which leads us to the conclusion that those platforms represent a hybrid digital business model.

Conclusion, Limitations, and Outlook

As our research aims to work towards a unifying understanding of DBM research and identify its generic types, we conducted a systematic literature review and analyzed the identified concepts. Our work provides several contributions. Firstly, we provide **scientific contributions**, as we present a review of various research strands in digital business models. That was imperative and is an essential contribution as different concepts overlap in terms of content and thus make precise utilization and terminological classification extremely difficult. Based on our work, we can state that the digital business model, conceptually, is not a substitute for the common understanding of the business model, but rather a content focus on digitization in the broadest sense and in particular on the integration of digital technologies. We also show that data-driven business models and digital platform business models each focus on the explicit generation of value from data, on the one hand, and the use of digital platforms and the creation of network effects, on the other. Based on the existence of definitions that set different priorities, one of our contributions is to propose a unifying definition of the digital business model. The definition character is expressed on the one hand by a clear textual definition, but also by term defining representations in the shape of types. As we see the new research field of digital business models as being young and in its offset, our definitorial contributions align with Osterwalder et al. (2005) evolutionary path of business model research, which identifies definitions as a central contribution. Also, we argue for the existence of a third generic type, the data-platform business model, which is a hybrid type and shares defining characteristics of both data-driven business models and digital platform business models. Referring to authors who criticize the lack of frameworks for digital business models, we argue that our contribution is a valuable contribution to promoting the discussion about digital business models. We argue that our work provides **managerial contributions**, as it enables, for example, managers striving to leverage potentials of digitization to align their endeavors

within our definition and under the different generic types. The current use of terminology in the context of the digitization of business models is characterized by buzzwords, in which our work contributes to the order of the research field. In the first step, practitioners can identify which conceptual elements are required for digital business models and, in a second step, focus on one subtype tailored to their requirements. Additionally, we constitute that the generic types represent classes of participants within data-driven ecosystems. This makes our typology to a great tool for formulating strategic approaches for business model innovation.

Our research is subject to **limitations**. Firstly, our research stems from a systematic literature review. Therefore the results, at this point, do not include data gathered from the field, and, as Webster and Watson (2002) highlight, it is unlikely that we have identified every article possibly relevant to our goal. Also, to achieve harmonization between different concepts, we chose to develop our concepts generically, which, inevitably, requires a compromise between richness of detail on the one hand and classifiable business model types on the other. Our work also focuses on major research streams and, at this point, excludes smaller and highly specific business model types, such as Industrie 4.0 business models.

Further valuable **research opportunities** arise from this paper and are suitable to address its limitations. First, we identified three subtypes the data-driven business model, digital platform business model, and data-platform business models, one might ask oneself if there are any other concepts that are on the same level of abstraction and pass our literature research. Second, as we have explicitly excluded applied and niché business models they should be considered in the next step to validate our typology. Especially an empirical validation should be useful, which might be conducted by a comprehensive market-study and the subordination under the different types. Third, for the same reason as above, the further extension of the typology's examples is needed to covering a maximum of different business model types.

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