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Foundations, the status quo, and future trends of the business model innovation process knowledge base

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Abstract: With the application of a science-mapping technique, the knowledge base of the business model innovation (BMI) process literature was systematically assessed. A total of 362 Scopus-indexed articles and conference papers from 2001 to 2018 were considered. This review uncovers the foundation, development, and future trends of the BMI process knowledge base. Moreover, this systematic literature review aims to connect the BMI process to two main disciplines: 1) strategic management; 2) innovation and entrepreneurship. Three schools of thought were identified: 1) new approaches to the BMI process; 3) antecedents and barriers to the BMI process; 3) strategic and sustainable decisions related to firm performance during the BMI process. The BMI literature is anchored equally in both disciplines, and hence a strategic entrepreneurship view is suggested for the process, especially since digital transformation is a relevant future avenue for BMI.

Keywords: business model innovation; BMI; process; science mapping; bibliometrics; systematic literature review.

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1 Introduction

Modern organisations face various challenges, such as governmental and regulatory changes, new competitors, and innovative technological progress (Casadesus-Masanell and Ricart, 2010; Cosenz and Noto, 2018; Habtay and Holmén, 2012; Hacklin et al., 2018; Keen and Qureshi, 2006). To remain competitive and defend against new market entrants, which are now often digitally based, firms must understand and adapt to their environment. Therefore, companies require a structured approach for innovating and adjusting their extant business model to the digital context (Latilla et al., 2020; Matzler et al., 2018). Recently, interest in business model innovation (BMI) has grown (Kraus et al., 2020; Maucuer and Renaud, 2019), especially in disciplines such as strategic management (Wirtz et al., 2010; Casadesus-Masanell and Zhu, 2013), innovation (Schneider and Spieth, 2013), and entrepreneurship (Trimi and Berbegal-Mirabent, 2012). A study in 2008 by IBM (2008) demonstrated that CEOs think intensively about BMI; 98% of the interviewed CEOs affirmed that they would launch widespread (69%) or modest (29%) BMI activities for their company in the next three years. In 2016, the IBM Global C-suite Study (2016) confirmed the trend, surveying 5,000 executives from 21 industries. The study results demonstrate that 80% of the interviewed CEOs had experimented with alternative business models or were considering doing so. BMI is a novel opportunity for organisations to respond to changing sources of value creation (Bouwman et al., 2018, 2019; Hacklin et al., 2018).

During the past two decades, different approaches (Frankenberger et al., 2013; Hacklin et al., 2018; Osterwalder and Pigneur, 2010; Schaller et al., 2018; Trapp et al., 2018) have been proposed to foster BMI. However, few academic works have been undertaken to define the concrete requirements of this innovation type. Generally, systematic perspectives of the business model concept as a whole and clear conceptualisations of the BMI process (Cosenz and Noto, 2018; Demil and Lecocq, 2010; Kim and Min, 2015; Trapp et al., 2018) are scattered.

2 Research objective and questions

This review aims to synthesise trends in the BMI process literature and connect the research field to the two main disciplines on which it is based: strategic management and innovation and entrepreneurship. The intention is to assess the foundation, development, and volume of the BMI process literature; detect leading journals, authors, and documents; determine the fundamental relevant disciplines; analyse the intellectual structure of the literature; and emphasise emergent trends. Consequently, the authors followed recommendations for systematic research reviews (Cooper and Hedges, 2009) to answer the following research questions:

1 RQ1: What is the foundation, total distribution, and volume of issued studies about the BMI process?

2 RQ2: Which authors, journals, and research articles based on which disciplines have had the highest impact on studies focussing on the BMI process?

3 RQ3: What are the intellectual structure, future trends, and emergent trends of the BMI process knowledge base?

As stated, the literature about the BMI process is scattered. Therefore, the objective of this article is to consolidate the actual research domain, identify the underlying discipline, and recognise future trends. This review provides a systematic, bibliometric analysis of academic trends recognised in Scopus-indexed documents.

The article utilises science mapping (Zupic and Čater, 2015) to discover trends in documents published in Scopus by applying a bibliometric synthesis. Through bibliometric analysis approaches, a more intelligible evaluation of accessible knowledge is conceivable (Van Eck and Waltman, 2017; Zupic and Čater, 2015). The ability to examine a significant amount of data and transfer it into useful information from a current dataset of studies is an advantage of bibliometric analyses. Bibliometric reviews apply quantitative calculations, which allow some rigour to be introduced in the literature review structure within the discipline of interest. Therefore, as Zupic and Čater (2015) have highlighted, those science-mapping methods can improve a review's quality through a systematic, transparent, and reproducible analysis.

