

Interconnected business models: present debates and future agenda

Milan Jocevski

Department of Industrial Economics and Management, KTH Royal Institute of Technology, Stockholm, Sweden and
Department of Management Engineering, Polytechnic University of Milan, Milan, Italy

Niklas Arvidsson

Department of Industrial Economics and Management, KTH Royal Institute of Technology, Stockholm, Sweden, and

Antonio Ghezzi

Department of Management Engineering, Polytechnic University of Milan, Milan, Italy

Abstract

Purpose – The purpose of this study is to provide a review of the emergent literature to advance the current understanding of the business model (BM) concept in a context in which more than one actor is actively involved in the development and delivery of a joint offer based on information and communication technologies.

Design/methodology/approach – The paper uses a systematic literature review approach. The review is based on 25 systematically selected publications published from 2000 to 2018 and retrieved from bibliographic databases and through a process of snowballing.

Findings – The authors found several alternative conceptualizations of a BM at a network level, which highlighted different elements as core components. Based on this, authors' findings suggest the literature has a fragmented view of what the BM concept entails at a network level, and of which actors are relevant. Conversely, there is a consensus that a single-firm view is inadequate for describing and studying joint value architectures because of its inability to consider all involved actors and their activities and resources. Therefore, a network-oriented view, as a relational aggregator, is seen as a possible way forward.

Originality/value – The study contributes to the current understanding of a BM concept at a network level and suggests three viewpoints from which to interpret value architectures at different levels of analysis: single-firm view, dyadic-level view and network-oriented view. Furthermore, the authors highlight several gaps to be studied and provide avenues for future research opportunities for scholars.

Keywords Services, Business model, Ecosystem, Business relationships, Value dimensions, Value network

Paper type Literature review

1. Introduction

To stay competitive and survive in the market, companies resort to the innovation of their value propositions, and a common strategy is to base new services on digital technologies (Bygstad and Lanestedt, 2009; Porter and Heppelmann, 2014). In this endeavor, new entrants to the service industry and businesses that move from selling products to providing services and solutions are dependent on information and communication technologies (ICT) and digitalization of information processes (Bouwman *et al.*, 2008; Kindström and Kowalkowski, 2014). Furthermore, the development of such services usually happens at the intersection of various activities executed by different actors with limited competences (Laya *et al.*, 2016; Palo and Tähtinen, 2011). In such complex and dynamic environments, which embody a network rather than a chain structure of value creation, collaboration among key partners from the very start is crucial to ensure that the service

is successfully developed (Basole, 2009; de Reuver *et al.*, 2018). However, the organization of these networked enterprises raises many questions in regard to the traditional views on companies and their business models (BMs), as the lines between enterprises and markets are increasingly blurred (Nenonen and Storbacka, 2010) and the challenges of the networked world

© Milan Jocevski, Niklas Arvidsson and Antonio Ghezzi. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licenses/by/4.0/legalcode>

The authors are grateful to the journal editor Professor Wesley Johnston as well as the two anonymous reviewers for their expert and constructive guidance during the review process. The authors thank Angelo Cavallo for his insightful suggestions in bringing this paper to fruition. The paper is produced as part of the EMJD Programme European Doctorate in Industrial Management (EDIM) funded by the European Commission for Education, Audiovisual and Culture Executive Agency, Erasmus Mundus Action 1. In addition, Milan Jocevski acknowledges the generous personal grant from the Swedish Retail and Wholesale Council, as well as the KTH Library for the financial support to publish this work as open access.

Received 14 June 2019

Revised 8 September 2019

15 November 2019

Accepted 16 November 2019

The current issue and full text archive of this journal is available on Emerald Insight at: <https://www.emerald.com/insight/0885-8624.htm>



Journal of Business & Industrial Marketing
35/6 (2020) 1051–1067
Emerald Publishing Limited [ISSN 0885-8624]
[DOI 10.1108/JBIM-06-2019-0292]

(one of the diverse and fluid connections) are only partially understood through firm-level perspectives (Kleindorfer and Wind, 2009).

The BM concept, which has received significant attention from several authors describing its usefulness for redesigning traditional forms of doing business and new value creation designs enabled by ICT (Amit and Zott, 2001; Timmers, 1998), has developed into several different branches of scholarly literature over the years (Massa *et al.*, 2017). Most authors consider the BM to be the architecture of different value dimensions, among which value creation, delivery and capture are the most common (Foss and Saebi, 2017; Teece, 2010). In the extant literature, authors typically refer to these dimensions as pertaining to a specific firm and argue that BM provides answers on how the business of a single-firm is organized (Casadesus-Masanell and Ricart, 2010; Spieth *et al.*, 2014). Some authors have addressed BM as firm-centric, yet boundary-spanning (Velu, 2016; Zott *et al.*, 2011), and have thus acknowledged the network of actors through the firm's perspective (Chesbrough, 2006; Zott and Amit, 2009; Visnjic *et al.*, 2018). However, an increasing number of authors argue that the development of services based on ICT, which requires an active interaction of different partners, may benefit from the design of a BM beyond the perspective of a single firm (Leminen *et al.*, 2018; Stott *et al.*, 2016; Westerlund *et al.*, 2014; Wu and Zhang, 2009). The rationale behind such thinking is that the design of BMs at a network level, unlike at a firm level, may shed light on the orchestration of various involved actors, their resources and the necessary activities aimed at developing such services.

Indeed, authors have suggested a shift to an ecosystem perspective that could lead to a richer understanding of the value creation and appropriation regarding digital innovations (Nambisan, 2018) because such processes no longer lie within a single firm but rather include other stakeholders as well (Doganova and Eyquem-Renault, 2009; Hynes and Elwell, 2016; Klimanov and Tretyak, 2019; Nenonen and Storbacka, 2010). In addition, value delivery should be seen as a collaborative effort where the BM indicates the orchestration of actors and activities related to the creation and delivery of value (Oliveira *et al.*, 2018; Storbacka *et al.*, 2013). Other empirical studies and reviews show that this topic is also highly relevant from a practical point of view because a firm's BM innovation and (re-)design in regard to the other actors within the network context have been connected to the firm's performance and competitive advantage (Frankenberger *et al.*, 2013; Klimanov and Tretyak, 2019; Voelpel *et al.*, 2004). However, scholarly studies remain scarce regarding the use and conceptualization of the BM at a network level, so we see a need to further understand a BM perspective that involves all the firms that participate in the service creation and provisioning of a so-called network-oriented model (Wirtz *et al.*, 2016).

In response to the highly theoretical and practical relevance of the topic, we have conducted a systematic literature review. Hence, this study aims to review the state-of-the-art research on a network and ecosystem view of a BM to advance the current understanding of the BM concept in a context where more than one actor is actively involved and participates in the development and delivery of a service based on ICT. Therefore, the research questions of the study are as follows:

- RQ1. How do researchers refer to the concept of a BM at a network level?
- RQ2. What are the particularities of the network-oriented view of a BM?

The contribution of this paper is twofold. First, we highlight various descriptions of the BM concept at a network level and reflect on the current understanding and use of the concept by different scholars. Even though we can observe that these descriptions are different, we see in the reviewed body of literature a consensus among researchers when it comes to the need for and importance of the network-oriented view of a BM. Second, we have highlighted different scholars' efforts and their calls to adjust the BM value architecture to a situation where a joint service development is proposed. These efforts are observed at the network level, which we have identified as one of the three levels of analysis to which the BM can be scaled. The main idea here is that the concept of a BM may be seen from three different viewpoints, which would then allow managers to adopt different levels for BM analysis, namely, a single-firm view, a dyadic-level view or a network-oriented view.

The remainder of this paper is organized as follows: Section 2 briefly discusses fundamental elements and literature on which we base our network-oriented view of BMs, which is followed by Section 3 on methodology. Section 4 outlines different terms used by authors when referring to the concept of a BM in a network context, and Section 5 discusses the current state of knowledge in the field. Finally, in Section 6, the conclusion brings the paper to a close with relevant remarks and suggestions for future research, as well as managerial implications.

2. Interconnectedness at a network level

Recent discussions on how companies work and go about their business in a networked digital world have leveraged several existing streams of thought that address the interactions between businesses and their environments. The three prevailing literature streams that served as antecedents to discussions on interconnected BMs are business ecosystem, business network and value network literature. Each, on its own merits, contributes to a growing systemic perspective on how a BM is conceptualized at a network level and is briefly described here to provide a background to the interconnectedness among businesses at a network level.

The ecosystemic approach described by Nelson and Winter (1982) is the parallel that is drawn between a biological ecosystem and a business ecosystem that has continued to appear in the literature to this day. In their view, and as subsequently suggested in another established line of reasoning on business ecosystems as networks of interconnected organizations (Moore, 1996, 2006), firms are affected by other firms' activities and market changes, just as organisms are in biological systems. Similarly, organizations also co-evolve, in the same way that interdependent species evolve in an endless reciprocal cycle (Moore, 1996). In a digital world, a business ecosystem does not respect traditional industry boundaries; instead, companies from different industries unite to create new

solutions and experiences, usually around a “keystone” firm (Iansiti and Levien, 2004).

However, there are other streams of thought on organizational interactions, such as network theories. The view of Håkansson and Snehota (1995), where business networks are seen as sets of relationships among business actors, is a possible alternative way to look at the firm’s interconnectedness at a network level. In their view, enterprises engage with their relationships to bring complex offers to customers, and each enterprise has a role that depends on the interaction in which it participates. According to Håkansson and Snehota (1993), business relationships that form a business network have two dimensions that evolve over time: elements of relationship exchange (activities, resources and actors) and functions that a relationship can take (on a single actor or at a dyadic or network level). One way to look at this is to view activities performed and resources shared by different actors from different functional perspectives: the perspective of a single actor, a dyad or a network. Important characteristics to mention are that:

- not all actors in the network work toward the same goal, only those that are part of the same activity pattern; and
- every business relationship exists on the precondition that there is a value exchange between the involved actors (Håkansson and Snehota, 2006).

