The Development of Business Model Research: A Bibliometric Review

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Abstract

Recent reviews demonstrate the usefulness of the business model concept as a level of analysis in management, whereas less attention has been devoted to the analysis of the paths of past research to guide its future development. We used bibliometric methods, specifically bibliographic coupling and algorithmic historigraphy, to trace the development of the business model literature from its origins in e-business to its current state. In addition to reviewing the literature as a whole, our study investigated the time-dependent co-evolution of research sub-streams. We examined the relative influence of publications and canonical papers (algorithmic historiography) within and between three separate time spans (bibliographic coupling). We found that business model foundations draw from three major business sub-disciplines—strategy, entrepreneurship, and innovation—whilst new frontiers (e.g., Industry 4.0, sustainability, and networks) offer an opportunity to increase the inter-connectedness of business model research. Finally, we discuss contemporary topics and future avenues for business model research.

Keywords: business model, review, bibliometrics, bibliographic coupling, historiography

1 Introduction

Every business since the dawn of commerce has followed a business model (BM) (Teece, 2010). A BM articulates how a business creates, delivers and captures value (Osterwalder & Pigneur, 2010; Teece, 2018). Since its beginnings in the early 2000s (e.g., Amit & Zott, 2001; Chesbrough & Rosenbloom, 2002; Magretta, 2002) BM design and development have increasingly attracted attention in theory and practice (Wirtz et al., 2016). A growing sense has, however, emerged that the BM literature has stalled in its development because the BM construct lacks clarity (Foss & Saebi, 2017), rehashing the same arguments year after year (Massa, Tucci & Afuah, 2017) and working in silos (Zott, Amit & Massa, 2011).

Several researchers have called for continual questioning of the core identity of BM research as well as the stability of its topics (Sidorova et al., 2008; Schaller & Vatananan-Thesenvitz, 2019). The historical development of this research along with the cumulative tradition, in reference to particular disciplines, can shape future BM research (see Grover et al., 2006). From this standpoint, structured and rigorous research on BM research is needed (Demil et al., 2015).

Thus, from these developments in the literature we derive the following research questions: (1) What is the structure of BM research? (2) How did it develop over time? and (3) What are the consequences for future research on BMs?

Drawing a coherent map of contemporary research in any domain based solely on subjective literature reviews is necessary to reveal conceptualizations and theory development (see e.g., Weerawarden et al., 2021) but insufficient (Coombes & Nicholson, 2013; Maucuer & Renaud, 2019). Such a literature review cannot encompass the dynamics of research in a given field or adequately reveal publications that have influenced focal areas of interest within specific time frames (Backhaus, Luegger & Koch, 2011). On the other hand, quantitative approach offers a range of opportunities for BM research (Weerawarden et al., 2021). Specifically, a bibliometric study can analyze citation patterns comprehensively and provide the basis for identifying research sub-streams and future research directions (Vallaster et al., 2019; Zupic & Čater, 2015). Finally, a bibliometric study is especially applicable to fragmented fields such as BM research as a means of structuring the traces of its development (Ramos-Rodriguez & Ruiz-Navarro, 2004).

Our study aims to analyze existing literature quantitatively to provide a coherent map of the historical development of BM research by structuring and clustering BM research into three distinct periods of time as well as identifying contemporary clusters and future research avenues.

We traced the development of the literature over three time periods—from its inception through 2011, 2012–2015, and 2016–2019. Additionally, we used algorithmic historiography to trace the development of BM literature over the entire period. Our data confirm previous claims that the BM research initially focused on e-business. We show that BM research has been evolving as a self-perpetuating field. The most often-cited influences on recent BM literature come from within the field. In the most recent period, BM research has revolved around contemporary topics such as sustainability and has experienced co-evolution with network-based and customer-centered frontiers.

To provide a useful outlook for BM research, we follow the approach previously outlined in several papers including Batistič, Černe and Vogel (2017) and Klun and Trkman (2018). First, the bibliometric analysis and literature review provide a thorough investigation of the development of BM research within existing clusters. Second, we developed a future outlook, relying on existing clusters, visible patterns of the future evolution of BM research, and contemporary topics of interest to researchers and practitioners (e.g., Industry 4.0, sustainability, and networks) as well as broader management–society encounters to provide substantive directions for future research on BMs.

2 Business model research

With the advent of e-businesses and the need for firms in globalized markets to re-design continuously (Župič & Giudici, 2016; DaSilva & Trkman, 2014), the BM as a concept has revolved around creating, capturing, and delivering value (Alt & Zimmermann, 2001). Despite the growing interest in BMs, our understanding of the utilization, development, and structure of BMs has

remained vague (Zott, Amit & Massa, 2011). Altogether, research on BMs has become heterogeneous and broader in scope. Also, the development of BM research has generated several discrete research sub-fields or 'silos' (Zott, Amit & Massa, 2011). The development of BM research has attracted considerable attention, establishing the need to distinguish it from established concepts such as strategy (DaSilva & Trkman, 2014). BMs remain sovereign to some extent and are distinguished from strategy, organization theory, and business planning (Wirtz et al., 2016).

BM research has not yet developed a clear footprint in strategic management (Ritter & Lettl, 2018). Furthermore, a systematic literature review by Coombes and Nicholson (2013) revealed only a few publications on BMs published in marketing outlets even though BM research has drawn on common ground (e.g., value creation, value capture, and value delivery). The rarity of exchanges of ideas between marketing and BM research reflects the application of several perspectives to the term 'business model', which creates ambiguity about the conceptual boundaries of BMs and the applied terminology.

A research field can win legitimacy and impose its presence in the long term if it can establish its boundaries with other fields, even if those boundaries are somewhat fuzzy (Bruyat & Julien, 2001). BM research must therefore develop a conceptual framework that explains and predicts a set of empirical phenomena that are not explained or predicted by other fields (Shane & Venkataraman, 2000). That being said, bibliometric analyses provide the opportunity for an in-depth understanding of interlinked arguments and train-of-thoughts that contributed to the development of a given concept (Wong, 2021). A BM would then become a 'unique and informative' unit of analysis (Baden-Fuller & Mangematin, 2013).

Several recent literature and bibliometric reviews have investigated the state of research in BM and related fields (Table 1). Initial observations of BM research have mostly emerged from structured literature reviews, focusing on the origins, adoption and value of the BM concept. While such reviews are needed, they are to some extent arbitrary and unable to 'structure and cluster' the entire research domain (see e.g., Coombes & Nicholson, 2013; Donthu et al., 2021). More recently, several reviews have focused on specific topics such as BM innovation, BMs in SMEs and digital BMs (see e.g., Caputo et al., 2021; Miller et al., 2020; Climent & Haftor, 2021).

Table 1. Previous literature reviews

Manuscript	No. of publications	Period	Focus	Type	Key findings
Caputo et al. (2021). Digitalization and business models: Where are we going? A science map of the field.	198	2010 – 2019	Relationship between digitalization and BM innovation.	Bibliometric analysis (citation, co-citations, bibliographic coupling, keywords co-occurrences)	The three main thematic clusters comprise technological innovation, strategic management, and digital transformation. BM debate is limited to only a few journals.
Ho (2020). Evolutionary network of business models studies and applications in emerging economies.	665	2000 – 2017	The development of BM research and the role of the BM concept in emerging economies.	Bibliometric analyses (Co-citation and main-path analysis)	The development of BM research evolved over 3 stages: 1) BM value and ontology, 2) Sustainability of BMs, 3) BMs and business development.
Kraus et al. (2020). Business model innovation: A systematic literature review.	40	2016 – 2019	An overview of the state of the art of research on BM innovation.	Structured literature review	Organizational, environmental and societal factors are the main drivers of BM innovation.
Loon and Quan (2020). Theorising business model innovation: An integrated literature review.	116	Open-ended	Theoretical underpinnings and mechanism involved in business model innovation (BMI).	Structured literature review	Adopting a process view to show that BMI is a series of unique, interdependent mechanisms (extra-generative cognition, a systems perspective, dynamic ambidexterity, modularisation for reconfiguration and exaptation, paradox heuristics and cooperative mutuality alliances.)
Ogrean and Herciu (2020). Business models addressing sustainability challenges—towards a new research agenda.	1074	1994 – 2020	The most appropriate BMs to address sustainability through an integrative, multi-level conceptual framework.	Bibliometric analysis (clustering, keywords and citation co-occurrences)	BM should be the building block of corporate sustainability with the aim of triggering and supporting it.
Belussi, Orsi and Savarese (2019). Mapping busines model research: a document bibliometric analysis.	3,604	1985 – 2017	Theoretical underpinnings, the state of the art and future avenues for BM definitions.	Bibliometric analysis (co-citation; bibliographic coupling)	BM has conceptual and empirical validity. BM lies at the intersection of strategy, innovation management, and value chain creation and operationalization. BM shifted focus from general topics related to innovation and digitalization to wider themes, e.g. sustainability.