3 Business model innovation

Before defining BMI, the term business model must be clarified. According to Teece (2010), the main objectives of a business model are to deliver value to the customer and generate revenue for the firm. The majority of the time, business models are represented in frameworks with multiple components, with the number of components differing depending on the author (e.g., Osterwalder and Pigneur, 2010; Schallmo, 2013; Joyce and Paquin, 2016; Wirtz, 2016; Lüdeke-Freund et al., 2018). The variation in the components is due to the different disciplines in which the business model literature is rooted, whether the strategic management or innovation and entrepreneurship disciplines (Maucuer and Renaud, 2019). The understanding of a business model for this study is the following: the business model represents the logic of a company, focussing on how it creates, delivers, and captures value around the customer value proposition (Johnson, 2010; Johnson et al., 2008; Richardson, 2008).

Although the concept has garnered recent academic interest (Kraus et al., 2020; Zott et al., 2011), little is known about how business models are innovated over time and adapt to developing business environments. Table 1 presents selected BMI definitions found in the literature; these are often cited and reflect the idea of the concept.

Hughes and Chafin (1996) have stated that processes attempt to accomplish important innovation activities, and thus their representations can be consulted as a management tool. The strategic management literature does not share this view since the BMI process

has been referred to as an outcome (Garcia and Calantone, 2002; Matzler et al., 2013). To understand the BMI process, one must analyse the basis of its derivation. Hartley (2006) has emphasised this argument, since outlining a process enables the recognition of obstacles and facilitators at certain steps, which can be relevant for practical application. Despite the critical view of normative process models to represent how innovation unfolds, practice indicates that they are well-established in business routines (Halecker, 2016). The reason for this usage is that such models reduce the complexity of a multifaceted phenomenon.

Table 1 Selected BMI definitions

Author(s)	*Definition BMI*
Markides (2006)	"Business-model innovation is the discovery of a fundamental different business model in an existing business" (p.20).
Comes and Berniker (2008)	"Business model innovation is the convergence of both a new profit model and a new customer value proposition, unified to create an entirely new type of market player" (p.78)
Skarzynski and Gibson (2008)	"At its essence, business model innovation is about creating fundamentally new kinds of businesses, or about bringing more strategic variety into the business you are already in – the kind of variety that is highly valued by customers" (p.111)
Osterwalder and Pigneur (2010)	"Ultimately, business model innovation is about creating value, for companies, for customers, and society" (p.5)
Bucherer et al. (2012)	"We define business model innovation as a process that deliberately changes the core elements of a firm and its business logic" (p.184)
Kaplan (2012)	"Business model innovation is a better way to create, deliver and capture value" (p.108).
Frankenberger et al. (2013)	"At root, a business model innovation can be defined as a novel way of how to create and capture value, which is achieved through a change of one or multiple components on the business model" (p.253).

Chesbrough (2010) has noticed that organisations have greater knowledge about the innovation process for technologies than for business models. One approach pursued in academia has been to create frameworks to represent the process with the intention for organisations to conceptualise novel business models. Some BMI process approaches are described in precise phases, starting with an idea stage followed by a development stage and then an implementation step (Frankenberger et al., 2013; Wirtz, 2016). This kind of procedure is closely linked to the innovation literature (Bucherer, 2010). It suggests that companies have to invent the new business model first and then implement it (Berends et al., 2016; Osterwalder and Pigneur, 2010). In a recent study, Bedi (2019) acknowledged that innovation capability is essential to improve business performance. Furthermore, the results reveal that a dynamic environment enhances the innovativeness of an organisation, in contrast to a stable business environment.

Table 2 Selected BMI process approaches

Steps / *Author(s)*	*Initiation*	*Ideation*	*Feasibility*	*Prototyping*	*Integration*	*Implementation*	*Monitoring and controlling*
Linder and Cantrell (2000)	Describing the actual business model	Developing the new business model				Changing the business model	
Pateli and Giaglis (2005)	Understand		Identify technology's influence			Change	
Chesbrough (2007)	Business model analysis	Experiment for innovation			Choosing the best concept	Implementation	
Johnson et al. (2008)		Value proposition development	Designing a profit formula			Identifying key resources and processes	
Bucherer (2010)	Business model analysis	Business model development				business model implementation	Business model controlling
Johnson (2010)	Understanding customers	Designing a new business model				Resources and processes for Implementation	
Osterwalder and Pigneur (2010)	Assembling all elements for new business model design		Research and analyse elements for business model design effort	Generate and test business model options and select the best		Implement the business model prototype	Adapt and modify the business model in response to market reaction
Frankenberger et al. (2013)	Initiation	Ideation			Integration	Implementation	
De Reuver et al. (2013)	Identify desired changes in the business model		Analyse the impact of the desired business model changes on other business model domains		Translate business model changes into specific activities	Back-casting of ideal transition path	
Schaller et al. (2018)	Evaluate		Analyse	Identify	Define		Revise