Building on this, we come to the third perspective of how organizations are thought to be interconnected and interacting. The value network perspective is rooted in the path from value chain to value constellation as described by Normann and Ramirez (1993), suggesting that it is not always possible to define fixed positions for firms based on a set of activities along a value chain (Porter, 1985). Instead, they refer to a new logic of value, the value constellations or value networks (Stabell and Fjeldstad, 1998) as a model for observing the overall system, with a focus on the value creation. They see the value creation system as a pattern of interactivity that connects actors as different co-creators of value (Ramirez and Mannervik, 2016). In a similar vein, Christensen (1997, p. 32) saw a value network as “a context within which a firm identifies and responds to customers’ needs, solves problems, [...] reacts to competitors, and strives for profit.” He also suggested that value networks are formed around technological trajectories and that different value networks can be part of one industry.

Although the discussion has predominantly been on inter-firm relationships because they are often dependent on numerous complementary resources for the provision of complex products and services (Basole, 2009), the consumer as the user and potential co-creator of the service should not be forgotten. For example, Alee (2003) argued that value networks are a purposeful group of people and organizations that are creating social and economic good through complex dynamic exchanges. She also offered a way to map those patterns of exchange, envisioning it as a perspective through which to examine both internal and external-facing network value-creating activities (Alee, 2009). Therefore, thinking of value as the benefit provided to consumers of the service and actors creating it, we look at the value and the process of its creation and delivery as a way to understand the relationships between different actors and the general orchestration of actors, resources and activities. In addition, whether talking about

business ecosystems, business networks or value networks, it is clear that a network-oriented view is needed to understand the interconnectedness of different actors and the consequences it has on the conceptualization of BMs at a network level.

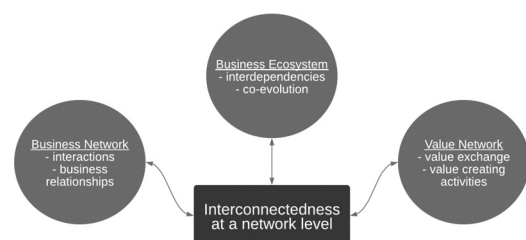
Indeed, several scholars have highlighted the need to understand the concept of a BM that relies on network level value creation processes (Bankvall et al., 2017), where the main idea is that such BMs can provide a wider conceptualization of networked value creation. Other authors have had similar thoughts when it comes to an overarching view of the BM in the context of interdependent ventures, and have referred to it as an ecosystem BM (Leminen et al., 2015). Moreover, Saebi and Foss (2015) argued for organizational flexibility, and that open BMs must allow organizational permeability and co-creation of value with other actors and users, which are considered as “key resources”; and Zott and Amit (2008) point out the need to understand how a BM can influence the positioning of the firm in its business environment.

Finally, based on the assumption that the relationship between two firms is built on a relationship between the firms’ BMs (Ghezzi, 2013), it is in the BM that the company relates to its external environment (Osterwalder and Pigneur, 2010) and with other actors’ BMs in an activity system (Zott and Amit, 2010). It is in such systems that Iansiti and Levien (2004, p. 68) have argued that “stand-alone strategies do not work when a company’s success depends on the collective health of the organizations that influence the creation and delivery of their product”; and it is in such a networked world that we argue for a better understanding of a BM concept. Therefore, we will rely on the three presented perspectives (i.e. business ecosystem, business network and value network) to inform the discussion on the BM concept at a network level. We summarize these perspectives with specific focal points in Figure 1, and assume that despite being developed in separate silos, the reasoning behind each of them relies on the same idea of interconnectedness at a network level. In addition, such an idea is in line with the previously argued need for a network-oriented view of a BM.

3. Method

In this study, we used a systematic literature review approach – a method to analyze and synthesize the findings of a number of systemically selected publications in a transparent and replicable manner (Tranfield et al., 2003). Such systematic literature reviews often follow a detailed procedure composed of several well-defined steps (see, e.g. Karakaya and Nuur, 2018; Klang et al., 2014; Mitrev et al., 2017). Therefore, in the

Figure 1 Framework used to inform the discussion on the BM concept at a network level



planning stage of our study, we first identified the research problem and question, which later helped us to design the sampling procedure and criteria for the inclusion of publications for our review. Later on, during the execution of the review, we relied on the research aim and the question to guide our literature analysis and synthesis. We did this in a critical manner, highlighting current references to the BM in a network context and discussing major gaps identified during the analysis process, finishing with suggestions for further research based on our analysis of where the topic might be heading (Hart, 1998). The study adopts a multi-step process that includes a sampling procedure, data analysis and data synthesis, as depicted in Figure 2.

3.1 Step 1

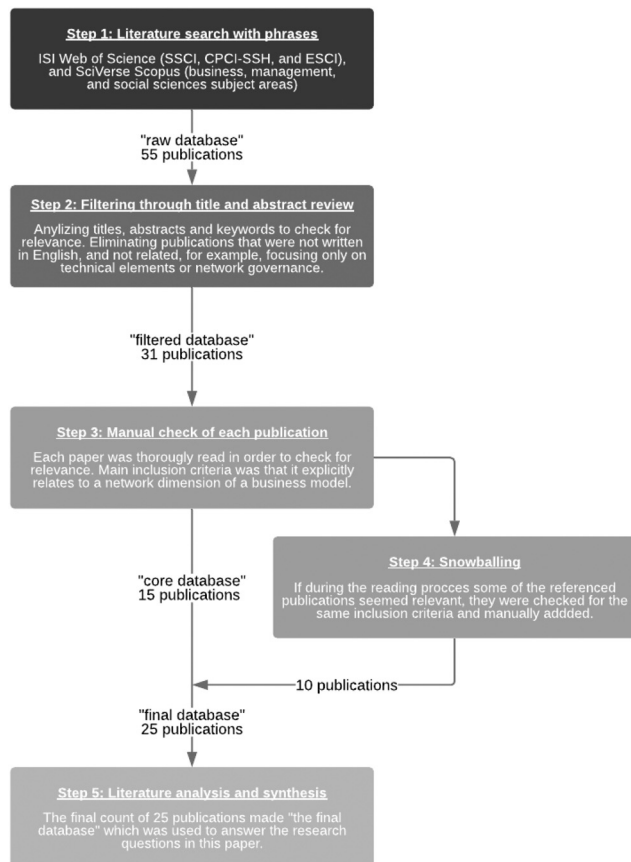
Typically, articles in academic peer-reviewed journals are regarded as validated knowledge with significant impact on the field, and are therefore often used as the sole sources for literature reviews (Podsakoff *et al.*, 2005). However, in this study, we include the diverse body of literature that was not subject to the traditional peer-review process, such as book chapters, because such practice has been noted to bring positive contributions to systematic reviews in management and organizational studies (Adams *et al.*, 2017). We searched for relevant articles in the Web of Science and SciVerse Scopus databases as two of the most comprehensive and commonly used databases. Because the latter is less selective than the

former (Cavallo *et al.*, 2018; Ghezzi *et al.*, 2018), it provides a source of publications that are more receptive to emerging topics in the literature. At the same time, it is not as broad as, for example, Google Scholar, which includes a much broader range of various “gray” publications (Adams *et al.*, 2017).

According to Laya *et al.* (2018), the concepts of “networked,” “network-centric,” “network-embedded,” and “ecosystem” BMs reflect the same network-oriented view of BMs. Searching for each of these keywords in combination with “business model*” (by using Boolean operator “AND”) would yield a significantly high number of hits, creating the basis for a broad discussion. We aimed for a more in-depth discussion on how researchers refer to the concept of a BM at a network level and the particularities of the network-oriented view of a BM. Therefore, to search the databases, we created four sets of search phrases using wildcard characters to cover a broader range of potential hits. We used “network* business model*” and “ecosystem* business model*” to search for publications where those word combinations would appear together. In addition, such searches would yield results such as “network business model” or “networked business models.” However, because the hyphen is treated as punctuation and therefore ignored in such searches, we included two more phrases to cover additional potential hits, namely, “network-centric business model*” and “network-embedded business model*”.

These four phrases were searched for in the title, abstract and keywords of each publication indexed in the SSCI, CPCI-SSH and ESCI of Web of Science. The same phrases were also used in a search carried out in the Scopus database, where an additional filter on the subject area was implemented. We opted to limit the search to publications in the business, management and social sciences fields because the terms “network” and “ecosystem” have been used in different areas, such as telecommunications and computing. As has been previously noted the Scopus database is less selective, so the number of publications that we obtained from this database was higher in comparison to the Web of Science. We had no limitation on the date range, and the search was performed on 19 August 2019. In total, excluding publications that appeared in both databases and incomplete entries, this step resulted in 55 publications (i.e. the “raw database”).

Figure 2 Flowchart of the used procedure



3.2 Step 2

Abstracts, along with retrieved documents’ titles and keywords, were initially read to check and refine whether all 55 publications were relevant to the study. When it was not possible to assess whether the publication fitted the scope based only on the title, keyword and abstract, the full text of the publication was scanned and analyzed to make the final decision. This step resulted in the exclusion of 24 publications, and thus the inclusion of 31 for the next step (i.e. the “filtered database”).

3.3 Step 3

Afterwards, each of the 31 publications was subject to full reading to determine whether it was relevant for the study. Each publication was checked to see whether it satisfied our three research criteria and should be considered for inclusion in the “final database.” The three criteria were:

- 1 the document had to derive, state or rely on a previously published BM definition;
- 2 the publication discusses in a nontrivial manner a network dimension of a BM; and
- 3 if an article had an empirical research approach, it should have been done in a setting that relies on ICT.

Such criteria were guided by our research questions and intention to focus on a context where more than one actor is actively involved and participates in the development and delivery of a service based on ICT. In doing so, we do acknowledge the general discussion concerning the concept of a BM at a network level, but when it comes to the empirical domain, we delimit the review to publications where the value proposition is based on ICT.

3.4 Step 4

To increase the comprehensiveness of this review and minimize biases against relevant articles not found in our search, we extended the sampling with the snowballing process (Santos and D'Antone, 2014). Such a procedure is believed to be particularly useful for complementing database searches and extending systematic literature studies (Wohlin, 2014). Therefore, during the reading of publications in Step 3, we paid special attention to notice any cited publication that was relevant but did not appear during our search (Step 1). For example, a work could have been published in a peer-reviewed journal that is open source, but not indexed in either of the searched databases. When such a publication was noticed, it was read thoroughly and checked to see whether it satisfied our three research criteria stated in Step 3. The same applied to any publication in the "filtered database." If they did meet the criteria, we would include them in our "core database." In total, ten additional publications met the criteria and were therefore included during the process of snowballing in our "final database".