Maucuer and Renaud (2019). Business model research: A bibliometric analysis of origins and trends.	553	Open-ended	Specificities, intellectual roots of and trends in BM in Strategic Management and Innovation & Entrepreneurship.	Bibliometric analysis (co-citation; bibliographic coupling)	The disciplines have similar theoretical pillars and patterns of developments but differ in research focus.
Ramdani, Binsaif and Boukrami (2019). Business model innovation: a review and research agenda.	219	2010 – 2016	Approaches to BM innovation.	Structured literature review	Firms should explore alternative BMs through experimentation, open and disruptive innovations, through modifying a single element, altering multiple elements simultaneously and/or changing their interactions.
Schaller and Vatananan-Thesenvitz (2019). Business model innovation (BMI) process: A systematic literature review with bibliometric analysis.	362	Open-ended	BMI process knowledge base.	Bibliometric analysis (citation, co-citation, co-author and bibliographic coupling)	BMI is a global phenomenon but most research originates in Anglo-American and German-speaking societies BMI lacks construct clarity and has not yet developed independent knowledge besides the general BM domain
Cuc (2019). Trends of business model research. A bibliometric Analysis.	500	1994 – 2017	Overview of the evolution of the BM research, leading trends and future research directions.	Bibliometric analysis (cluster, keywords co-occurrence).	The main topics are BM Innovation and Sustainability, Digital Technologies, Industry 4.0, Social Entrepreneurship, and Theory development.
Hajiheydari et al. (2019). Business model analytics: technically review business model research domain.	14081	Open-ended	The intellectual core of the BM, its connections to other domains, and trending topics.	Bibliometric analysis (co-word and burst analysis).	Three main research areas (electronic BM, BM innovation, and sustainable BM) and generic research trends (e.g., sustainable development management).
Klimanov and Tretyak (2019). Linking business model research and marketing: new network-based approach to business model analysis.	88	1996 – 2018	Conceptual links between marketing and BM research to enable BM analysis based on inter-organizational relationships.	Structured literature review	Limited involvement of marketing researchers in BM studies. Algorithm for BM analysis.
Foss and Saebi (2017). Fifteen years of research on business model innovation: how far have we come, and where should we go?	150	2000 – 2015	*Comprehensive systematic critical assesment of the BM innovation literature.*	Structured literature review	The development of a research model with antecedents, moderators and outcomes of BM innovation.
Li, Qiao and Wang (2017). Exploring evolution and emerging trends in business model study: a co-citation analysis.	1498	1995 – 2015	The development of BM studies in 2 recent decades.	Bibliometric analysis (Co-citation analysis)	Identification of recent key foci (BM innovation and value creation).

Peric, Durkin & Vitezic (2017). The constructs of a business model redefined: A half-century journey.	108	1960 – 2015	Clarify the BM concept and identify its most common themes.	Structured literature review	BM is all about value, has an important role in strategy implementation and is increasingly used in symbiosis with sustainability.
Wirtz et al. (2016). Business models: origin, development and future research perspectives.	681	1965 – 2013	Origins and theoretical development, and a recently converging view of BM research	Structured literature review	BM research must focus on innovation, change & evolution, performance & controlling, and design.
Klang, Wallnöfer and Hacklin (2014). The business model paradox: A systematic review and exploration of antecedents.	54	Open-ended	The presence of both—outstanding popularity and severe criticism of the BM concept.	Structured literature review	Identification of the core of the BM concept along the dimensions of classification, constitution and configuration.
Coombes and Nicholson (2013). Business models and their relationship with marketing: A systematic literature review.	405	1970 – 2011	Engagement between marketing and BM research, and to identify their common themes.	Structured literature review	BM research was impacted by non-marketing disciplines. Open BMs are promising area to better connect BM research to industrial marketing.
Lambert and Davidson (2013). Applications of the BM in studies of enterprise success, innovation and classification: An analysis of empirical research from 1996 to 2010.	69	1996 – 2010	Raise awareness and enhance understanding of the BM concept and ways in which it can contribute to management streams.	Structured literature review	Discovery of the following themes: (1) BMs and enterprise classification, (2) BMs and enterprise performance, and (3) BMI.
Zott, Amit and Massa (2011). The business model: Recent developments and future research.	103	1975 – 2009	Broad and multi-faceted review of BM concept.	Structured literature review	BM is developing in silos. BM is a new unit of analysis with a systemic perspective on business, encompassing boundary-spanning activities while focusing on value creation.

Publications have also used co-citation analyses to analyze the state of the art of BM research (e.g., Belussi, Orsi & Savarese, 2019; Cuc, 2019) to facilitate the identification of separate research clusters and serve as the basis for identification of topics for further research (Ogrean & Herciu, 2020). Past research has on the one hand, however, failed to take the specificities of BM research into account and, on the other hand, insufficiently reviewed the literature as a *whole*. We thus call for 'capturing the relative influence and specificities' of BM research (Maucuer & Renaud, 2019).

3 Data and Methods

The current study is unique in examining BM research as a whole and dividing it into three stages to capture time-dependent research streams. We complement previous bibliometric analyses with the use of historiographic analysis in an initial attempt to identify the most influential publications. Finally, in designing our bibliometric review, we followed the suggestions of Snyder (2019) and focused specifically on including directions for further research. Hence, this study draws on past research and the main findings derived from 'conversations' of the authors within (intra-connectedness) and between (inter-connectedness) the identified research sub-streams for an extensive discussion of future research directions that would address gaps, concerns, and opportunities to pursue the 'scientificity' of BM research.

We mapped the BM literature using bibliometric methods (Zupic & Čater, 2015). Bibliometrics involves the statistical analysis of scholarly communication through citations of publications (de Solla Price, 1965). These methods use citation information in bibliographical databases to extract meaningful information about the structures of scientific fields. Specifically, we used bibliographic coupling (Kessler, 1963) and algorithmic historiography (Garfield, Pudovkin & Istomin, 2003).

Bibliographic coupling uses similarity between reference lists to establish connections between scholarly publications. For example, if ten publications appear in two scientific papers' reference lists, those two papers are connected with a coupling strength of ten. Stronger bibliographic connection implies conceptual similarity. When this information is gathered for all relevant publications in the scientific field of interest, a network map of the field can be drawn. Conceptually similar documents would be rendered closer on a bibliographic coupling map. Clustering methods can be applied to the network to delineate the field's structure and identify research sub-streams.

Algorithmic historiography uses direct citations to draw connections between documents. These are then presented in a map with year of publication on the Y axis, sorting documents by year of publication. The X axis has no particular meaning, as the documents are arranged on the X axis on the basis of their connections with earlier documents which appear higher on the map, consequently forming a stream of research over time. Unlike with bibliographic coupling, the closeness of documents on a historiographic map does not necessarily indicate conceptual similarity. This map shows the development of the field in chronological order and the knowledge flow over time.

3.1 Search and selection

We searched the Clarivate Analytics Web of Science (WoS) Core Collection with 'business model' in the subject field (i.e., title, abstract, or keywords) for articles published before 2020. WoS is the most commonly used database in bibliometric reviews (Zupic & Čater, 2015) and covers significant breadth of quality scientific journals. The search returned 10,828 entries which were further filtered through the business, management, and economics categories. We further opted to include only

English-language articles published in SSCI-ranked peer-reviewed journals (i.e. journals with an impact factor) and thus excluded articles published in SSCI-expanded journals and book chapters. Of the remaining 2,676 documents, we selected as document types only 'article,' 'editorial material,' and 'review,' which left us with 2,431 entries.

The abstracts of all remaining documents were read and rated (Yes-include/Not-include) by two authors to minimize the use of subjective judgment (Perreault & Leigh, 1989). The criterion for inclusion was that BM was one of a research study's central themes of investigation. To avoid excessive random agreement (Rust & Cooil, 1994), the raters classified inclusion criteria (e.g., whether the publications investigated BM typology, BM conceptualization, or BM elements). Articles that mentioned BM only passingly were excluded from the sample. After rating the articles independently, the interrater agreement was 86.4%. In addition to percentage of agreement, we calculated Cohen's kappa to avoid overestimating the level of agreement between the two raters. The result was 0,728, indicating substantial agreement or to draw conclusions (Hallgren, 2012). The differences in the remaining articles were reconciled by re-reading the abstracts together and deciding whether to include a contested article. At the conclusion of this process, 731 articles remained.