The ex-ante approach to BMI is represented by an active management plan involving suitable structural components (Cosenz and Noto, 2018; Johnson et al., 2008; Wirtz, 2016). Contrary to the supposition that business models are initially constructed and assessed on an analytical basis, some scholars have described the process of BMI as experimentation (Casadesus-Masanell and Ricart, 2010; Chesbrough, 2006; Sosna et al., 2010). This quality is due to rapidly changing external conditions (Bican and Brem, 2020; Ritter and Pedersen, 2020), which influence the decision to transform the business model. According to McGrath (2010), the fast-paced business environment leaves no room for in-depth analysis and thus pushes firms to investigate novel business models. These are increasingly dedicated to sustainability (Geissdoerfer et al., 2017, 2018; Cheah et al., 2018) and the digital transformation of the business model (Vendrell-Herrero et al., 2018; Bican and Brem, 2020). Parida et al. (2019) have combined the two research interests and have analysed how organisations can leverage digitalisation to transform their business model under the sustainability aspect. Given that BMI is a novel research domain, the process approaches display diverse understandings (Table 2).

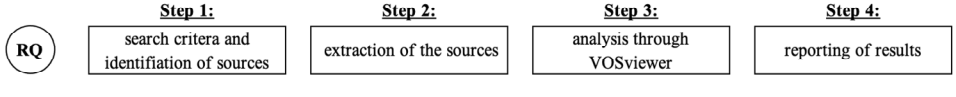
Some scholars have adopted a static understanding of the business model (Baden-Fuller and Morgan, 2010; Magretta, 2002). According to Demil and Lecocq (2010, p.227), this understanding "insists that the important word in the expression is 'model', and thus [focusses] on the coherence between its core components". In the static approach, the business model is seen as a blueprint which encompasses specific functions and activities. The main goal of this view is to describe how an organisation works. However, this perspective denies that business models may focus on transformation and thus must be considered as a progressive and changing concept influenced by internal and external environments (Cosenz and Noto, 2018; Demil and Lecocq, 2010; McGrath, 2008; Sosna et al., 2010). For example, Cosenz and Noto (2018) have stated that by combining generic business model representations with system dynamics modelling, an organisation can generate a strategy design tool that may bypass various constraints associated with a static perspective on business models. The second understanding denotes a transformational approach (Demil and Lecocq, 2010) in which either some components or the whole business model may change. The process aims to create a new business model that better fits the altered environment (Demil and Lecocq, 2010; Shirky, 2008) or to explore new growth possibilities for the existing business model. The transformational view allows organisations to reflect on their actual way of conducting business. Trapp et al. (2018) have proposed a BMI identification tool to evaluate whether a BMI project entitles as transformational. Essentially, the tool is based on five criteria which represent an operationalised definition of BMI. Other researchers have attempted to connect the BMI process to other theories or concepts. For instance, Vicente et al. (2018) have analysed how the development of dynamic capabilities improves the BMI process. Burtet et al. (2018) have suggested adopting open-source innovation as a business model, stating that it has a highly strategic aspect. Similarly, Tafti et al. (2019) have proposed a strategic alignment model for collaborative open innovation networks. Those studies have opened a new path for BMI and propose that organisations manage the process differently, centring on the improvement of their own capabilities while also looking to integrate network partners in the process.

4 Methodology

The study used a bibliometric review method to assess the BMI process research domain. The term bibliometrics has its origin in French language and is derived from bibliometrie. The terminology was first documented in Le livre et la Mesure – Bibliometrie by Paul Otlet (1934). According to Ferreira et al. (2014), bibliometrics employs quantitative techniques to systematically assess knowledge in a specific research field by connecting individual papers. Zupic and Čater (2015, p.15) have clarified that 'bibliometric software tools take raw bibliographic data (e.g., an export from Web of Science), perform bibliometric calculations, and calculate the similarity matrices between items (documents, authors, journal and words)'. The outcome can be represented in maps or classification tables (Boyack et al., 2009). This approach permits the researcher to uncover the dynamics and structure of a researched scientific domain. It is a quick way to immerse oneself in a research domain of interest and gain an initial glimpse of the research field's structure and network.

According to Nerur et al. (2008), bibliometrics have developed into a consistent approach for citation analysis. Today, bibliometric approaches make it possible to produce an comprehensible analysis of knowledge accumulation. Applications of the approaches in the management literature yield interesting findings, such as for roadmapping (Gerdsri et al., 2013), innovation in sustainable development (Vatananan-Thesenvitz et al., 2019), and digital business models (Schaller et al., 2019). The first step is the clarification of the search criteria and the identification of the sources (Figure 1). The authors used the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines established by Moher et al. (2009). Moher et al. (2009, p.265) have stated that the aim of the PRISMA 'is to help authors improve the reporting of systematic reviews and meta-analyses'. The second step is the refinement of the search. After fine-tuning the search by manually eliminating individual sources from the database, the authors extracted the data from Scopus as a .csv file. The third step concerned science-mapping research through bibliometric methods. The final step is the reporting and interpretation of the results in alignment with the research objective and the research questions.