3.5 Step 5

In sum, this procedure led us to the identification of 25 articles (i.e. the "final database") that met all our criteria and thus were thoroughly reviewed to answer our research questions. They are listed in Table I. We classified each publication along the following three dimensions inspired by Klang *et al.* (2014):

- 1 formal conceptualization of the BM concept in a networked context;
- 2 methodological approach and empirical phenomenon under study; and
- 3 the reference to the discussed literature on interconnectedness (see chapter two), i.e. business ecosystem, business network or value network literature stream.

When it came to classifying contributions according to the used definitions/conceptualizations of the BM concept in a network context, we distinguished between publications that had explicit definitions and those that used definitions offered by somebody else (Massa *et al.*, 2017). In cases where authors used the concept without defining it, we categorized that publication within the latter group. Tables II and III contain further details. Moreover, based on the methodological approach and research design, conceptual publications and

literature reviews (as well as one introduction to a special issue) were classified as "conceptual," whereas empirical papers that could have included some theory development, and empirical literature reviews, were classified as "empirical" (Table I). Finally, under the identified themes within each of the papers from the "final database," we have addressed the core principles referring to the characteristics of the theoretical foundation literature used (see chapter two).

We primarily used tables as exploratory devices that would help us to compare and contrast publications from the "final database" within each of the three dimensions. After identifying different themes in articles, which are presented in the last column in Tables II and III, we performed qualitative clustering (Miles and Huberman, 1994) which yielded directions for further discussion (i.e. synthesis). This step also helped us highlight underdeveloped topics and define future research directions, and served as the final stage of the literature review.

3.6 A first look at the literature

The historical distribution of publications shows an increasing interest in the topic during the last two decades, with the number having grown at a substantially higher rate during the last five years (Figure 3). Although the majority of the sample is published in peer-reviewed journals, more than 30 per cent of publications were presented at conferences or published as book chapters (Figure 4). These facts speak to the novelty of the topic. The papers selected came mainly from the marketing management field, where some were published in outlets that are more technically oriented but have used a business perspective in an empirical context.

4. Defining a network-oriented view of a business model

Before digging deeper into the analysis of the literature, it is worth reflecting on the meaning that is given to the concept of a BM in a network context. Two streams are identified in the "final database." In the first, authors coin new terms or use terms already used by other authors to highlight the difference of a BM concept in a network context from previous firm-centric BM conceptualizations (Table II). The second stream in our "final database" is composed of a minority of authors who assume that one of the fundamental traits of a BM concept is that it explains how a firm relates to its environment and the relationships that a firm has with other actors in a network (Table III). Authors in this stream continue to use the term *BM* without any modifiers, while heavily stressing different network elements as core components in descriptions of a BM. In other words, they seem not to believe that there is a need for a new conceptualization of the BM concept in a network context, in the way that authors in the preceding stream do. Nevertheless, by building on the idea that a BM *can be* conceptualized, i.e. be formally described (Massa *et al.*, 2017), both of these streams contribute to the notion that the BM concept can and should include elements relating to a business' environment and the inherent interconnectedness of different organizations.

By looking more closely at the used definitions/conceptualizations, it can be observed that there is no dominantly used term for the BM concept. We have found

Table I Selected studies with a network-oriented view of business models

Reference*	Title	Source	Research strategy
Andersson <i>et al.</i> (2014)*	Service innovations enabled by IoT	30th Annual IMP Conference	Empirical
Bankvall <i>et al.</i> (2017)	Conceptualizing BMs in industrial networks	Industrial Marketing Management	Conceptual
Dellyana <i>et al.</i> (2018)	Managing the actor's network, BM and BM innovation to increase value of the multidimensional value networks	International Journal of Business & Society	Empirical
Ehret <i>et al.</i> (2013)	BMs: Impact on business markets and opportunities for marketing research	Industrial Marketing Management	Conceptual
Ghanbari <i>et al.</i> (2017)*	Business development in the IoT: A matter of vertical cooperation	IEEE Communications Magazine	Empirical
Gordijn <i>et al.</i> (2000)*	What's in an electronic BM?	Knowledge Engineering and Knowledge Management: Methods, Models, and Tools	Empirical
Harmon and Castro-Leon (2018)	Service innovation in the Cloud: Implications for strategy development	Technology Management for Interconnected World Service	Empirical
Heikkilä and Heikkilä (2010)*	Conscripting of network BMs	The IUP Journal of Business Strategy	Empirical
Iivari <i>et al.</i> (2016)*	Toward ecosystemic BMs in the context of industrial Internet	Journal of Business Models	Conceptual
Ikävalko <i>et al.</i> (2018)	Value creation in the IoT: Mapping BMs and ecosystem roles	Technology Innovation Management Review	Empirical
Jabłoński (2015)	The economization of network BMs	Management of Network Organizations	Conceptual
Jekov <i>et al.</i> (2017)	Study on the IoT ecosystem BMs and the segment of startups	10th Annual International Conference of Education, Research and Innovation	Empirical
Komulainen <i>et al.</i> (2006)*	BM scenarios in mobile advertising	International Journal of Internet Marketing and Advertising	Empirical
Laya <i>et al.</i> (2018)	Network-centric BMs for health, social care and well-being solutions in the internet of things	Scandinavian Journal of Management	Empirical
Leminen <i>et al.</i> (2018)	The future of the Internet of Things: toward heterarchical ecosystems and service BMs	Journal of Business and Industrial Marketing	Empirical
Markendahl <i>et al.</i> (2017)	On the role and potential of IoT in different industries	Internet of Things Business Models, Users, and Networks	Empirical
Palo and Tähtinen (2013)	Networked BM development for emerging technology-based services	Industrial Marketing Management	Empirical
Palo and Tähtinen (2011)	A network perspective on BMs for emerging technology-based services	Journal of Business & Industrial Marketing	Empirical
Storbacka <i>et al.</i> (2012)*	Designing BMs for value co-creation	Special Issue – Toward a Better Understanding of the Role of Value in Markets and Marketing	Conceptual
Suherman and Simatupang (2017)	The network BM of cloud computing for end-to-end supply chain visibility	International Journal of Value Chain Management	Empirical
Turber <i>et al.</i> (2014)*	Designing BMs in the era of IoT: towards a reference framework	Advancing the Impact of Design Science: Moving from Theory to Practice	Empirical
van der Borgh <i>et al.</i> (2012)	Value creation by knowledge-based ecosystems: Evidence from a field study	R&D Management	Empirical
Westerlund <i>et al.</i> (2014)*	Designing BMs for the IoT	Technology Innovation Management Review	Conceptual
Wirtz <i>et al.</i> (2016)*	BMs: Origin, development and future research perspectives	Long Range Planning	Conceptual
Ziouvelou and McGroarty (2018)	A BM framework for crowd-driven IoT ecosystems	International Journal of Social Ecology and Sustainable Development	Conceptual

Note: *The marked publications were included in the "final database" through the snowballing process

several instances of the use of *ecosystem*, *ecosystem's* or *ecosystemic BM*, as well as *network*, *networked* and sometimes *network-centric* or *network-embedded BM*. Moreover, the debate is still open in respect to what a BM *is*, what it *does*, *relates to*, *includes*, and so on. Some of the authors in our "final database" offer questions as dimensions to represent the BM (Ikävalko

et al., 2018; Turber *et al.*, 2014), which we use as cues to understand how researchers refer to the concept of BM in a network context. Specifically, the four questions we use for that purpose are – *who*, *what*, *how* and *why*.

The first question is *who*, and refers to the actors that are part of a BM at a network level, their roles and the value exchange

Table II List of publications that offered working definitions and conceptualizations of the business model concept in a networked context

Reference	Used definition/conceptualization	Type of conceptualization*	Core themes addressed within the publications
Andersson et al. (2014)	They refer to networked BM as dynamic devices to develop “strategic nets” of cooperating actors, with a more or less defined leadership, serving as mental models and devices to explore the market, to shape and coordinate action and to aid the development from pilot stage to full-scale market introduction	Used definition offered by Palo and Tähtinen (2013)	Actors’ roles BM as a dynamic device Service innovation
Bankvall et al. (2017)	A network-embedded BM relies on network level value creation processes and business exchange patterns that are not clearly aligned	Used their own definition	BM analysis Firm, relationship and network level Value flow
Ghanbari et al. (2017)	The network-centric BM framework uses the BM concept to understand business planning in a value network. The framework contains three elements: business network, opportunity and model development	Used definition offered by Palo and Tähtinen (2013)	Business opportunities Positioning within a business network Value co-creation
Harmon and Castro-Leon (2018)**	Enterprises shift to networked BM by developing multisided service platforms. Therefore, value creation shifts from the firm to a market network of users, partners and other actors within a service ecosystem	The concept is used without a direct definition	Multisided platforms Value creation shift
Heikkilä and Heikkilä (2010)**	Network BM has, besides long-lasting customer relationships, four core components: product/service, finance, technology and network structure	The concept is used without a direct definition	Joint network BM design Knowledge exchange
Iivari et al. (2016)**	Ecosystemic BM for IoT is “oblique” where the ecosystem is seen as a whole and the relationships among partners are no longer based on customer-supplier relationships but organizations are now dependent on each other, interact to achieve common strategic objectives and eventually share a common fate	The concept is used without a direct definition	Organizational boundaries Value creation and value appropriation
Ikävalko et al. (2018)	The IoT ecosystem BM view answers questions such as: who are the collaborators, why do they participate, and where are the sources of value creation?	Used definition offered by Turber et al. (2014)	Actors’ roles in a business ecosystem Focus shift to ecosystem BMs Value co-creation
Jabłoński (2015)**	The network BM is the concept of core values offered to customers, and the configuration of the network of delivering value consisting of one’s own strategic capabilities and other values in the network (e.g. outsourcing, alliances), and the constant attempts of the company to change and meet stakeholders’ objectives	The concept is used without a direct definition	Network as a business ecosystem Long-term relationships
Jekov et al. (2017)	An ecosystem BM is a BM composed of value pillars anchored in ecosystems and focuses on both the firm’s method of creating and capturing value and any part of the ecosystem’s method of creating and capturing value	Used definition offered by Westerlund et al. (2014)	Value pillars, value creation and capture Move from a single-firm to ecosystem BM
Komulainen et al. (2006)	The core elements of a network BM include the product/service, the business actors and their roles, and the value-creating exchanges among the actors	Used their own definition	Actors’ roles, including end-users Value-creating exchanges
Laya et al. (2018)	Network-level BM guides how a net of companies will create customer and network value by developing a collective understanding of the business opportunities and shaping the actions to exploit them	Used definition offered by Palo and Tähtinen (2013)	Actors’ roles and orchestration activity Resource dependency
Leminen et al. (2018)	Ecosystem BM i.e. value design expands the BM thinking beyond organizational boundaries and demonstrates how value is created and captured in an ecosystem. It can be conceptualized by four pillars: value drivers, value nodes, value exchanges and value extracts	Used definition offered by Westerlund et al. (2014)	Organizational boundaries Value design tool