3.2 The process of bibliometric analysis

Our aim was to trace the development of the field of BM research over time so we distributed across publications three periods: from its inception through 2011, 2012–2015, and 2016–2019. We chose 2011 as the limit for the initial period because of the publication of the first comprehensive landmark review of the BM field (Zott, Amit & Massa, 2011). The remainder were divided into two four-year periods (2012–2015 and 2016–2019). Bibliographic coupling analysis was conducted separately for each period. Algorithmic historiography inherently reveals the development of the field over time so we analyzed all publications together in that phase of our research.

We used VOS viewer software (Van Eck & Waltman, 2009) for bibliographic coupling and CitNetExplorer (Van Eck & Waltman, 2014) for algorithmic historiography. The number of citations and coupling strength were the criteria for identifying document relevance. The number of citations is a measure of influence and documents needed to meet a minimum threshold for inclusion. Coupling strength measures how connected a given document is with the rest of the included documents. If coupling strength is too low, the document is disconnected from the rest of the field and not part of a major research stream.

3.3 Methods coding

In the end, we coded about 300 publications over three periods to analyze methods used in BM research. We selected the 100 publications with the highest coupling strengths for each period. This decision was guided by visualization limitations for bibliographic coupling maps, as these tools cannot accommodate an unlimited number of publications. Thus we coded all publications that were visualized in bibliographic coupling analysis. Two researchers examined the publications for each period. The rater agreement for the three categories ranged between 0.81 and 0.92. Cohen's kappa range ranged between 0.73 and 0.84.

The results derived from coding reveal the development of BM research in the first period, where the number of conceptual papers was the largest (36). In addition, both coding and algorithmic historiography revealed the domains that contributed to the theoretical underpinnings of BM

research (e.g., the resource-based view). While the ratio of conceptual papers decreased substantially in the second period (19 % in comparison to 37 % during the first), both the second and third periods demonstrate a relatively constant ratio between conceptual and empirical papers (19;72 and 22;66, respectively). Also, in the third period the number of literature reviews is greater (9 in comparison to 6 in each of the previous periods), whereas the number of empirical publications is lower, indicating the need to consolidate theoretical advancements and develop an agenda for future research. More surprisingly, the ratio between quantitative and qualitative research design remained relatively stable across all three periods (14;39, 19;49, and 21;43, respectively). We initially expected the proportion of quantitative studies to gradually rise as researchers would increasingly test theoretical concepts and predictions based on the BM concept's early theoretical development in conceptual and qualitative studies. This has not happened. While qualitative research is prevalent as a result of single- and multiple-case studies, researchers have mostly used descriptive statistics, structural equation modelling (SEM), SEM-PLS, and regression analyses when applying a quantitative research methodology.

4 Results

4.1 Bibliographic coupling: Period through 2011

All clusters for the period through 2011 are visualized in Figure 1 and summarized in Table 2.

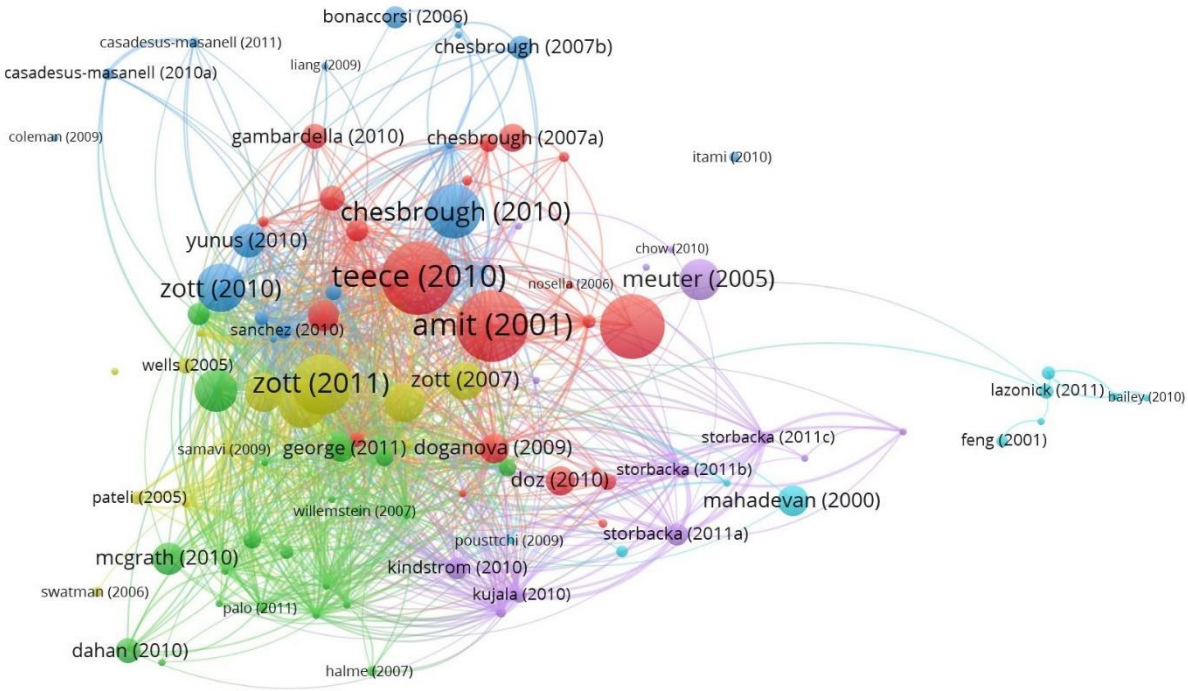

Figure 1. The period through 2011 – clusters based on bibliographic coupling data. To enhance clarity, only the 500 strongest links are shown.

No.	Label	No. of documents	Color in Figure 1
1	Technological innovation	17	Red
2	Business model foundations	11	Green

3	Business model change	12	Blue
4	Electronic business	9	Yellow
5	Value creation & firm performance	7	Violet
6	Market competition	6	Light blue

Table 2. Summary of clusters in the period up to 2011.

We labeled the **first cluster (the largest, in red) Technological innovation**. Research in this cluster examined BMs as vehicles for commercializing technological innovation. This stream of research relates the BM concept to then-contemporary topics of technological innovation such as open innovation and disruptive innovation (Chesbrough, 2007; Cavalcante et al., 2011). Innovative companies must capture the value of technological innovation through innovative BMs (Chesbrough & Rosenbloom, 2002; Gambardella & McGahan, 2010; Wirtz, Schilke & Ullrich, 2010) or react to challengers with disruptive BMs (Lucas & Goh, 2009; Wu, Ma & Shi, 2010).

Publications in the **BM foundations cluster (second largest, in green)** aim to decipher the logic behind viable BMs by focusing on the core of the BM concept and its interplay with strategy and entrepreneurship (Mason & Spring, 2011; Palo & Tähtinen, 2011). Publications in this cluster discuss novel entrepreneurial approaches with a specific focus on the roles of BMs (Bock, Opsahl & Gerard, 2010). The publications present the BM construct as a sovereign concept that indicates 'strategic choices' that firms make (Montoro-Sanchez, Ortiz-de-Urbina-Criado & Romero-Martinez, 2009). Several publications in the cluster examine ways in which companies can elicit value from their BMs (Aziz & Mahmood, 2011; Sharma & Gutierrez, 2009). In so doing, firms can better understand the role that BMs play in shaping performance.

Publications in the **BM change cluster (in blue)** focus on the challenges established firms encounter when trying to change their BMs. The bulk of this research is based on case studies of companies that experienced a BM change either as a self-initiated process or as a forced reaction to external events (see e.g., Aspara et al., 2011). Open-source movement is particularly strong in this period and poses a threat to traditional BMs in the software business. One change commonly suggested as a response to open-source movements is a change towards hybrid BMs that combine traditional license fees with open-source services (see e.g., Bonaccorsi, Giannangeli & Rossi, 2006). For publications in this cluster, a BM is considered mainly a trial-and-error adaptation that enables organizations to differentiate themselves from others. The aim of the vast majority of publications is to identify idiosyncratic features of successful BMs and provide suggestions for future development.