Figure 1 Methodical approach to accomplish the objective of the research



Two databases can be called upon for such research: Web of Science by Thomas Reuters and Scopus by Elsevier. Data from Scopus was collected since it is often employed to create datasets for systematic literature reviews (Mongeon and Paul-Hus, 2016; Schaller et al., 2019; Vatananan-Thesenvitz et al., 2019; Zupic and Čater, 2015). Furthermore, it is the leading abstract and citation database of peer-reviewed literature, including academic journals, conference bulletins, and books. Mongeon and Paul-Hus (2016) have stated that Scopus has superior coverage compared to other scientific databases, thus better suiting research review purposes in management fields (Falagas et al., 2007). Likewise, when compared to other databases, Scopus allows easier export of data that fits bibliometric software (Kovačević and Hallinger, 2019; Zupic and Čater, 2015). The main

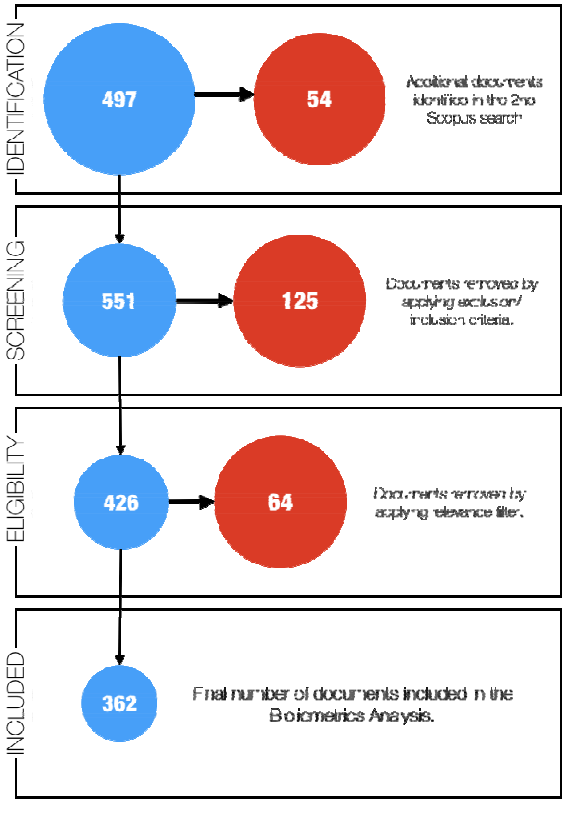
advantage when utilising Scopus as a source is that the citation and abstract database also accesses references, which are not initially included in Scopus (Zupic and Čater, 2015).

4.1 Research setup

The concept of BMI has also been termed business model evolution (Demil and Lecocq, 2010), business model reconfiguration (Massa and Tucci, 2013), business model renewal (Doz and Kosonen, 2010), business model transformation (Aspara et al., 2013; Berzosa et al., 2012), and business model design (Massa and Tucci, 2013; Osterwalder and Pigneur; 2010). Therefore, via the Boolean operators 'AND' and 'OR' and the wildcard character ('*'), the following search terms included in the title, abstract, and/or keywords were joined:

> 'business model innovation' OR 'business model design' OR 'business model transformation' OR 'business model renewal' OR 'business model reconfiguration' OR 'business model evolution' OR 'innovating business model*' AND process.

Figure 2 PRISMA flow diagram with detailed steps (see online version for colours)



Source: Adapted from Moher et al. (2009)

The search string was extended to the following keywords to cover additional documents:

> 'business model innovation process' OR 'business model design process' OR 'business model transformation process' OR 'business model renewal process' OR 'business model reconfiguration process' OR 'business model evolution process'.

No subject areas were excluded since valuable information may be gained from studies about the BMI process in specific domains (e.g., business model redesign in medicine for an ecosystem of actors). Those studies may provide a broader understanding of the specific process requirements for business models due to their diverse practical and academic origins. Nonetheless, in Scopus, each title, abstract, and keyword of an article was screened regarding its importance to the research topic. This study focuses only on journal articles and conference papers since a higher degree of quality control can be reached (Gerdsri et al., 2013). The period for this literature review was from 2001 to 2018 (full years). The following inclusion conditions were applied:

1 articles must be from journals or conference papers

2 papers must be written in English

3 papers must be relevant to the research topic.

Following the elimination of duplicate publications, the resulting documents were subsequently reviewed for advanced analysis. After screening of the records, 64 articles were excluded due to nonconforming literature, resulting in a sample size of 362 publications (Figure 2). The downloaded material included, in addition to author information, the following data: document titles, keywords, abstracts, and multiple citation data.