(continued)

Table II

Reference	Used definition/conceptualization	Type of conceptualization*	Core themes addressed within the publications
Markendahl et al. (2017)**	A network model, where BM networks and partners are included, highlights the importance of capturing multi-actor aspects of value creation and how the value network can be composed	The concept is used without a direct definition	Move from a single-firm to a networked BM Value co-creation
Palo and Tähtinen (2013)	A networked BM guides how a net of companies will create customer and network value by developing a collective understanding of the business opportunities and shaping the actions to exploit them	Used their own definition	Firm-level and networked BMs Novel technology-based services
Palo and Tähtinen (2011)	The concept of a networked BM refers to the strategic net of actors involved in developing, producing, and marketing the technology-based service as well as delivering it to the customers	Used their own definition	Actors' activities and roles Business network
Suherman and Simatupang (2017)	The network BM is defined as the logic of how multiple actors in a supply chain collaborate to achieve integration across the value network	Used their own definition	Mapping value flow Multi-actor collaboration
van der Borgh et al. (2012)**	The ecosystem's BM is analyzed from a viewpoint of the entire ecosystem, and includes four design themes: novelty, complementarity, efficiency and lock-in adapted to the ecosystem environment	The concept is used without a direct definition	Co-evolution of firm's and ecosystem's BMs Value drivers
Westerlund et al. (2014)	An ecosystem BM is a BM composed of value pillars anchored in ecosystems and focuses on both the firm's method of creating and capturing value as well as any part of the ecosystem's method of creating and capturing value	Used their own definition	BM design tool Ecosystem nature of IoT Value design
Wirtz et al. (2016)**	The network BM includes the various, mostly external interactions of a BM. In the network context, the BM represents a management tool to check and control the value distribution with joint value creation	The concept is used without a direct definition	Management tool Value distribution
Ziouvelou and McGroarty (2018)**	A crowd-driven ecosystem BM framework integrates all relevant value network participants and value-related activities and processes in an open ecosystem-centric context, addressing both the "inner" and the "outer" ecosystem components	The concept is used without a direct definition	Organizational boundaries Ecosystem thinking

Notes: *If the authors of the particular publication referred to a definition offered by somebody from the "final database" it was stated in the table.

**Authors of these publications have used their respective conceptualizations but without direct definition. In other words, we would look for the author's cues to understand their conceptualization, but in some cases, authors did refer to others' definitions/conceptualizations

that happens between them ([Komulainen et al., 2006](#)). It is about the orchestration of different actors and the multi-actor approach to value creation ([Markendahl et al., 2017](#)) and value delivery ([Jabłoński, 2015](#)). *What* is the second question, and refers to the joint offer, i.e. the value proposition that the configured network of actors is coordinately developing and delivering to customers ([Palo and Tähtinen, 2011](#)). The *how* question helps us understand the BM concept from an activities perspective, where the BM is seen as an organizational device to shape and coordinate activities to create customer and network value ([Andersson et al., 2014](#); [Palo and Tähtinen, 2013](#)). In addition, it can be used as a design tool to see how value is created and captured in a network ([Leminen et al., 2018](#); [Westerlund et al., 2014](#)). Thus, the *locus* of value creation moves outside organizational boundaries to a network level ([Storbacka et al., 2012](#)), at which [Bankvall et al. \(2017\)](#) claim that a (network-embedded) BM can help us to understand the activities needed for joint value creation. At the same time,

those activities are the ones that influence how the actors relate to each other ([Storbacka et al., 2012](#)), create bonds and design value network composition and multi-actor collaboration ([Andersson et al., 2014](#); [Suherman and Simatupang, 2017](#)). Finally, to answer the *why* question, authors remind us that in the digital and networked world, organizations increasingly depend on each other to achieve common strategic objectives ([Iivari et al., 2016](#)). Therefore, the model itself can be used as a boundary object for planning ([Heikkilä and Heikkilä, 2010](#)); as a general framework to integrate relevant value network participants and value-related activities and processes ([Ziouvelou and McGroarty, 2018](#)); as a management tool to check and control the value distribution with a joint value creation ([Wirtz et al., 2016](#)) or to understand business planning in value networks ([Ghanbari et al., 2017](#)).

In short, a network-oriented view of BMs underlines the idea that there is a different view that can be taken, distinct from the single-firm view. A network-oriented view can be a useful tool in

Table III List of publications in which a new term was not used to address the BM concept in a network context

Reference	Used definition/conceptualization	Type of conceptualization*	Core themes addressed within the publications
Dellyana et al. (2018)	The BM is the representation of how actors in the network exchange value and arrange the value flow, where one of the elements of the BM in the network perspective is the value exchange between network actors	Used definition offered by Komulainen et al. (2006) and Palo and Tähtinen (2011)	Multidimensional value network Network governance
Ehret et al. (2013)	BMs define a business based on its unique value proposition in a network of collaborating users, organizations and other stakeholders. The starting point for BM approaches is to identify the potential for the unique contribution of a firm within a value-creation system and to define its contractual boundaries and relationships to its environment	Used their own definition	Actors' roles, performance and orchestration in networks Value delivery
Gordijn et al. (2000)	An e-BM ontology centers around the core concept of value, and expresses how value is created, interpreted and exchanged within a multi-party stakeholder network	Used their own definition	Co-creation activities Value exchange
Storbacka et al. (2012)	The BM is a constellation of interrelated design elements, outlining the design principles, resources and capabilities (i.e. design layers) related to markets, offerings, operations, and organization (i.e. design dimensions). A BM manifests itself in the practices that the focal actor engages in and these practices influence how the focal actor relates to other actors	Used their own definition	Value co-creation and value flow Actor's interactions
Turber et al. (2014)	Dimensions in the BM framework in an IoT ecosystem include the value network of collaborating partners (who), sources of value creation (where) and benefits from collaboration (why)	Used their own definition	An ecosystem that includes a customer Service-dominant logic

Note: *If the authors of the particular publication referred to a definition offered by somebody from the "final database" it was stated in the table

Figure 3 Academic articles, proceedings and book chapters from a "final database"

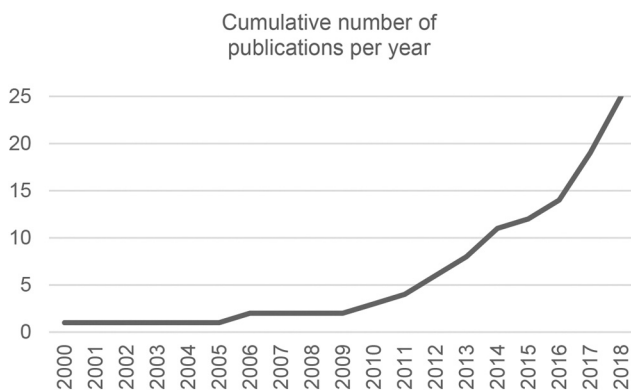
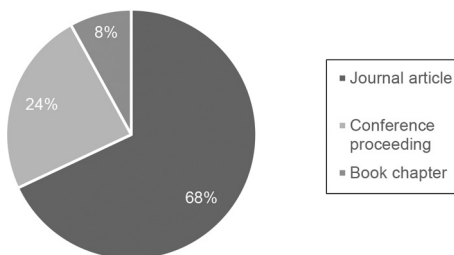


Figure 4 Source of publications



an interconnected environment, without diminishing the importance of a BM used on a single-firm level. Finally, while at the firm level, the concept of a BM refers to the value architecture of one firm, at the network level a BM can be seen as a relational

aggregator, orchestrating relationships within the network and guiding the design of a value flow across the network.

5. The state-of-the-art research on business models at a network level

We have already highlighted that the particular perspective used by researchers when using a BM concept was focused on the single enterprise ([Leminen et al., 2018](#); [Spieth et al., 2014](#)). Although there are examples where a firm's environment is taken into account through the concept of a BM ([Zott and Amit, 2009](#)), the used BM view is usually focused on the firm as the focal entity within the environment ([Ehret et al., 2013](#)). However, in a networked and digital world, the development of services is not so straightforward if using a single-firm BM perspective ([Markendahl et al., 2017](#)). Therefore, alternative views, grounded in different theoretical foundations of firm interconnectedness, have been proposed as a more appropriate BM perspective for developing joint service offers and understanding business opportunities in networks ([Ghanbari et al., 2017](#); [Ikävalko et al., 2018](#); [Jekov et al., 2017](#)).

The development of BMs according to [Bankvall et al. \(2017\)](#) may start either from the firm-level BM and move from there to the dyadic, and then, the network-level BM; or vice versa, may start by designing the network-level BM and then discuss dyad and then each of the BMs of the participating actors individually. Moreover, interaction among actors is the key here because no matter where the design of BMs starts, the interactions dictate both the BM archetypes and the roles of the actors within. Also, because different firms usually participate with firm-centric BMs that could be in mutual conflict ([Andersson et al., 2014](#)), it is through interactions that they can be adapted and consolidated. In one of the studies, the companies were working in workshops on a "joint business

modelling” activity by using a BM as a tool for knowledge exchange (Heikkilä and Heikkilä, 2010). In that study, interactions facilitated by researchers helped business managers realise all the risks related to conflicting incentives and lacking competences, making the process of business modeling fruitful for all. In fact, using a network level BM indirectly improves firms’ abilities to achieve high performance (Jabłoński, 2015).