Publications in the **Electronic business cluster (in yellow)** share a common denominator, the implications for BMs catalyzed by the evolution of the internet (Morris, Shindehutte & Allen, 2005; Zott & Amit, 2007). The publications in this group are among the oldest by average year (2007), which supports the notion that the BM concept spread from e-business to other domains. The publications provide recommendations for value creation, delivery, and business propositions (see e.g., Cagnina & Poian, 2009). Furthermore, the emerging era of digitalization established the need for new BM ontologies and facilitated discussions of corresponding BM design options (Samavi, Yu & Topaloglou, 2009; Zott & Amit, 2007).

The last two clusters in this analysis have their roots in strategic management. Publications in the **fifth cluster (in violet)** contribute to the understanding of the **Value-creation and firm-performance** aspects of BMs. This field of strategy has been focused mostly on the value-capture aspects of a firm's activities (see e.g., Kindström, 2010). The BM concept brought a new perspective that also focuses on value creation. Moreover, strategists utilized concepts borrowed from strategic management to pursue the development of common themes such as value co-creation (Storbacka, 2011).

The key idea of the **Market-competition cluster (in light blue)** is to understand how BMs help firms engage in market competition. Publications in this cluster seek to establish how BMs help firms compete, especially in unpredictable environments (see e.g., Froud et al., 2009). In light of this focus on competition, some publications examine BMs more thoroughly in certain industries or markets (see e.g., Lazonick & Tulum, 2011; Lechner & Hummel, 2014). Publications in the fifth (violet) cluster show how BMs complement concepts on a strategic level whereas publications in the sixth (light blue) cluster focus on how tactics and BMs align or interfere with one another. Presumably, the design of tactics is affected heavily by the coexistence or emergence of novel BMs (Bailey, Clark & De Ruyter, 2010). Some publications elaborate on the differences between types of BMs and positional strategy and tactics to decipher the conundrum involved in choosing the optimal BM for a given firm.

4.2 Bibliographic coupling: 2012–2015 Period

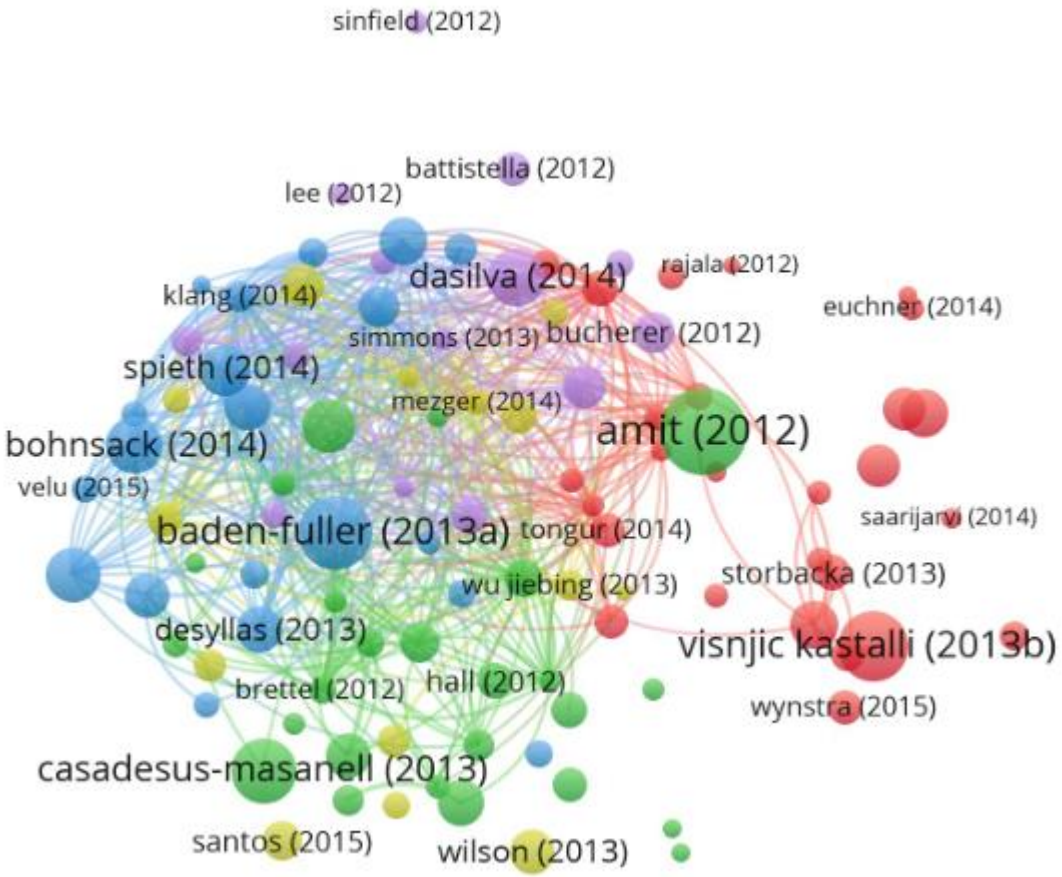

Figure 2. 2012 to 2015 period – clusters based on bibliographic coupling data. To improve clarity, only the 500 strongest links are shown.

No.	Label	No. of documents	Color in Figure 2
1	Value creation	27	Red
2	Value of BM concept	25	Green
3	Business model innovation	20	Blue
4	Entrepreneurship	14	Yellow
5	Strategic flexibility	14	Violet

Table 3. Summary of clusters in the 2012–2015 period.

In the **Value-creation cluster (Figure 2, in red)** a common topic is how businesses create value and develop corresponding BMs. The research focuses on two broad approaches to value creation: (1) how companies utilize (digital) technologies to create value through BM innovation (Tongur & Engwall, 2014), and (2) marketing-stream publications that examine the complexity of value drivers (Benson-Rea, Brodie & Sima, 2013), the role of partnerships in value creation (Ng, Ding & Yip, 2013), solution-provider models (Frankenberger, Weiblen & Gassmann, 2013), and value-proposition design (Maglio & Spohrer, 2013). One group of publications examines 'upgrades' in the definitions and applicability of the BM concept. Specifically, the publications aim at contextualizing the then-emerging plurality of BMs, reflecting the emerging importance of cloud computing, sustainability, and various themes related to the 'era of digitization'. Moreover, the publications examine activities that facilitate BM transformation and how BMs began interfering with established concepts in strategic and innovation management, entrepreneurship, and marketing. This cluster has strong ties with other clusters and serves as a boundary spanner between clusters.

The focus of publications in the **Value of the BM concept cluster (in green)** is on examining the often-neglected 'explanatory and practical' value of the BM concept in various settings. Researchers seek to establish links between the value-capture side of BM innovation and specific established concepts related to strategy, e.g., design and implementation in practice (Amit & Zott, 2012), the strategy-deciding process for entrepreneurs (Demil et al., 2015), strategic analysis (Zott & Amit, 2013), and strategic decision-making (Ritala & Sainio, 2014). Finally, a subset of publications focuses on the determinants of BM success (Ritala, Golnam & Wegmann, 2014), its relationship to enhanced or diminished performance (Morris, Shirokova & Shatalov, 2013), and the interplay of a particular BM with other established concepts in innovation management (Hu, 2014).

The main theme of publications in the **Business model innovation cluster (in blue)** evolved from the BM change cluster in the first period. BM innovation is considered an enabler and facilitator of business transformations in various industries. Following the pervasiveness of the BM concept in organizational analyses, the research stream that discusses the capabilities, determinants, and consequences of (un)successful BM implementation is evident (Aspara et al., 2013). The discussion is further fueled by the need to evaluate the 'explanatory' power of BMs during the continuous emergence of more recent management novelties. Finally, two similar aspects of BM change are evident: the first focuses specifically on BM reconfiguration (Khanagha, Volberda & Oshri, 2014) and the second emphasizes the transformational process and the need for continuous BM innovation within organizations (Spieth, Schneckenberg & Ricart, 2014; Velu, 2015).