4.2 Data analysis

The study utilised VOSviewer to measure and visualise the BMI process-related literature. Van Eck and Waltman (2011) have defined VOSviewer as an application tool for generating maps based on network data. According to Van Eck and Waltman (2011), visualisation of similarities (VOS) mapping methods allow for a more suitable illustration of the retrieved data than representations generated through a multidimensional procedure. Therefore, in this study, VOSviewer software was employed to generate network maps of links among various BMI process knowledge base characteristics. The software was utilised to normalise the data based on association strength (Van Eck and Waltman, 2009). Furthermore, it enabled visualisation of the network analysis while controlling several parameters, and it incorporated a strong clustering tool based on Louvain's algorithm (Blondel et al., 2008). Notably, statistical tools utilised in the past, such as multidimensional scaling and principal cluster analysis (White and McCain, 1998), have progressively declined in usage due to the potential to visualise network analyses (Zupic and Čater, 2015).

Table 3 presents the types of analyses that can be employed in bibliometrics. Citation analysis refers to how often a document in the database is cited by other documents in the same dataset (Hallinger and Suriyankietkaew, 2018). Co-citation analysis means that the more frequently two documents are cited together, the more those two documents are connected (Zupic and Čater, 2015). This type of analysis can be employed in three distinct ways: journal co-citation analysis (JCA), author co-citation analysis (ACA), and document co-citation analysis (DCA). Applying co-citation analysis allows one to

analyse more documents than originally obtained from Scopus. This specific analysis considers all publications in the reference lists of documents comprised in the review dataset (Hallinger and Suriyankietkaew, 2018).

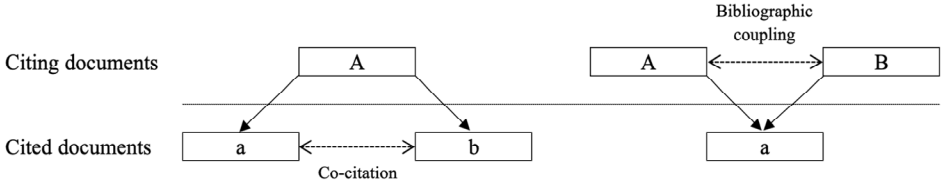
Table 3 VOSviewer manual description of analyses types

Type of analysis	*Description by VOSviewer manual*
Co-authorship analysis	The relatedness of items is determined based on their number of co-authored documents
Citation analysis	The relatedness of items is determined based on the number of times they cite each other
Co-citation analysis	The relatedness of items is determined based on the number of times they are cited together
Bibliographic coupling	The relatedness of items is determined based on the number of references they share

Source: Van Eck and Waltman (2013)

Although bibliographic coupling was introduced before co-citation analysis, the latter is more popular for literature reviews utilising science mapping (Zupic and Čater, 2015). Bibliographic coupling attempts to determine the degree of similarity between two documents by comparing their number of references. The more frequently the documents in the respective reference lists coincide, the stronger their link. Figure 3 illustrates the differences in the two types of analyses.

Figure 3 Co-citation analysis and bibliographic coupling



Source: Adapted from Vogel and Güttel (2013)

5 Results

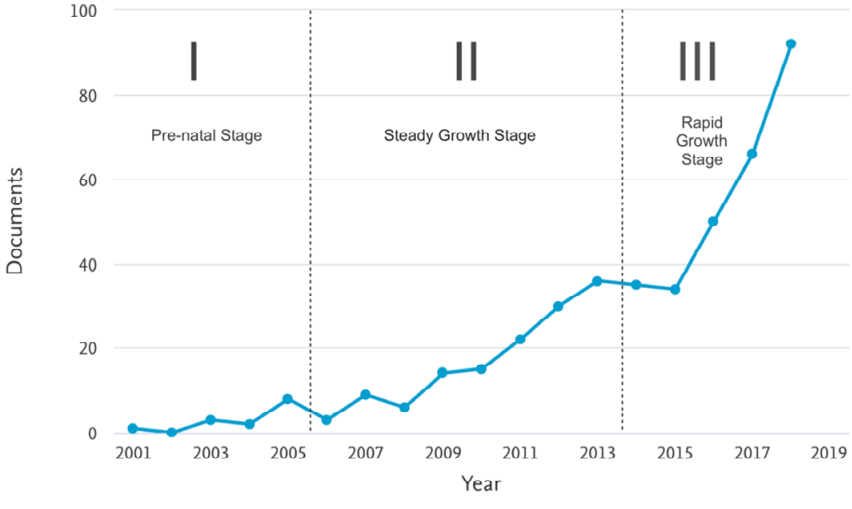
This section presents the results of the bibliometric review for the BMI process. First, the literature base and the development of the research field is presented, followed by the main contributing journals, authors, and articles, which provide insights into future trends.