Furthermore, using a network-oriented view, the BM can be seen as a management tool to check and control the value distribution with joint value creation, and can be understood as a link between strategy and the operative management (Wirtz *et al.*, 2016). It has also been used as a planning tool for scenario planning (Komulainen *et al.*, 2006), a dynamic device for planning an emerging business opportunity (Palo and Tähtinen, 2013) and an instrument to see the business from a strategic viewpoint (Suherman and Simatupang, 2017). It is at this higher, network level, which allows the entire system to be understood, unlike at a lower, firm level, where only individual components can be grasped, that Westerlund *et al.* (2014) argue for a different BM framework; one which they prefer to address as “value design.” In such a conceptualization, the discussion revolves around the dynamic nature of the ecosystem BM and the story of “how the engine works” rather than what its components are.

Nevertheless, the argued shift from firm BM to ecosystem BM (Jekov *et al.*, 2017) is noted as a change of management focus (Westerlund *et al.*, 2014) in designing the BM that is based on the input of many actors. It is why the network-oriented view of a BM could shed light on a situation when it is impossible for a single-firm BM to orchestrate the relevant resources and activities needed to develop a joint service (Palo and Tähtinen, 2011), not to mention the coordination of different actors and their roles. In addition, all these elements of network relationships (activities, resources and actors) are a part of each of the BMs, because the BM both shapes the network and is shaped by it (Palo and Tähtinen, 2013).

We see the BM concept as a multi-level device, with which one can take:

- a single-firm view where the BM represents the value architecture of a particular firm;
- a dyadic-level view, where the BM is seen as a linking agent between two actors; and finally
- a network-oriented view, where we see the BM as a relational aggregator.

In such a way, the BM concept allows different viewpoints to be taken to analyze a business solution or a service development at each of the three levels. In other words, it allows for a value architecture to be analyzed from three different viewpoints.

5.1 Joint value proposition

With the use of digital technologies, new possibilities for service development arise, and so do new value propositions in those contexts where the involvement of more than one actor is expected. Such service offers lay at the core of the discussion on BMs that are formed and developed around them (Andersson *et al.*, 2014). These services are sometimes created as bundles of existing services, and sometimes follow a path of servitization, i.e. an opportunity to leverage on service-led BMs, instead of focusing on product-centric ones (Iivari *et al.*,

2016). Furthermore, previously independent actors are increasingly connected through both technical and business ties with the goal of producing smart services. In developing such services, firms adapt their own firm-level BMs and thus extend a firm’s scope and scale (Harmon and Castro-Leon, 2018). Interestingly, Palo and Tähtinen (2013) distinguish between service and business opportunity development, where despite being different processes, they run in parallel and determine which of the actors are involved with the service itself, and which with the business in general. For this, the network-oriented view of a BM can be used as a guide.

In some cases, there are reports of multidimensional value networks being formed to create a new business concept and a service based on new technologies (Dellyana *et al.*, 2018). These technologies then become the key for creating new BMs and are resetting the competitive advantage arena (Harmon and Castro-Leon, 2018). In our “final database,” there are two dominant examples of such technologies: the Internet of Things (IoT) and cloud computing (Appendix).

Finally, it is also worth mentioning that the trend of transforming firm-centric activities toward network-centric activities was seen as a change to service-dominant logic (Turber *et al.*, 2014). In line with such logic and service co-creation activities, Ikävalko *et al.* (2018) argue that a network-oriented view of a BM can make sense of the roles of each of the actors for the service development, as well as helping to understand their firm-level BM options.

5.2 Actors’ roles in the network

In order for the service development and delivery to function properly as a joint value proposition of several different cooperating parties, it is necessary for each and every one of those involved to understand their roles. Moreover, these roles are not fixed over time and may be adapted in line with changing ecosystem conditions, which is why network constellations and individual roles have long been considered part of a BM concept. Therefore, the network-oriented view is essential, so that the relevance of the external environment would be recognized (Turber *et al.*, 2014). In other words, firms (i.e. different actors) are interconnected, and therefore their activities are co-dependent and usually evolve around the activities of one specific focal firm (Ghanbari *et al.*, 2017). Their resources also exhibit dependency that provides a basis for the emergence of new solutions (Laya *et al.*, 2018). Dynamic network governance is attributed to employees of the focal firm, who can reflect on business relationships based on duration, trust and frequency of interaction (Dellyana *et al.*, 2018). Nevertheless, discussions around these activities, shared resources and the roles each firm takes need to be embedded in the development process because the scope of change covers all involved actors (Bankvall *et al.*, 2017) and each has to position itself so as to guarantee the success of the entire ecosystem, not just a single firm (Ghanbari *et al.*, 2017).

In the empirical studies we have analyzed, the dominant context is one of IoT ecosystems (Appendix). Authors thus refer almost exclusively to BMs that pertain to the creation of IoT services as *ecosystem BMs* because they tie the offered service and value architecture to the ecosystem within which the service is developed. There, in a co-evolving ecosystem, the concept of a BM connects the firm with its environment,

customers and society as a whole for joint utilization of complementary capabilities (Iivari *et al.*, 2016). It is used so as to enable one to understand value drivers at both the firm and the overarching ecosystem level. These value drivers are assumed to be closely linked, changeable over time and influence whether an actor stays in the ecosystem (van der Borgh *et al.*, 2012). They furthermore suggest that the alignment of firms' roles within the ecosystem (in terms of resources, knowledge and complementarities) and firm-level BMs with a network-oriented BM may lead the ecosystem to prevail over its disintegration. Furthermore, Ziouvelou and McGroarty (2018) suggest a next step "crowd-driven ecosystem-centric BM" that is characterized by structures powered by technology, user participation in value creation and open innovation of services. This model, however, brings new interdependence challenges that stem from further enlarging the network boundary to include the crowd as well. The inclusion of end-users as actors has been noted in other analyzed publications, too (Ehret *et al.*, 2013; Komulainen *et al.*, 2006).

Drawing on the evolutionary approach, Storbacka *et al.* (2012) argue for the interplay between the firm-level and the meso-level, where actors interact by means of practices and value is co-created through business relationships. They use the concept of a BM as a way to create an inter-actor configurational fit between the firms' BMs and network level practices, allowing for a shift of value creation outside organizational boundaries. Similar to Jabłoński (2015), who goes beyond dyadic long-term business relationships in the business ecosystem, they do not consider individual business links but strive for the orchestration of actors within the entire network setting.

Finally, the network-oriented view of a BM primarily considers network configuration, understanding how it can support the delivery of planned value proposition and what implications it has on actors' roles within the network (Andersson *et al.*, 2014; Ehret *et al.*, 2013). It can be used to define contracts for orchestration that can furthermore be used to manage inter-firm business relationships (Ehret *et al.*, 2013). In a less rigid interpretation, the network-oriented view of a BM can also be used for structuring activities around role archetypes (Ikävalko *et al.*, 2018) and thus lay the foundation for the design of actors' roles in the network (Laya *et al.*, 2018).

5.3 Value dimensions and value flow

Within the networks, different value drivers are comprised of individual and shared motivations of actors. That is, on the one hand, there are individual firm ambitions for being a part of the network and the firm's expected value to be captured, and on the other, there are shared objectives that are oriented toward creating the proposed joint value (Westerlund *et al.*, 2014). With this in mind, the proposition of Westerlund *et al.* (2014) is that the concept of a BM at a network level should be framed in terms of value design, i.e. an overall value architecture that explains how value is created, delivered and appropriated by the ecosystem (Suherman and Simatupang, 2017). We refer to these three notions of value (i.e. value creation, value delivery and value appropriation) in addition to value proposition as the four value dimensions that describe a BM.

Overall, value creation, or rather value co-creation, is used as the central notion of value in a network context (Markendahl

et al., 2017). A general discussion of a value creation process outside firm boundaries revolves around the thinking that because of the interdependence of actors' activities toward creating one joint proposed value, that value is co-created by a network of collaborating actors (Harmon and Castro-Leon, 2018; Ikävalko *et al.*, 2018; Storbacka *et al.*, 2012). A similar approach is applied to value appropriation; it has to be arranged according to the roles and orchestration of actors within the value network (Iivari *et al.*, 2016). This is why actors, their resources and performed activities need to be considered as part of the network-oriented view of a BM, and why Iivari *et al.* (2016) see value dimensions and value flow spanning firm boundaries.

Value co-creation needs to be coordinated (Ghanbari *et al.*, 2017), and assigning co-creation activities is seen as part of the BM concept (Gordijn *et al.*, 2000). The entire value flow, i.e. the value exchange that happens between the actors, needs to be considered; and the choice of adequate mechanisms of exchange is believed to rest within the concept of a BM (Storbacka *et al.*, 2012). For example, Bankvall *et al.* (2017) use the network-oriented view of BM to map the contribution of each firm to the provided offering of the network and design value flow. Similarly, Suherman and Simatupang (2017) use the BM to map the value flow, and Dellyana *et al.* (2018) to maintain different types of BMs in line with the overarching plan (based on negotiated value exchange with other actors). Interestingly, these flows are discussed in general, but in one case, it was closely related to economic value exchange (Gordijn *et al.*, 2000).

To sum up, for a joint offering there needs to be a joint value creation and subsequent delivery of the offer, and an adequate distribution of the appropriated value within a network. For these reasons, embodied in four value dimensions (i.e. value proposition, value creation, value delivery and value appropriation), the flow of value within the network represents an important aspect that is argued to be part of the BM concept. It can be viewed at a single-firm level where each collaborating actor has its expectations and plans, at a dyadic level where the established value flow constitutes the business relationship, and finally at a network level where overarching coordination is either described or mapped by the BM framework. These levels correspond to three viewpoints of the BM concept: a single-firm view, a dyadic-level view and a network-oriented view.

6. Conclusions and future investigation guidelines

The BM concept has been defined and used in a range of contexts (Massa *et al.*, 2017) but has only recently attracted increasing attention from industrial marketing scholars. In this article, we have provided a literature review on the emerging topic of BMs in a networked business environment. As we show, authors have resorted to different literature streams on actors' interconnectedness and used different methodological approaches to argue for a network-oriented view of a BM. Some have used new terminology to refer to such a view (e.g. ecosystem BM), and some have incorporated the network element within existing BM definitions. Through a discussion on different conceptualizations of a BM in a networked context and by using four central questions to describe a network-

oriented view of a BM (Figure 5), we render the literature to four dimensions to provide an understanding of how researchers refer to the concept of a BM, in turn providing an answer to the first research question. Furthermore, acknowledging that our findings are based on the literature review of both conceptual and empirical publications that are set in an ICT context, we have no reason to believe that the presented reference to the BM concept at a network level is only applicable to an ICT setting. Therefore, we do not exclude the possibility that these conclusions and propositions are applicable in more general terms.