The **Entrepreneurship cluster (in yellow)** includes topics that are relevant specifically to entrepreneurship. A prominent theme is BM design, which is essential for new ventures still searching for their BMs. Furthermore, a firm's structure is strongly connected to the design of its BM and the prospects of innovating it, especially in line with the 'social aspect' of sustainable entrepreneurship and business operations (Santos, Pache & Birkholz, 2015). Publications in this cluster are based predominantly on case-study research. They discuss several specific applications of BMs (e.g., Lehoux et al., 2014) and the relationship of the BM concept to other concepts that are relevant to new-venture development (e.g., organizational design, complexity and uncertainty, social value creation). A sub-stream of research prioritizes the need for a comprehensive examination of the BM concept and BM innovation (Arend, 2013; Andries, Debackere & van Looy, 2013). The stream represented by Wu, Bin and Yongjiang (2013) demonstrates, for instance, one of the shifts in entrepreneurship, entailing amends such as 'customer centricity' among the other in BM ontologies. This cluster contains the remains of the evolution of ideas related to the technological innovation cluster in the first period.

We labelled the **fifth cluster (in violet) Strategic flexibility**, a category that emphasizes first the differences between strategy and BMs with the canonical paper of DaSilva and Trkman (2014). Several other authors discuss the interplay of strategy and BM with a focus on achieving the flexibility that is needed to tackle emerging concepts (Battistella, Biotto & De Toni, 2012; Cao, 2014). Palo and Tähtinen (2013) use the notion of network-based models to study omni-channel management and the inclusion of various stakeholders in BM development. The network-based models include outside actors (e.g., business partners, ecosystem members, or even competitors) as a significant part of a firm's BM. A sub-stream focuses on designing strategies that identify new business opportunities and can be dynamically re-designed when needed (Sinfield et al., 2012). Publications in this cluster can be seen as a continuation of clusters such as market competition from the first period. The cluster pursues the idea of value co-creation and the need to adapt a BM in ever-changing markets.

4.3 Bibliographic coupling: 2016–2019 Period

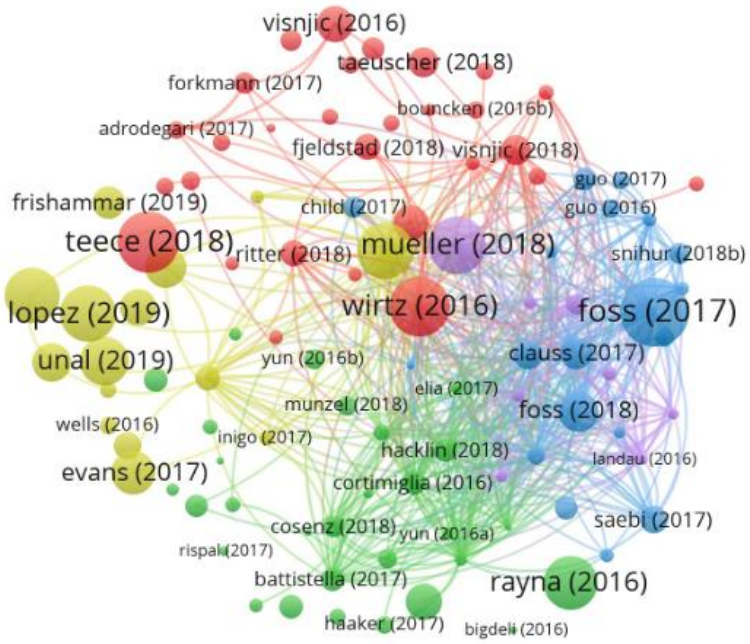

Figure 3. 2016 to 2019 period – clusters based on bibliographic coupling data. To improve clarity, only the 500 strongest links are shown.

No.	Label	No. of documents	Color in Figure 3
1	Enterprise and network architectures	29	Red
2	Business model and technology	29	Green
3	Domain-based cluster	19	Blue
4	Sustainable development	15	Yellow
5	New frontiers	8	Violet

Table 4. Summary of clusters in the 2016-2019 period.

The main theme of publications in the **first cluster (in red)** is the discussion of **Enterprise and network architectures** and the corresponding (re)design of BMs. Evidently, the continuous shift towards service-based industries established the need to rethink existing BM designs (Amit & Han, 2017; Adrodegari & Saccani, 2017; Bogers, Hadar & Bilberg, 2016) and the role of capabilities in such redesign (Teece, 2018). The facilitators of BM redesign for emerging enterprise and network architectures were disruptive technologies and the progression of the 'era of digitalization' (Chandna & Salimath, 2018; Cozzolino, Verona & Rothaermel, 2018; Ehret & Wirtz, 2017). The facilitators, especially digital technologies, enabled the BM concept to enter previously neglected domains such as frugal innovation and outcome market strategy (Howell, van Beers & Doorn, 2018; Täuscher & Laudien, 2018; Visnjic, Neely & Jovanovic, 2018). A strong research sub-stream emphasizes the need for network-based models in the more recent emergence of coopetition-based networks (Bankvall, Dubois & Lind, 2017; Bouncken & Friedrich, 2016; Tallman, Luo & Buckley, 2017). The rapidly growing number of research papers established the need for review papers (Ritter & Lettl, 2018; Wirtz et al., 2016).

The **second cluster (in green) is BM and technology**. Fragmented BM development, usually guided by 'BM ontologies' such as the BM Canvas, established the need to evaluate critical success factors in implementing, reconfiguring, and switching between new BMs (Batocchio, Ghezzi & Rangone, 2016; Haaker at al., 2017; Heikkilä et al., 2016; Taran et al., 2016). Thus, publications in this cluster drew on technological innovations and strategic flexibility to examine the enhancement of new BM development and BM performance (Cosenz & Noto, 2018; Cosenz, 2017; Elia et al., 2017; Hacklin, Björkdahl & Wallin, 2018). Furthermore, as a result of technological advancements and the need to better link business strategy to BM development, publications in this cluster discuss 'building blocks' and 'configurations' (Battistella et al., 2017; Herbes et al., 2017; Taran et al., 2016) that are relevant to smart cities, Industry 4.0, and the Internet of Things (Leminen et al., 2018; Metallo et al., 2018; Schiavone, Paolone & Mancini, 2019). In light of this, one final research sub-stream discusses the capabilities needed in new BM development (Cosenz & Noto, 2018; Elia et al., 2017; Hacklin, Björkdahl & Wallin, 2018) and touches on its corollaries (Arbussa, Bikfalvi & Marques, 2017; Gärtner & Schön, 2016).

The **domain-based cluster (in blue)** includes publications that represent state-of-the-art research on the BM concept and BM innovation from an evolutionary perspective (the canonical paper is Foss and Saebi, 2017). Also, the recent advance of the BM concept further fueled the discussion of BM innovation in various settings (Futterer, Schmidt & Heidenreich, 2018; Guo et al., 2017) and of

novel perspectives on BM applications (Velu, 2017). Finally, some publications address both the challenges associated with proper BM selection that have evolved more recently and those associated with BM portfolio management (Child et al., 2017; Snihur & Tarzijan, 2018).

The **Sustainable development cluster (in yellow)** is coherent, although smaller; it includes publications on sustainability, social responsibility, and circular economies (Ünal et al., 2019). Publications in the New frontiers cluster (in violet) address new frontiers in BM development (Gebauer, Haldimann & Saul, 2017; Landau, Karna & Sailer, 2016) and the associated uncertainties associated with the development of new BMs and the redesign of existing ones (Schneckenberg et al., 2017).

4.4 Bibliographic coupling summary

We have summarized the key characteristics of each period in Table 5. Our bibliographic coupling analysis shows the development of BM research over three periods. It starts with the Formation period (until 2011) where initial research started sporadically and gained momentum at the end of the decade. In the Consolidation period (2012-2015) there are strong discussions over the conceptualization and actual value of BM concept. In the third period (2016-2019), which we labeled New directions, several new streams of BM research appear and there is increasing attention to BM evaluation.

Period	No. of clusters	Title	Key characteristics
until 2011	6	Formation	- BM established as a new research domain. - BM research emerges in e-business and spreads to other domains. - Theoretical foundations mainly in technological innovation and strategic management
2012 – 2015	5	Consolidation	- Strong discussions on the conceptualization and value of BM - Theoretical work on the BM concept and subsequent discussions on main BM dimensions and elements.
2016 – 2019	5	New directions	- The BM is a viable unit-of-analysis for developing research areas (e.g. Industry 4.0). - Increased attention devoted to BM evaluation.

Table 5. Cluster analysis summary.