5.1 Foundation, development, and volume of the BMI process literature

The first research question intends to discover the theoretical foundation, volume, and development of the BMI process literature. The 362 BMI process articles and conference papers gathered denote a modest knowledge base (Figure 4). The body of knowledge consisted of approximatively two-thirds journal articles and one-third conference papers. In 2010, the literature on the BMI process started to increase rapidly. Practitioners and

scholars became more interested in this topic, which resulted in an ever-higher number of publications, except in 2014 and 2015. The majority of documents were published between 2015 and 2018; thus, the growth trajectory reveals the increasing and recent interest in the BMI process topic. The overall trendline in Figure 4 indicates three temporal waves of BMI process literature. The first wave, from 2001 to 2005, is the prenatal stage, for which few publications were recorded. This stage can be perceived as the foundation stage of the business model literature when researchers attempted to grasp the concept of BMI. From 2008 to 2013, a steady growth stage can be identified. Academics focussed primarily on new ways to innovate the business model by proposing ever-new approaches. This was recognised as a top priority for CEOs who shared their views on innovations in the IBM Global Business Service Study 2006 (Pohle and Chapman, 2006). The final wave, from 2015 through today, can be classified as a rapid growth stage, characterised by high scholarly activity levels. In this period, many researchers have focussed on the digital transformation of the business model. Overall, the intensified research on the BMI process is explained by the numerous special issues in strategy and innovation management journals such as *Long Range Planning* (2013), *International Journal of Innovation Management* (2013), *R&D Management* (2014), and *Strategic Entrepreneurship Journal* (2015). Recently, *Harvard Business Review* featured ten 'must reads' (2019) dedicated exclusively to the research field.

Figure 4 Development path of the BMI process literature (see online version for colours)



Source: Scopus

Many publications, especially in the early phase, relate to authors who are also primary references in the general business model domain. Concretely, this means that independent literature about the BMI process has yet to emerge. It denotes that BMI is a research field of recent interest in which construct clarity is missing, but accumulating research efforts can be observed. Therefore, this research field has its roots in the business model literature (Foss and Saebi, 2017; Maucuer and Renaud, 2019).

Although the BMI process literature has seen exponential development in recent years, scholars in this research field cannot agree on a unified view, causing the emergence of divergent conceptual understandings (Kraus et al., 2020; Schneider and

Spieth, 2013). These ongoing conceptual heterogeneities have been explained based on several factors: missing theoretical underpinnings (Schneider and Spieth, 2013), the field's newness (Chesbrough, 2010), and the divergence in its definitions (Frankenberger et al., 2013). One main cause for the heterogenous development of definitions is that the BMI process has been advanced independently in different streams (Kraus et al., 2020; Schneider and Spieth, 2013). Therefore, this silo thinking indicates that the various BMI processes have advanced in separate disciplinary fields, mainly either in the strategic management or innovation and entrepreneurship research domains.

5.2 Revealing the disciplines by analysing the journals, authors, and articles

The next research question aims to discover leading journals, authors, and publications in the BMI process knowledge base and connect them to the strategic management and innovation and entrepreneurship disciplines. The most cited journals in this dataset are presented in Table 4 (with a threshold of at least five publications). *Long Range Planning* is mentioned most often, with 1,550 citations, followed by *R&D Management* (323) and the International Journal of Innovation with 315 citations.

Table 4 Top publishing journals on BMI process by the number of articles*

Rank	*Source*	*Documents*	*Citations*	*Strategic management*	*Innovation and entrepreneurship*	*Other*
1	*Journal of Cleaner Production*	16	115			x
2	*International Journal of Innovation*	14	315		x	
3	*Long Range Planning*	10	1550	x		
4	*R and D Management*	9	323		x	
5	*Journal of Business Strategy*	6	53	x		
6	*Research Technology Management*	6	55		x	
7	*Technological Forecasting and Social Change*	5	176			x
8	*International Journal of Entrepreneurship*	5	54		x	
9	*Procedia CIRP*	5	15			x