This review highlights the need expressed by authors of reviewed publications for a shift in BM thinking from a firm-level to a network-level. We believe that the BM concept may be seen as a multi-level device that would allow different scales to be adopted for analysis, i.e. would allow managers to observe a value architecture from three different viewpoints. These viewpoints correspond to three levels of analysis inspired by Håkansson and Snehota (1993). The first, a single-firm view, has been the dominant one over the years. It allows the focus on a single-firm and value architecture that is specific to that firm. The second, a dyadic-level view, is where a BM could explain particularities of business relationships that a firm is a part of; therefore, acting as a linking agent between two actors. Finally, there is a network-oriented view, which we believe can be referred to as a relational aggregator, because the very nature of the BM concept at the network level is to explain value architecture represented through business relationship elements between several actors. Similarly, Klimanov and Tretyak (2019) have also recently proposed a network-based approach to BM analysis focused on managing business relationships.

Nevertheless, even if there are different BM points of view, our analysis of the underlying assumptions in the reviewed literature showed that BM designs seen from these different viewpoints coexist and coevolve over time. To some authors, firm-level BMs of the companies that collaborate on the same service development may be in conflict (for example in terms of expected incentives) but could reach a consolidated state through actors' interaction, joint discussions and joint creation of a BM at a network level. For others, the interplay of the firm- and network-level BMs would allow an alignment of actors' roles and therefore strengthen both the design of firm-level BM and the BM set around the joint value proposition.

In addition, further analysis of the authors' underlying assumptions when discussing BMs at a network level indicated that they have varying standpoints with regard to which actors constitute a network and how are they interconnected. Overall, for authors that subscribe to the ecosystemic approach, the

Figure 5 Describing a network-oriented view of a BM



business ecosystem includes customers and partners, but also competitors and other ecosystem stakeholders. However, there are also those that think of the business ecosystem only as a multilateral set of partners, those that engage in joint utilization of complementary capabilities. Furthermore, the ecosystemic approach brings a shift to established thinking about how value is created and captured in a networked world, so it is often entangled in its assumptions with the value network literature stream. Alternatively, some authors refer to business networks and therefore only include business actors in the discussions, but also sometimes combine their reasoning with that one of a value network view.

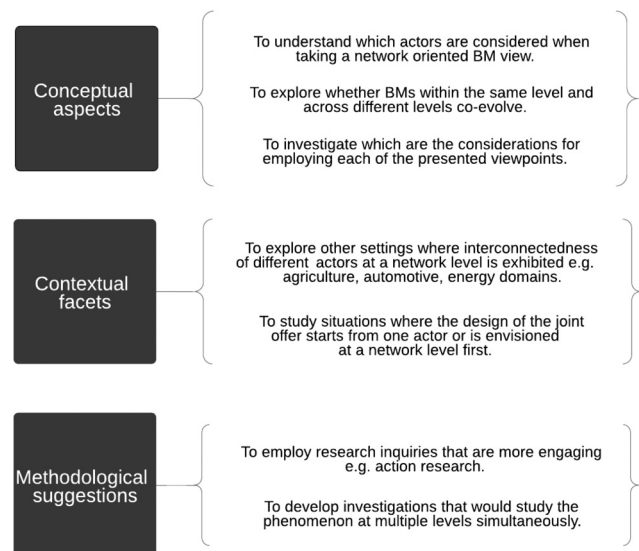
In conclusion, we believe that the network-oriented view of BMs represents a crucial viewpoint in the networked world; one that does not require a new theoretical concept, but rather can be seen as a meso-level value architecture that describes the value flow and dynamics of value creation, delivery and capture mechanisms at a network level. These value dimensions together follow the development of new joint value propositions and coexist at the three mentioned levels. In this paper, the particularities that pertain to such a (network) view of a BM have been discussed, in turn answering the second research question and leading to the suggested future guidelines.

6.1 A future research agenda

Although the research (both conceptual and empirical) has advanced over the years and is gaining momentum, there are still open points that would further direct and focus future research efforts. We have identified several underdeveloped topics through this literature review, and here we present research guidelines for future studies that could address these shortcomings. A summary is presented in Figure 6.

The network-oriented view of a BM is introduced as a way to address complexities that arise in developing new services. Primarily, this refers to the fact that there are now more actors involved in the development and delivery of these services, especially of those based on digital technologies. Therefore, many actors need to be considered – but which? As we have

Figure 6 Avenues for a future agenda



seen, authors have focused on dyadic relationships and different network constellations, and in doing so have had different underlying assumptions behind the interconnectedness aspect that is apparent at a network level. Some have even analyzed ecosystems that they refer to as industry multi-sided platforms and some have considered consumers as co-creators of value. Therefore, to advance the conceptualization of the network-oriented view of a BM, a better understanding of which actors constitute the network is needed. Specifically, how can the borders of the network of actors be delineated when discussing BMs at a network level? And, can value dimensions help to inform this understanding?

Furthermore, our analysis of assumptions behind research in this field shows that there is a need to pursue further research on the co-evolution of BM designs. Building on the assumptions of several authors that firm-level and network-level BMs develop in an interplay, it would also be beneficial to understand whether firm-level BMs of different business actors are also coevolving. In fact, very little action research has been done on a more in-depth analysis of such scenarios. As a result, we see potential in deepening our understanding of the BM concept by using methodologies that go beyond empirical examples and case studies used so far and allow the researcher to be more engaged with the phenomenon. In addition, we propose examining whether starting from the design of a firm-level or network-level BM is a more adequate way to address service development in a network context.

The third investigation guideline refers to our proposition of seeing the BM as a multi-level device. In this article, the body of literature that refers to the network-oriented view of a BM was analyzed, but the importance of other viewpoints was not taken for granted. In fact, we would like to see more research at each of these levels of analysis, as well as those executed at more than one level in parallel. However, the researchers need to be more transparent and carefully choose and reflect on the viewpoint of the BM concept they use. We believe that fostering multiple levels as separate ways to see the design and implementation of BMs would contribute to the progress of BM research. To that end, we suggest further research on the following questions: What are the strong points for using each of the BM viewpoints (single-firm, dyadic-level and network-oriented views) in isolation versus jointly? Is there a unique set of dimensions that can describe a BM at each of the levels of the analysis, or is it the same set but with different aspects becoming more important depending on which level is analyzed?

Finally, on examining the empirical studies in the “final database,” what emerges as the dominant empirical context is that of the IoT ([Appendix](#)). Two additional conceptual studies also discussed the concept of a BM in IoT ecosystems. However, we see further potential in many other industries where the network-oriented view of BM would be useful. For example, we came across some publications from the domains of agriculture, the automotive industry and energy (while reading papers during Step 3 of our selection process) that have explored different BM elements at a network level. Contrasting our findings concerning the network-oriented view of BMs with those from different domains would eventually strengthen the BM concept and allow the consolidation of extensive research efforts.

6.2 Managerial implications

This article provides managers with a couple of interesting implications. Firstly, based on the reviewed literature on BMs in a network context, we see a growing interest in a systematic perspective on how companies do business and think about their BMs within the value networks. This raises an important point regarding the previously dominant thinking about BMs as attributes of firms or as logics behind firms' profit formulae. Therefore, we believe that reflective managers could benefit from a shift in a mindset from an established single-firm view to a more network-oriented one. Furthermore, we find that a network-oriented view of a BM brings additional considerations regarding joint value proposition and different actors' roles and value flows in the network, which is not seen from a single-firm viewpoint. Secondly, apart from the mentioned single-firm and network-oriented viewpoints, the findings suggest a third, dyadic-level view. This suggests that in the development of services based on ICT, managers may choose to observe the BM value architecture pertaining to the firm itself, the dyadic relationship that they establish with another actor within the network or the entire value design of the network. These three viewpoints, therefore, warrant an idea of a BM as a multi-level device, which one may then use to zoom in or out of a particular level of analysis. Our intention is not to imply that one viewpoint is better than the other but rather that each of them highlights different aspects that ought to be understood. That said, managers must ensure that all aspects are covered in their efforts to steer the business in a direction that would ensure its survival in the ecosystem. Finally, bearing in mind that the reviewed papers were set in contexts where more than one actor is actively involved and participates in the development and delivery of a service based on ICT, our findings may be of particular interest to managers in such domains.

6.3 Research limitations

We believe this article has contributed to advancing our understanding of a BM concept at a network level by presenting state-of-the-art literature and discussions thereon. However, the article is subject to some limitations. First, our sourcing includes search data from the electronic databases of Web of Science and SciVerse Scopus. Thus, some publications might have remained unnoticed. However, we used a process of snowballing to locate further articles and thus mitigate this limitation. Second, the empirical focus of our paper is limited to networks formed around provisioning services based on ICT. We acknowledge that there are other organizational environments that do not pertain to the digital domain but still exhibit different levels of interconnectedness among actors. Thus, caution must be used when generalizing our findings to other network contexts. Third, we considered search phrases that referred to terms used to denote the BM concept at a network level, thus not including phrases that referred to BM dimensions. An example of such omitted dimensions may be the provision of value or joint value delivery. Such search keywords may be used in future research to further our understanding of particular BM dimensions and their role at each of the levels of analysis we presented in this work. In addition, the three literature streams covered in Section 2 are not exhaustive when it comes to different lines of thinking

about the network level organizational interactions, but they are the dominant ones. Therefore, a future discussion may focus on interconnected BMs within a different stream, e.g. service-dominant logic. Finally, we are aware of the possibility of confirmation bias by which we may tend to promote information that confirms our thinking (Nickerson, 1998). To minimize this, we used a systematic literature review with a transparent multi-step process. In addition, we made sure that all publications obtained through a snowballing process also had to satisfy all the stated inclusion criteria to be included in the “final database.” This process can thus serve as a starting point for future research that would expand certain criteria we used and extend our findings.