4.5 Algorithmic historiography

To complement and triangulate the development of BM research we used algorithmic historiography in an additional analysis. While a mixed-methods approach is prominent in bibliometric studies, algorithmic historiography makes it possible to trace the development of a field over time and identify paradigm shifts within its evolution (Garfield, Pudovkin & Istomin, 2003). Paradigm shifts are specific turns in the development of scientific literature when new ideas in a scientific discipline supersede old ways of thinking (Kuhn, 1962). Hence, we use algorithmic historiography to identify the publications that had substantial impact on advancing BM research including those that were not part of the clusters analyzed with bibliographic coupling. Algorithmic historiography reveals publications that 'added knowledge' to a particular research domain and illustrates 'chains of reasoning' (Wong, 2021).

The idea behind algorithmic historiography is to visualize the most important publications in a given field (core documents) on a map where nodes represent documents which are connected by direct citations. Documents are arranged by year of publication (the Y axis) so readers can trace the flow and evolution of knowledge in a given field. This visualization is known as historiographic mapping (McCain, 2008). The method is relatively new to management research. It has been utilized recently to study the evolution of big data research (Batistič & van der Laken, 2019) and leadership development (Vogel et al., 2020). In BM research, specifically, the authors of more-recent reviews (e.g., Caputo et al., 2021; Ogrean & Herciu, 2020) complement early reviews with mixed-methods approach; however, to our best knowledge the current study is novel in applying historiographic analysis, particularly, to BM research.

We implemented the historiographic analysis in CitNetExplorer software (Van Eck & Waltman, 2014) and followed the procedure outlined in Van Eck and Waltman (2014, 2017). First, we imported our WoS sample BM documents. Second, we identified k-core documents—a set of documents where each is connected to at least k other documents in the set. This selection is important because core documents are central to a field's development and they are more strongly connected to other documents in the network. To select the most central documents we chose the largest k that produced a non-zero network. We used the threshold of 20 citations, which identified the smallest non-zero k-core of 182 documents. Third, we visualized the most often-cited documents on the historiographic map. We experimented with various thresholds to balance the comprehensiveness and readability of the map. After creating different maps with 40, 60, 80, and 100 documents, we settled on the final version with the 60 most often-cited core documents (Figure 4).

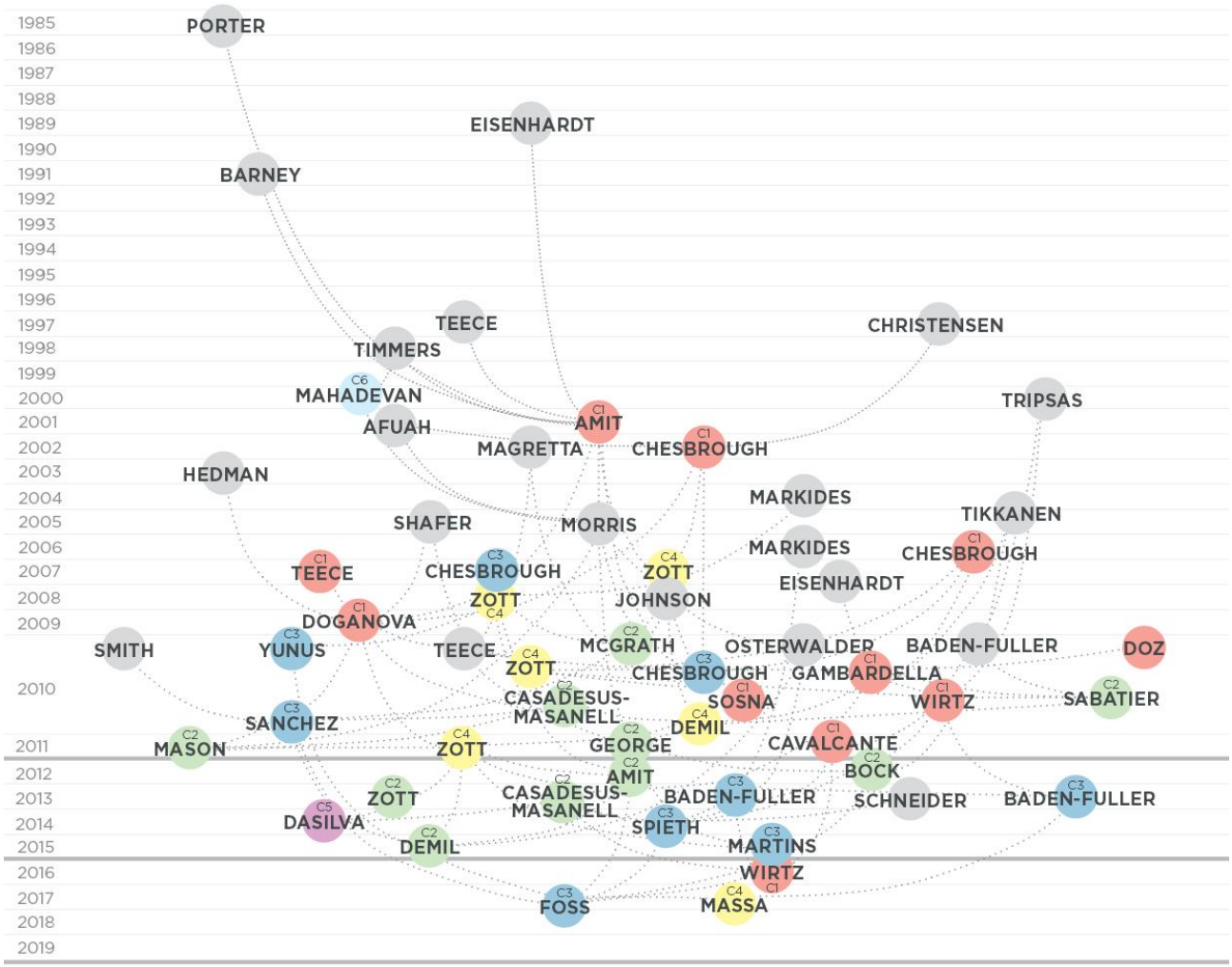

Figure 4. Historiographic map of 60 core publications.

The final step in the analysis was the interpretation of the map. We have read the abstracts (and in some cases full papers) of the 60 publications included in the historiographic map. A number of documents overlapped with those identified in the bibliographic coupling analysis. We identified bibliographic clusters and noted their place in historic development. We traced the influences running from early theoretical foundations from outside the field (e.g. Barney 1991; Porter, 1985) through the early BM literature to contemporary research. By tracing these direct citations on the historiographic map we were able to discern the development of the literature. We iteratively compared these insights with those derived from bibliographic coupling to arrive at a comprehensive picture of the development of the field.

The historiographic map (Figure 4) represents the development of BM research. Y axis is organized historically by the date of publication and connections between documents are direct citations. Contrary to bibliographic coupling maps, the closeness of nodes in historiographic map has no inherent meaning. To connect historiographic map with clusters in specific time periods (as identified by bibliographic coupling) we colored the clusters with the same color as in bibliographic coupling maps.

Dated in the 1980s and ’90s, papers from Porter (1985), Eisenhardt (1989) and Barney (1991) demonstrate that BM research was originally built on the strategic management body of knowledge.

Because such BM research drew on core concepts such as competitive advantage and required theoretical underpinnings from theories such as the resource-based view, a range of publications from the first period (through 2011) in the historiographic map are not included in the BM research cluster analysis. In addition, the historiographic map reveals the most influential publications, for instance publications from the *Technological innovation* cluster.

While the root papers influenced the development of value-related constructs lying at the core of the BM concept (see e.g., Amit & Zott, 2001; McGrath, 2010), publications from Technological innovation resonate with those from the electronic business era (see e.g., Timmers, 1998). Canonical papers from the 2000s (e.g., Morris, Shindehutte & Allen, 2005; Chesbrough, 2007; Zott & Amit, 2007, 2008) laid down a stepping stone for a research sub-stream on BM 'fit', its ability to enhance the understanding of firm performance, and further contemplation of BM redesign (see e.g., Johnson, Christensen & Kagermann, 2008; Doganova & Eyquem-Renault, 2009; Shafer, Smith & Linder, 2005). In light of this development path, both practitioners and researchers have become increasingly interested in establishing BM 'ontologies' (see e.g., Osterwalder & Pigneur, 2010). Notwithstanding its origins and practitioner-oriented nature, the Business Model Canvas significantly influenced the development of BM research, especially the examination of the concept and the subsequent development of archetypes, design options, and frameworks, and was recently used as a lens through which also to observe BM innovation (Bhatti et al., 2020).