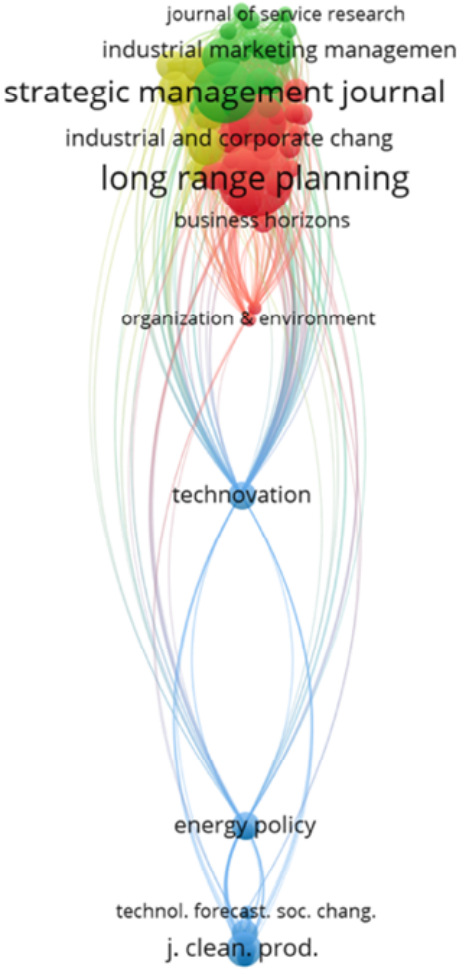
Note: *The classification of the references is based on the journal's positioning according to the Association of Business Schools listing (Cremer et al., 2015)

Source: VOSviewer

The articles' distribution in the individual journals indicates great diversity; however, most of the articles are issued in strategy, innovation, business, and management domains, based on the journals' positioning according to the Association of Business Schools listing (Cremer et al., 2015). This insinuates that the expansion of the BMI process relies on diverse research fields, and the process approach is considered from different angles.

Next, a JCA was applied to identify the journals with the highest similarity in research interests. Figure 5 portrays the 63 journals with the most citations. *Long Range Planning* has the most co-citations (980), which indicates a significant influence of this journal in the BMI process domain. Other journals with a high impact are *Strategic Management Journal* (569), *Harvard Business Review* (508), and *Journal of Cleaner Production* (305). From the journal representation, one can deduce that the development of the BMI process literature has strong strategic management roots. This insight has also been revealed by Maucuer and Renaud (2019) for the business model literature, where the majority of the cited publications are in journals with a strategic management background and are based on the classics (Barney, 1991; Porter, 1980, 1985; Teece et al., 1997) of the strategy research domain.

Figure 5 Journal co-citation network of the BMI process literature with a threshold of 20 citations (see online version for colours)



Source: VOSviewer

The nodes in Figure 5 are based on the quantity of co-cited papers issued by the journal. The journals are grouped using colours; those with the same colour tend to publish documents on related subjects. In this regard, Zupic and Čater (2015) have acknowledged that the journals within the same colour that are located near each other are inclined to be interested in the same intellectual topics. VOSviewer created four clusters for the JCA network structure regarding the BMI knowledge base:

- The red cluster comprises general strategic management journals, which are typically situated in an international context.
- The green cluster comprises strategic management journals of high quality, according to the Association of Business Schools (Cremer et al., 2015), and focuses on methodological aspects.
- The blue cluster comprises internationally oriented transdisciplinary journals that focus on environmental and sustainability research as well as technology management.
- The yellow cluster includes entrepreneurship and innovation journals.

The majority of journals, especially those with a considerable number of documents, are journals with a significant impact factor and thus contribute to the empowerment and structure of the BMI process research field. The yellow (entrepreneurship and innovation) and red clusters (strategic management) are located next to each other, highlighting the close link between these two areas in the BMI process literature.

Another advantage of bibliometric analysis is the ability to identify prominent scholars in a research area (White and McCain, 1998; Nerur et al., 2008). The authors with the most citations and thus the most impact in BMI process research are Chesbrough (871 citations), Christensen (743), Johnson (743), Kagermann (743), Demil (429), Lecocq (429) – each with only one document – and Gassmann (299), Lüdecke-Freund (296), Hansen (281), and Schalteger (281; Table 5). Leading contributors by the number of publications linked to the knowledge base of the BMI process are Lindgren (9), Brocken (8), Bouwman (7), and Ghezzi (7).

The 10 most cited articles are equally distributed between strategic management and innovation and entrepreneurship journals, suggesting that BMI process literature development depends equally on each discipline. This outcome is in accordance with Schneider and Spieth's (2013) findings, which connect BMI to the strategic entrepreneurship perspective.

Johnson et al.'s (2008) article illustrates the connection of the specificities of the two main disciplines by advising three essential steps to determine whether a company should innovate its business model. The first step is to articulate what makes the existing business model successful. The second step is to observe the business environment and detect signals which indicate that the business model is outdated. When a disruptive competitor is entering the market, other firms often need to follow the advantage-seeking logic of strategic management. The third step is to define whether the effort to change the business model will have a lasting influence on the market or industry. Here, the process relies on the entrepreneurial logic of opportunity seeking, which is characterised by Johnson et al. (2008) as introducing a less expensive or less complicated solution, capitalising on new technologies, or introducing a completely new solution to a problem.