References

- Adams, R.J., Smart, P. and Huff, A.S. (2017), “Shades of grey: guidelines for working with the grey literature in systematic reviews for management and organizational studies”, *International Journal of Management Reviews*, Vol. 19 No. 4, pp. 432-454.
- Alee, V. (2003), *The Future of Knowledge: Increasing Prosperity through Value Networks*, Butterworth-Heinemann.
- Alee, V. (2009), “Value-creating networks: organizational issues and challenges”, *The Learning Organization*, Vol. 16 No. 6, pp. 427-442.
- Amit, R. and Zott, C. (2001), “Value creation in e-business”, *Strategic Management Journal*, Vol. 22 Nos 6/7, pp. 493-520.
- Andersson, P., Markendahl, J. and Mattsson, L. (2014), “Service innovations enabled by internet of things”, *30th Annual IMP Conference*.
- Bankvall, L., Dubois, A. and Lind, F. (2017), “Conceptualizing business models in industrial networks”, *Industrial Marketing Management*, Vol. 60, pp. 196-203.
- Basole, R.C. (2009), “Visualization of interfirm relations in a converging mobile ecosystem”, *Journal of Information Technology*, Vol. 24 No. 2, pp. 144-159.
- Bouwman, H. De Vos, H. and Haaker, T. (2008), “Mobile service innovation and business models”, doi: [10.1007/978-3-540-79238-3](https://doi.org/10.1007/978-3-540-79238-3).
- Bygstad, B. and Lanestedt, G. (2009), “ICT based service innovation – a challenge for project management”, *International Journal of Project Management*, Vol. 27 No. 3, pp. 234-242.
- Casadesus-Masanell, R. and Ricart, J.E. (2010), “From strategy to business models and onto tactics”, *Long Range Planning*, Vol. 43 Nos 2/3, pp. 195-215.
- Cavallo, A., Ghezzi, A. and Balocco, R. (2018), “Entrepreneurial ecosystem research: present debates and future directions”, *International Entrepreneurship and Management Journal*, pp. 1-31.
- Chesbrough, H.W. (2006), “Open business models: how to thrive in the new innovation landscape”, *Research Technology Management*, Vol. 50, pp. 256.
- Christensen, C.M. (1997), *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*, Harvard Business Review Press, Boston, MA.
- de Reuver, M., Sørensen, C. and Basole, R.C. (2018), “The digital platform: a research agenda”, *Journal of Information Technology*, Vol. 33 No. 2, pp. 124-135.
- Dellyana, D., Simatupang, T.M. and Dhewanto, W. (2018), “Managing the actor's network, business model and business model innovation to increase value of the multidimensional value networks”, *International Journal of Business & Society*, Vol. 19 No. 1, pp. 209-218.
- Doganova, L. and Eyquem-Renault, M. (2009), “What do business models do? Innovation devices in technology entrepreneurship”, *Research Policy*, Vol. 38 No. 10, pp. 1559-1570.
- Ehret, M., Kashyap, V. and Wirtz, J. (2013), “Business models: impact on business markets and opportunities for marketing research”, *Industrial Marketing Management*, Vol. 42 No. 5, pp. 649-655.
- Foss, N.J. and Saebi, T. (2017), “Fifteen years of research on business model innovation: how far have we come, and where should we go?”, *Journal of Management*, Vol. 43 No. 1, pp. 200-227.
- Frankenberger, K., Weiblen, T. and Gassmann, O. (2013), “Network configuration, customer centricity, and performance of open business models: a solution provider perspective”, *Industrial Marketing Management*, Vol. 42 No. 5, pp. 671-682.
- Ghanbari, A., Laya, A., Alonso-Zarate, J. and Markendahl, J. (2017), “Business development in the internet of things: a matter of vertical cooperation”, *IEEE Communications Magazine*, Vol. 55 No. 2, pp. 135-141.
- Ghezzi, A. (2013), “Revisiting business strategy under discontinuity”, *Management Decision*, Vol. 51 No. 7, pp. 1326-1358.
- Ghezzi, A., Gabelloni, D., Martini, A. and Natalicchio, A. (2018), “Crowdsourcing: a review and suggestions for future research”, *International Journal of Management Reviews*, Vol. 20 No. 2, pp. 343-363.
- Gordijn, J., Akkermans, H. and Van Vliet, H. (2000), “What's in an electronic business model?”, *Knowledge Engineering and Knowledge Management: Methods, Models, and Tools*, pp. 257-273.
- Håkansson, H. and Snehota, I. (1995), *Developing Relationships in Business Networks*, Routledge, London.
- Håkansson, H. and Snehota, I. (2006), “No business is an island: the network concept of business strategy”, *Scandinavian Journal of Management*, Vol. 22 No. 3, pp. 256-270.
- Håkansson, H. and Snehota, I. (1993), “The content and functions of business relationships”, *9th IMP Conference*.
- Harmon, R.R. and Castro-Leon, E.G. (2018), “Service innovation in the cloud: implications for strategy development”, *Technology Management for Interconnected World Service, Portland International Conference on Management of Engineering and Technology (PICMET)*, pp. 1-15.
- Hart, C. (1998), *Doing a Literature Review: Releasing the Social Science Research Imagination*, SAGE Publications, London.
- Heikkilä, M. and Heikkilä, J. (2010), “Conscripting of network business models”, *The IUP Journal of Business Strategy*, Vol. 7 No. 4, pp. 7-23.
- Hynes, N. and Elwell, A.D. (2016), “The role of inter-organizational networks in enabling or delaying disruptive innovation: a case study of mVoIP”, *Journal of Business & Industrial Marketing*, Vol. 31 No. 6, pp. 722-731.

- Iansiti, M. and Levien, R. (2004), "Strategy as ecology", *Harvard Business Review*, Vol. 82 No. 3, pp. 68-78.
- Iivari, M.M., Ahokangas, P., Komi, M., Tihinen, M. and Valtanen, K. (2016), "Toward ecosystemic business models in the context of industrial internet", *Journal of Business Models*, Vol. 4 No. 2, pp. 42-59.
- Ikävalko, H., Turkama, P. and Smedlund, A. (2018), "Value creation in the internet of things: mapping business models and ecosystem roles", *Technology Innovation Management Review*, Vol. 8 No. 3, pp. 5-15.
- Jabłoński, A. (2015), "The economization of network business models", *Management of Network Organizations*, pp. 169-180.
- Jekov, B., Shoikova, E., Donchev, D. and Petkova, P. (2017), "Study on the IoT ecosystem business models and the segment of startups", *10th Annual International Conference of Education, Research and Innovation*, doi: [10.21125/iceri.2017.1291](https://doi.org/10.21125/iceri.2017.1291).
- Karakaya, E. and Nuur, C. (2018), "Social sciences and the mining sector: some insights into recent research trends", *Resources Policy*, Vol. 58, pp. 257-267.
- Kindström, D. and Kowalkowski, C. (2014), "Service innovation in product-centric firms: a multidimensional business model perspective", *Journal of Business & Industrial Marketing*, Vol. 29 No. 2, pp. 96-111.
- Klang, D., Wallnöfer, M. and Hacklin, F. (2014), "The business model paradox: a systematic review and exploration of antecedents", *International Journal of Management Reviews*, Vol. 16 No. 4, pp. 454-478.
- Kleindorfer, P. and Wind, Y. (2009), *The Network Challenge: Strategy, Profit, and Risk in an Interlinked World*, Pearson Education.
- Klimanov, D. and Tretyak, O. (2019), "Linking business model research and marketing: new network-based approach to business model analysis", *Journal of Business & Industrial Marketing*, Vol. 34 No. 1, pp. 117-136.
- Komulainen, H., Tuija, M., Sinisalo, J., Tahtinen, J. and Ulkuniemi, P. (2006), "Business model scenarios in mobile advertising", *International Journal of Internet Marketing and Advertising*, Vol. 3 No. 3, pp. 254-270.
- Laya, A., Markendahl, J. and Lundberg, S. (2018), "Network-centric business models for health, social care and wellbeing solutions in the internet of things", *Scandinavian Journal of Management*, Vol. 34 No. 2, pp. 103-116.
- Laya, A., Jocevski, M., Ghezzi, A. and Markendahl, J. (2016), "Business model as relational aggregator: exploring business relationships", *32nd IMP Conference*, Poznan, available at: www.impgroup.org/paper_view.php?viewPaper=8894
- Leminen, S., Rajahonka, M. and Westerlund, M. (2015), "Ecosystem business models for the internet of things", *Technology Innovation Management Review*, Vol. 1, pp. 10-13.
- Leminen, S., Rajahonka, M., Westerlund, M. and Wendelin, R. (2018), "The future of the internet of things: toward heterarchical ecosystems and service business models", *Journal of Business & Industrial Marketing*, Vol. 33 No. 6, pp. 749-767.
- Markendahl, J. Lundberg, S. and Kordas, O. (2017), "On the role and potential of IoT in different industries", *Internet of Things Business Models, Users, and Networks*.
- Massa, L., Tucci, C.L. and Afuah, A. (2017), "A critical assessment of business model research", *Academy of Management Annals*, Vol. 11 No. 1, pp. 73-104.
- Miles, M.B. and Huberman, A.M. (1994), *Qualitative Data Analysis: An Expanded Sourcebook*, 2d ed., SAGE Publications, Thousand Oaks, CA.
- Miterev, M., Turner, J.R. and Mancini, M. (2017), "The organization design perspective on the project-based organization: a structured review", *International Journal of Managing Projects in Business*, Vol. 10 No. 3, pp. 527-549.
- Moore, J. (1996), *The Death of Competition: Leadership and Strategy in the Age of Business Ecosystems*, John Wiley and Sons.
- Moore, J.F. (2006), "Business ecosystems and the view from the firm", *The Antitrust Bulletin*, doi: [10.1177/0003603x0605100103](https://doi.org/10.1177/0003603x0605100103).
- Nambisan, S. (2018), "Architecture vs. ecosystem perspectives: reflections on digital innovation", *Information and Organization*, Vol. 28 No. 2, pp. 104-106.
- Nelson, R.R. and Winter, S.G. (1982), *An Evolutionary Theory of Economic Change*, Belknap Cambridge MA, Vol. 93, [10.2307/2232409](https://doi.org/10.2307/2232409).
- Nenonen, S. and Storbacka, K. (2010), "Business model design: conceptualizing networked value co-creation", *International Journal of Quality and Service Sciences*, Vol. 2 No. 1, pp. 43-59.
- Nickerson, R.S. (1998), "Confirmation bias: a ubiquitous phenomenon in many guises", *Review of General Psychology*, Vol. 2 No. 2, doi: [10.1037/1089-2680.2.2.175](https://doi.org/10.1037/1089-2680.2.2.175).
- Normann, R. and Ramirez, R. (1993), "From value chain to value constellation: designing interactive strategy", *Harvard Business Review*, Vol. 71 No. 4, pp. 65-77.
- Oliveira, M.G.D., Mendes, G.H.S., Albuquerque, A.A.D. and Rozenfeld, H. (2018), "Lessons learned from a successful industrial product service system business model: emphasis on financial aspects", *Journal of Business and Industrial Marketing*, Vol. 33 No. 3, pp. 365-376.
- Osterwalder, A. and Pigneur, Y. (2010), *Business Model Generation*, A Handbook for Visionaries, Game Changers, and Challengers, John Wiley and Sons, Hoboken, NJ.
- Palo, T. and Tähtinen, J. (2011), "A network perspective on business models for emerging technology-based services, edited by ulkuniemi", *Journal of Business & Industrial Marketing*, Vol. 26 No. 5, pp. 377-388. P.
- Palo, T. and Tähtinen, J. (2013), "Networked business model development for emerging technology-based services", *Industrial Marketing Management*, Vol. 42 No. 5, pp. 773-782.
- Podsakoff, P.M., Mackenzie, S.B., Bachrach, D.G. and Podsakoff, N.P. (2005), "The influence of management journals in the 1980s and 1990s", *Strategic Management Journal*, Vol. 26 No. 5, doi: [10.1002/smj.454](https://doi.org/10.1002/smj.454).
- Porter, M.E. (1985), *Competitive Advantage: Creating and Sustaining Superior Performance*, New York, NY, doi: [10.1182/blood-2005-11-4354](https://doi.org/10.1182/blood-2005-11-4354).
- Porter, M.J. and Heppelmann, J.E. (2014), "How smart, connected products are transforming competition", *Harvard Business Review*, No. November.
- Ramirez, R. and Mannervik, U. (2016), *Strategy for a Networked World*, Imperial College Press.