The idea of further defining and re-examining the BM concept was pursued by several canonical papers that were published in the second period, from 2012 through 2015 (see e.g., Amit & Zott, 2012; Baden-Fuller & Mangmatin, 2013; DaSilva & Trkman, 2014). These publications demonstrate the importance of the *Value of the BM concept* cluster in the second period. The presence of publications from BM Innovation on the historiographic map reflects the omni-presence of this type of innovation. Apart from DaSilva and Trkman (2014) who aimed at delineating the BM from other concepts in strategic management, two clusters added to knowledge and helped advancing BM research importantly in the second period.

There is growing interest in publications that aim at comprehensively reviewing BM research sub-streams (see e.g., Wirtz et al., 2016; Foss & Saebi, 2017). In fact, publications from the third period acknowledge the lack of direction for BM research and call for opening future research avenues by initiating discussions with other research domains. The historiographic map shows the influence of literature reviews in the most recent period. Three clusters from the third period demonstrate the need for improving the inter-connectedness of BM research with other domains (Enterprise and network architectures, Domain-based cluster, and New frontiers). The *Enterprise and network architectures* cluster reveals the need to broaden the BM concept to the supply-chain (network) level and calls for adopting the 'multi-stakeholder' perspective in future development. The other two clusters identified specific research domains, for instance sustainability, digital and circular economies, and ambiguity tied to the applicability of the BM concept on these new frontiers.

5 Discussion

We examined the progress of BM research using bibliographic coupling and algorithmic historiography. Our study observed BM research over three time periods, tracing the formation and consolidation of the BM concept, and elaborating on the most recent period in discussing the future-research agenda. While the bibliometric analysis helped us to establish the structure, the most

influential publications, and the development of the 'intellectual territory', a critical assessment is needed in order to derive a meaningful research agenda (Wong, 2021).

The first time period denotes the formation of the BM concept where BM research was sparked by the initial interest in e-business. Algorithmic historiography demonstrates early outside influences from mostly prominent strategy perspectives such as the resource-based view, the dynamic capabilities view, and Porter's value chain/activity system. The influences of strategy perspectives are further corroborated in cluster BM foundations. The structure of BM research in this period aligns well with the classification in Zott, Amit and Massa (2011), with two exceptions: additional clusters of market competition and BM change.

The developments in the second period reveal the consolidation of a BM paradigm. As scholars increasingly agree on the BM as a concept that involves value proposition, creation, and capture, the BM becomes strongly connected to practice and especially relevant in innovative new ventures. Moreover, publications in the Value-creation cluster aim to extend the BM paradigm. That research is rooted in three business sub-disciplines, on strategy, entrepreneurship, and innovation. The three sub-disciplines further established the position of the BM concept as a viable unit of analysis when discussing business opportunities and business transformation (see e.g., the Strategic flexibility cluster). However, BM research at that time notably remained 'trapped' within its own boundaries. The authors of publications in several research sub-streams (e.g., BM Innovation) also played an important role in shaping the broader general BM domain (see e.g., Schaller & Vatananan-Thesenvitz, 2019). Hence, this omni-presence of certain authors clearly demonstrates how and why the intra-connectedness of research sub-streams has contributed to making BM research a self-perpetuating field. As shown by our historiography, a highly influential book by Osterwalder and Pigneur (2010) clearly established the ontological foundations for BM research sub-streams with its Business Model Canvas. In addition, cluster analysis shows that scholarly research on rigorous ontological foundations has been unexpectedly scarce.

Finally, as the BM concept matured as a viable 'unit of analysis', its expansion has continued into the third time period (new directions). The breadth of the BM concept manifests in its forays into contemporary research domains, such as sustainability, Industry 4.0, and networks (e.g., the Sustainable development and New frontiers clusters). Other research sub-streams, such as the Enterprise and network clusters, resonate with the need to expand our understanding of the BM concept at a higher level of analysis (i.e., exploring depth of the BM concept). Because of a range of existing BM design options and the need for continuous redesign, researchers began devoting attention to BM evaluation. The third period (expansion) offers a reasonable time span and contemporary topics that provide a solid basis for future research directions (Caputo et al., 2020). In Table 6 we provide a list of the clusters from the expansion period, our future research topics, questions, and illustrative references.

Cluster (*color*)	References	Potential research questions
Enterprise and network architectures	Bankvall, Dubois & Lind (2017); Chandna & Salimath (2018); Fjeldstadt & Snow (2018).	5.1 BM management in networks *How can networks help to improve joint value-creating territories?* *Which are essential and powerful value drivers of the development of network-based models?* *What are the core elements of network-based models?* *How can the development of network-based models facilitate conversations with B2B marketing?* *How can a firm maintain successful complementary and eliminate obsolete or unsustainable BMs in its BM portfolio?*
Business model evaluation	Battistella et al. (2017); Batocchio, Ghezzi & Rangone (2016); Schiavone, Paolone & Mancini (2019).	5.2 Predictive value of the BM concept *What is the role of BM ontologies in gauging the ex-ante value of a certain BM?* *What capabilities are needed to empower firms to conduct ex-ante evaluations of their BMs?* *How do those capabilities influence the type, development, and success of an implemented BM?*
Domain-based cluster	Futterer, Schmidt & Heidenreich (2018); Guo et al. (2017); Pati et al. (2018).	5.3 Business model innovation capabilities *How can ontological clarity be developed to improve empirical examinations of the BM concept?* *Which building blocks (elements) and success factors are critical in the development of new and network-based BMs?* *How can borrowed constructs from and conversations with more recent research domains improve the BM concept?*
Sustainable development	Plugge, Nikou & Bouwman (2020); Frishammar & Parida (2018).	5.4 BM ontology richness *What are the boundary conditions for BM design options, archetypes, architectures, frameworks, and ontologies?* *Are certain ontologies universally applicable or are ontologies applicable only to particular domains?* *How do ontologies change as levels of analysis and perspectives change?*
New frontiers	Gebauer, Haldimann & Saul (2017); Metallo et al. (2018).	5.5 Inter-connectedness *How can a BM lens explain and facilitate the development of markets, industries, and firms in emerging domains?* *Which borrowed constructs from various research domains could improve the BM concept?* *With main topics and keywords identified, which steps need to be taken to facilitate BM research conversations?*

Table 6. Summary of findings and future research directions.

5.1 Business model management in networks

Previous research typically reflects the plurality of BMs, for instance in case studies on Amazon, where BMs at the organizational level ostensibly avoid 'competing for similar resources (Casadesus-Masanell & Ricart, 2011). New BMs emerged with the presence of network architectures. Larger networks (value nets) entailed overlapping roles between supply-chain actors and the need to study the management of multiple BMs in both individual companies and supply chains (Trkman, Budler & Groznik, 2015). The co-creation and appropriation of value in networks with overlapping stakeholder roles remains a complex research topic. Evidently, publications in the cluster on emerging enterprise and network architectures began considering network members such as competitors, partners, and end-users (Rajakallio et al., 2015). While the authors of these studies increasingly agree on the impact of 'value networks' for BM development (Fjeldstadt & Snow, 2018), more attention should be devoted to the identification and alignment of value drivers such as 'network membership' (Chandna & Salimath, 2018).

To manage a BM effectively, joint BM development must advance to the extent that not only is the business logic between network members aligned but also the associated BMs are developed in a way that facilitates network-based BM management. In fact, greater engagement of network members and interconnecting value configurations will facilitate the development of 'value-creating territories' (Bankvall, Dubois & Lind, 2017; Hacklin, Marxt & Fahrni, 2009; Snihur, Lamine & Wright, 2018). Hence, BM researchers could work to discover more appropriate BM design options for network members involved in value co-creation (Demil et al., 2015). The 'demand' for insights from marketing in BM research is expected to gradually grow with the future evolution of network-based models (Robertson, 2017). For instance, a complex question in innovation-pervasive markets is how competition should be managed and value co-created (Nyström, 2009). Gatignon et al. (2017) suggested clustering various perspectives on value creation and capture in marketing and BM research, while Ehret and Wirtz (2017) call including consumers in value co-creation.

5.2 The predictive value of the business model concept

In line with Massa, Tucci and Afuah (2017), we question the predictive value of the BM concept. While it has served well as a paradigm for explaining 'business architecture' and for retrospective explanations why some companies outperform others (e.g., *Business model change* from the period from inception through 2011), the predictive value of a BM remains unclear. Any business success story (e.g., Amazon or Salesforce) can easily be attributed to 'business model' innovation (DaSilva et al., 2013), but whether BM research has helped to inform both theory and practice regarding the actions needed is questionable. Whether the theoretical underpinnings of the BM concept are sound and its value indisputable has yet to be addressed in the literature (Al-Debei & Avison, 2010; Batocchio, Ghezzi & Rangone, 2016; Schiavone, Paolone & Mancini, 2019). In addition, empirical research from the *Business model evaluation* cluster corroborates those findings. First, it demonstrates that firms are not empowered to evaluate future value contributions through the lens of their BMs (Bini, Danielli & Giunta, 2016). Second, in their own evaluations, firms fail to acknowledge the complementary nature of a given BM in connection with concepts such as dynamic capabilities and strategic agility (Battistella et al., 2017).

Methodological richness would improve the assessment of multiple BM designs in various industries and at various levels of analysis. Less conventional methods (for instance, qualitative comparison analysis as proposed by Täuscher, 2017) used in BM research have recently shown a

promising way of determining the practical value of BMs. After all, a pre-requisite for examining the value of a BM is to determine the relationships between BM research and various research domains.

5.3 Business model innovation capabilities

Whereas BM innovation was a sovereign concept in the past, our study shows that more recently it has become important to various innovation-related BM research sub-streams (see e.g., clusters from the 2012–2015 period). Consequently, 'BM innovation' has become a popular buzzword for various activities ranging from business process re-engineering to product innovation as well as the implementation of management novelties (Bogilović & Černe, 2018; Klun & Trkman, 2018). Nevertheless, 'innovation must include BMs' (Chesbrough, 2007), and with its radical character (Johnson, Christensen & Kagermann, 2008), BM innovation in successful firms is aimed at finding ways to re-design value creation and re-define value propositions for various stakeholders (Ramdani, Binsaif & Boukrami, 2019). External forces, especially in the presence of ambiguity in business ecosystems (Pohle & Chapman, 2006), affect the extent to which a BM is adapted (Saebi, Lien & Foss, 2017). The *Domain-based cluster* reveals that publications began moving into the study of BM innovation capabilities, suggesting the need to address the link between BM innovation and firm performance more thoroughly (Futterer, Schmidt & Heidenreich, 2018; Guo et al., 2017; Pati et al., 2018; Velu, 2016). To examine its performative nature, an initial attempt to develop a 'measurement scale' for BM innovation was made (Clauss, 2017).

Finally, it would be interesting to explore how widespread BM innovation and the disruptive era of digitalization shape research sub-streams and, vice versa, how the emergence of sub-streams such as work on network and enterprise architecture affects BM innovation, especially with the focus on value co-creation and value appropriation. Examining the interplay between BM innovation and network-based models is a promising area. Future research could investigate whether network-based models are meaningful artifacts that provide a 'common language' for stakeholders in larger networks. Joint innovation of a BM requires accounting for marketing, supply-chain management, strategic management and other perspectives to move a BM innovation beyond a focal-company perspective.

5.4 Business model ontology richness and the need for business model constructs

Drawing on previous research that has emphasized (mis)interpretations, vague conceptualizations of BMs, and the need for a unified understanding of BMs (Casadesus-Masanell & Ricart, 2010; Wirtz et al., 2016), our study investigates the presence of the BM concept in various research sub-streams by analyzing citation patterns, further suggesting a rethinking of the development of BM ontologies for BM analysis. Because ontologies as a set of elements with features and relations are not necessarily generalizable for or applicable to distinct research domains, we assert that the way ahead is to embrace the diverging development of BM ontologies. Subsequently, unequal emphasis on the elements and value-related dimensions of BMs can be expected in multiple domains (Al-Debei & Avison, 2010). For instance, a network-based ontology for industrial marketing management would probably require an emphasis on 'partners' (a BM element) and 'value co-creation' (a dimension). Also, the development of the so-called ontologies should be approached with a clear idea of the target audience and the unit of analysis (Plugge, Nikou & Bouwman, 2020). For instance, a customer- or firm-centered ontology would probably require an emphasis on value

propositions, whilst ontologies for BM portfolio management require an emphasis on the co-existence of various BMs (Trkman, Budler & Groznik, 2015).

The mission of the ontological-richness agenda is to address the context dependencies that established the need for a range of BM ontologies. Research could pursue the following contributions. First, studies could focus discussions and development of BM ontologies on a particular (or broader) domain of researchers and practitioners. Second, studies could investigate the role of BM ontologies in shifting to core questions regarding 'what BMs are for' and 'how valuable BMs are for a firm's performance' (Plugge, Nikou & Bouwman, 2020; Budler & Trkman, 2019). Third, while BM has long been acknowledged as a salient unit of analysis (see e.g., Zott, Amit & Massa, 2011) the development of a BM ontology should consider both the research domain (e.g., Sustainability) and the level of analysis (e.g., inter-organizational). While some BM ontologies adopt a firm-centric stance, others require a network-based view of the business ecosystem (Palo & Tähtinen, 2011). Also, the development and use of a particular BM ontology depends on its use at a given stage of BM development, implementation, or innovation, among other factors. The emergence of the *Sustainable development* cluster demonstrates the value of the BM concept for contemporary topics. Publications in that cluster investigate the need for and the possibility that the BM concept can be applied accordingly to new frontiers (see e.g., Evans et al., 2017; Frishammar & Parida, 2018; Ünal et al., 2019).

As various BM ontologies consider the importance of BM constructs differently, quantitative testing of BMs becomes a complex challenge. Elaborating on the work of Foss and Saebi (2017), we suggest that the way forward lies in stronger construct clarity that would enable quantitative testing. Despite the diversity of ontologies we find in BM research, efficient operationalization can be achieved only with unified clarity about certain BM constructs that are relevant to a particular research domain such as sustainability. Such clarity would enable a subset of researchers to develop a predictive theory and test it quantitatively. Finally, future research could develop subsets of clearly defined and measurable constructs with validated questionnaires, scales and hypothesized relationships that are suitable for a general audience or targeted research domains.

5.5 Inter-connectedness of business model research

Since the emergence of the BM concept it has become an increasingly attractive buzzword. To investigate the explanatory and predictive value of a BM concept, however, researchers, consultants, and practitioners from various communities (e.g., those involved in urban mobility, Industry 4.0, or sustainability) should deploy a BM mindset to depict organizational, network, and occasionally also intra-organizational BM(s) (see e.g., Amazon) (Berends et al., 2016) as well as to identify BM elements and capabilities that facilitate a future BM change.

In so doing, researchers would prevent 'BM' from becoming a buzzword and facilitate the inter-connectedness of various research domains. While a growing body of evidence demonstrates the convenient use of the BM concept for conceptualizing, describing, and re-designing those *New frontiers*, the value derived from such a BM approach remains unclear. The emergence of new frontiers entails the need for constant monitoring of a field's development. For instance, the value drivers, value-capture mechanisms, and effectuation logic associated with the BM concept can be complementary to the Industry 4.0, strategic flexibility, and internationalization domains (Gebauer, Haldimann & Saul, 2017; Metallo et al., 2018; Reymen et al., 2017). Finally, it is apparent that the number of either literature reviews or conceptual papers is large, as the BM concept has gained

widespread prominence (Wirtz et al., 2016; Li, Qiao & Wang, 2017; Ho, 2020), with the main topics and consequently keywords of this topic being well-known to many.

6 Conclusion

Our study contributes to a clearer understanding of how the advancement of BM research should be pursued by offering theoretical and methodological contributions. Methodological contributions pertain to complementing the prevailing approach (structured literature reviews) and bibliometric analyses with methods coding and historiography that can reveal most influential papers for a type of research that is broad in scope (Donthu et al., 2021). Theoretical contributions can be seen in structuring knowledge in BM research as a whole, yet providing a nuanced view in a temporal frame with clustering by over three time periods.

Bibliometric methods represent an objective and rigorous methodological approach to quantitatively examining a given type of research. Our study structures BM research by establishing patterns in different time periods. The combination of clustering and histiography a nuanced and complementary view of BM research. For instance, while the Value creation cluster has strong ties with other clusters and serves as a boundary spanner between the clusters, algorithmic historiography reveals a relatively low impact on then-future research.

This research establishes a foundation for future research avenues by drawing on major insights from a literature review and the sub-streams of BM research. Our work helps to understand how to advance the BM research. We assert it should be done in two ways: by strengthening connections between BM research sub-streams (intra-connectedness) and by facilitating connections between BM research and other domains (inter-connectedness). In this way, BM research would strengthen both its structure and coherence (see e.g., Nielsen et al., 2018).

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