- Saebi, T. and Foss, N.J. (2015), "Business models for open innovation: matching heterogeneous open innovation strategies with business model dimensions", *European Management Journal*, Vol. 33 No. 3, pp. 201-213.
- Santos, J.B. and D'Antone, S. (2014), "Reinventing the wheel? A critical view of demand-chain management", *Industrial Marketing Management*, Vol. 43 No. 6, pp. 1012-1025.
- Spiehl, P., Schneckenberg, D. and Ricart, J.E. (2014), "Business model innovation – state of the art and future challenges for the field, R and", *R&D Management*, Vol. 44 No. 3, pp. 237-247.
- Stabell, C.B. and Fjeldstad, Ø.D. (1998), "Configuring value for competitive advantage: on chains, shops, and networks", *Strategic Management Journal*, Vol. 19 No. 5, pp. 413-437.
- Storbacka, K., Frow, P., Nenonen, S. and Payne, A. (2012), "Designing business models for value co-creation", *Special Issue – Toward a Better Understanding of the Role of Value in Markets and Marketing*, pp. 51-78.
- Storbacka, K., Windahl, C., Nenonen, S. and Salonen, A. (2013), "Solution business models: transformation along four continua", *Industrial Marketing Management*, Vol. 42 No. 5, pp. 705-716.
- Stott, R.N., Stone, M. and Fae, J. (2016), "Business models in the business-to-business and business-to-consumer worlds – what can each world learn from the other?", *Journal of Business & Industrial Marketing*, Vol. 31 No. 8, pp. 943-954.
- Suherman, A.G. and Simatupang, T.M. (2017), "The network business model of cloud computing for end-to-end supply chain visibility", *International Journal of Value Chain Management*, Vol. 8 No. 1, pp. 22-39.
- Teece, D.J. (2010), "Business models, business strategy and innovation", *Long Range Planning*, Vol. 43 Nos 2/3, pp. 172-194.
- Timmers, P. (1998), "Business models for electronic markets", *Electronic Markets*, Vol. 8 No. 2, pp. 3-8.
- Tranfield, D., Denyer, D. and Smart, P. (2003), "Towards a methodology for developing evidence-informed management knowledge by means of systematic review", *British Journal of Management*, Vol. 14 No. 3, pp. 207-222.
- Turber, S., Brocke, J., Gassmann, O. and Fleisch, E. (2014), "Designing business models in the era of internet of things: towards a reference framework", *Advancing the Impact of Design Science: Moving from Theory to Practice*, pp. 17-31.
- van der Borgh, M., Cloudt, M. and Romme, A.G.L. (2012), "Value creation by knowledge-based ecosystems: evidence from a field study", *R&D Management*, Vol. 42 No. 2, pp. 150-169.
- Velu, C. (2016), "Evolutionary or revolutionary business model innovation through co-competition? The role of dominance in network markets", *Industrial Marketing Management*, Vol. 53, pp. 124-135.
- Visnjic, I., Neely, A. and Jovanovic, M. (2018), "The path to outcome delivery: interplay of service market strategy and open business models", *Technovation*, Vols 72/73, pp. 46-59.
- Voelpel, S.C., Leibold, M. and Tekie, E.B. (2004), "The wheel of business model reinvention: how to reshape your business model to leapfrog competitors", *Journal of Change Management*, Vol. 4 No. 3, pp. 259-276.
- Westerlund, M., Leminen, S. and Rajahonka, M. (2014), "Designing business models for the internet of things", *Technology Innovation Management Review*, Vol. 4 No. 7, pp. 5-14.
- Wirtz, B.W., Pistoia, A., Ullrich, S. and Göttel, V. (2016), "Business models: origin, development and future research perspectives", *Long Range Planning*, Vol. 49 No. 1, pp. 36-54.
- Wohlin, C. (2014), "Guidelines for snowballing in systematic literature studies and a replication in software engineering", *Proceedings of the 18th International Conference on Evaluation and Assessment in Software Engineering*, doi: [10.1145/2601248.2601268](https://doi.org/10.1145/2601248.2601268).
- Wu, X. and Zhang, W. (2009), "Business model innovations in China: from a value network perspective", *US-China Business Cooperation in the 21st Century: Opportunities and Challenges for Entrepreneurs*.
- Ziouvelou, X. and McGroarty, F. (2018), "A business model framework for crowd-driven IoT ecosystems", *International Journal of Social Ecology and Sustainable Development*, Vol. 9 No. 3, pp. 14-33.
- Zott, C. and Amit, R. (2008), "The fit between product market strategy and business model: implications for firm performance", *Strategic Management Journal*, Vol. 29 No. 1, pp. 1-26.
- Zott, C. and Amit, R. (2009), "The business model as the engine of Network-Based strategies", *The Network Challenge – Strategy, Profit, and Risk in an Interlinked World*.
- Zott, C. and Amit, R. (2010), "Business model design: an activity system perspective", *Long Range Planning*, Vol. 43 Nos 2/3, pp. 216-226.
- Zott, C., Amit, R. and Massa, L. (2011), "The business model: recent developments and future research", *Journal of Management*, Vol. 37 No. 4, pp. 1019-1042.

Appendix

Table A1 Empirical studies

Reference	Study context	Actors discussed/involved in the study	Method
Andersson et al. (2014)	IoT in the automotive industry	Car manufacturer (Volvo Cars), technology provider (Ericsson), mobile operator (AT&T), third-party service provider (Linus Matkasse)	Empirical illustration – connected vehicle case
Dellyana et al. (2018)	Music streaming platform, fashion e-commerce, a web-hosting company	Each of the network's focal firms and partners	Multiple case study design
Ghanbari et al. (2017)	IoT for smart cities	Advertising company, end-user, telecommunication equipment vendor, transport operator	Use cases in smart city
Gordijn et al. (2000)	E-commerce	Surfer, Internet provider, peering provider	Empirical illustration – free Internet access service
Harmon and Castro-Leon (2018)	Cloud services (artificial intelligence, flying drone, health)	Legacy software firm, a solution provider in the IoT sector, a cloud platform provider	Three empirical illustrations – the process of migration from goods-dominant to cloud-based services
Heikkilä and Heikkilä (2010)	Manufacturing machinery, business information system and services, and telecom services	A network of three global publicly listed companies and three research and funding partners	Action research study
Ikävalko et al. (2018)	IoT open innovation ecosystems in a smart city context	Different actors: ideators (end-users), intermediaries (public service providers, tech companies), or designers (app developers)	Multiple case study design
Jekov et al. (2017)	IoT context	Start-ups in IoT domain based on the use of big data, machine learning and artificial intelligence	Empirical illustration of start-ups – acquired and stand-alone
Komulainen et al. (2006)	M-advertising	Description of actors involved: app and content providers, MNOs, device manufacturers etc	Scenario planning
Laya et al. (2018)	Connected devices in the context of health, social care, and wellbeing	A focal company with different associating actors in the network for each of the discussed cases	Multiple case study design
Leminen et al. (2018)	IoT context	Focal company in each of the discussed cases	Literature review and multiple case study
Markendahl et al. (2017)	IoT context	Partner companies, municipality representatives, employer organizations etc	Multiple case study
Palo and Tähtinen (2013)	Ubiquitous infrastructure service	Device manufacturer, media broker, operator, non-profit development	Case study
Palo and Tähtinen (2011)	Ubiquitous, technology-based service	Suppliers, partners, competitors, customers	Scenario planning
Suherman and Simatupang (2017)	Cloud computing	Firms using and providing the cloud	Single case study – the adoption of cloud computing
Turber et al. (2014)	IoT context	Focal company (Nest Labs) and its collaborators (partners, end-customers, and remaining stakeholders)	Empirical illustration – connected thermostat case
van der Borgh et al. (2012)	Knowledge-based ecosystem	Mostly technology companies, investors, research institutes etc	Single case study – high tech campus in Eindhoven

Corresponding author

Milan Jucevski can be contacted at: jucevski@kth.se

For instructions on how to order reprints of this article, please visit our website:

www.emeraldgroupublishing.com/licensing/reprints.htm

Or contact us for further details: permissions@emeraldinsight.com