To further elaborate on these traditional citation analyses, the authors extended the examination to DCA. This analysis assessed the degree to which publications in the retrieved dataset had been co-cited with publications in the reference lists of the other BMI process publications (White and McCain, 1998; Zupic and Čater, 2015; Table 6).

Table 5 Ten most cited BMI process articles, 2001–2018*

Author(s)	*Article*	*Cites*	*Strategic management*	*Innovation and entrepreneurship*	*Other*
Chesbrough (2010)	Business model innovation: opportunities and barriers	871	x		
Johnson et al. (2008)	Reinventing your business model	743	x		
Demil and Lecoq (2010)	Business model evolution: In search of dynamic consistency	429	x		
Schaltegger et al. (2012)	Business case for Sustainability: the role of business model innovation for corporate sustainability	224			x
Francis and Bessant (2005)	Targeting innovation and implication for capability development	195		x	
Malhorta (2005)	Integrating knowledge management technologies in organisational business processes: getting real-time enterprises to deliver real business performance	179			x
Cavalcante (2013)	Understanding the impact of technology on firms' business models	161		x	
Schneider and Spieth (2013)	Business model innovation: Towards an integrated future research agenda	145		x	
Enkel and Gassmann (2010)	Creative imitation: exploring the case of cross-industry innovation	145		x	
DaSilva and Trkman (2014)	Business model: what it is and what it is not	123	x		

Note: *The classification of the references is based on the journal's positioning according to the Association of Business Schools listing (Cremer et al., 2015)

Source: VOSviewer

This analysis revealed that, of the top 10 co-cited articles, the majority are from strategic management journals, which suggests that strategic topics positively influence the BMI process research field. The results also exposed scholars who contribute to the debate across both disciplines (strategic management and innovation and entrepreneurship), such as Amit, Chesbrough, Demil, Johnson, Teece, and Zott. These authors are recognised as 'boundary spanners' (Maucuer and Renaud, 2019), as demonstrated by one of the most frequently co-cited articles, 'Business models, business strategy and innovation' (Teece,

2010). The journals of the co-cited articles are primarily high quality (e.g., *Strategic Management Journal*, *Long Range Planning*, and *Harvard Business Review*), thus establishing and structuring the foundation of the BMI process knowledge base.

Table 6 Ten most co-cited BMI process articles, 2001–2018*

Author(s)	*Documents*	*Co-cites*	*Strategic management*	*Innovation and entrepreneurship*	*Other*
Chesbrough (2010)	Business model innovation: opportunities and barriers	117	x		
Teece (2010)	Business models, business strategy and innovation	111	x		
Zott and Amit (2010)	Business model design: an activity system perspective	100	x		
Zott et al. (2011)	The business model: Recent developments and future research	89			x
Amit and Zott (2012)	Creating value through business model innovation	73			x
Chesbrough and Rosenbloom (2002)	The role of business model in capturing value from innovation; evidence from Xerox Corporation's technology spin-off companies	58	x		
Morris et al. (2005)	The entrepreneur's business model: towards a unified perspective	54		x	
Demil and Lecocq (2010)	Business model evolution: In search of dynamic consistency	50	x		
Johnson et al. (2008)	Reinventing your business model	50	x		
Magretta (2002)	Why business models matter?	50	x		

Note: *The classification of the references is based on the journal's positioning according to the Association of Business Schools listing (Cremer et al., 2015)

Source: VOSviewer

The strategic logic in the BMI process literature provides a frame to innovate while pursuing a competitive advantage, whereas the entrepreneurial view promotes seeking and seizing new opportunities. The reason to combine both disciplines while innovating the business model is that a solely advantage-seeking approach is insufficient to reach sustained firm performance since market positions continually change due to new and disruptive challengers. Therefore, to stand out from the competition, firms need to be capable to react to those new entrants with innovative, entrepreneurial opportunity-seeking ideas.

A combination of both disciplines represents the strategic entrepreneurship view. Within this perspective, it is possible to simultaneously examine a firm's internal state

and its external ecosystem (Ireland et al., 2003). Here, the different possibilities and barriers to the use of novel practices have been uncovered (Certo et al., 2009; Ireland and Webb, 2009). This view is suitable when organisations face uncertainty since it requires them to react to changing value creation sources by restructuring the actual way of conducting business (Alvarez and Busenitz, 2001; Amit and Zott, 2010). This strategic entrepreneurship perspective supports growth and innovation through two factors: first, through product, process, and market opportunities (entrepreneurship) and, second, by ascertaining and developing continual competitive advantages (strategic management; Hitt et al., 2001). For BMI, both disciplines (entrepreneurship and strategic management) are equally vital and are complements rather than substitutes. Via adaptation of the strategic entrepreneurship view to BMI, the two fundamental disciplines are connected to the process, which ensures a consolidated approach that connects internal and external sources of value creation.

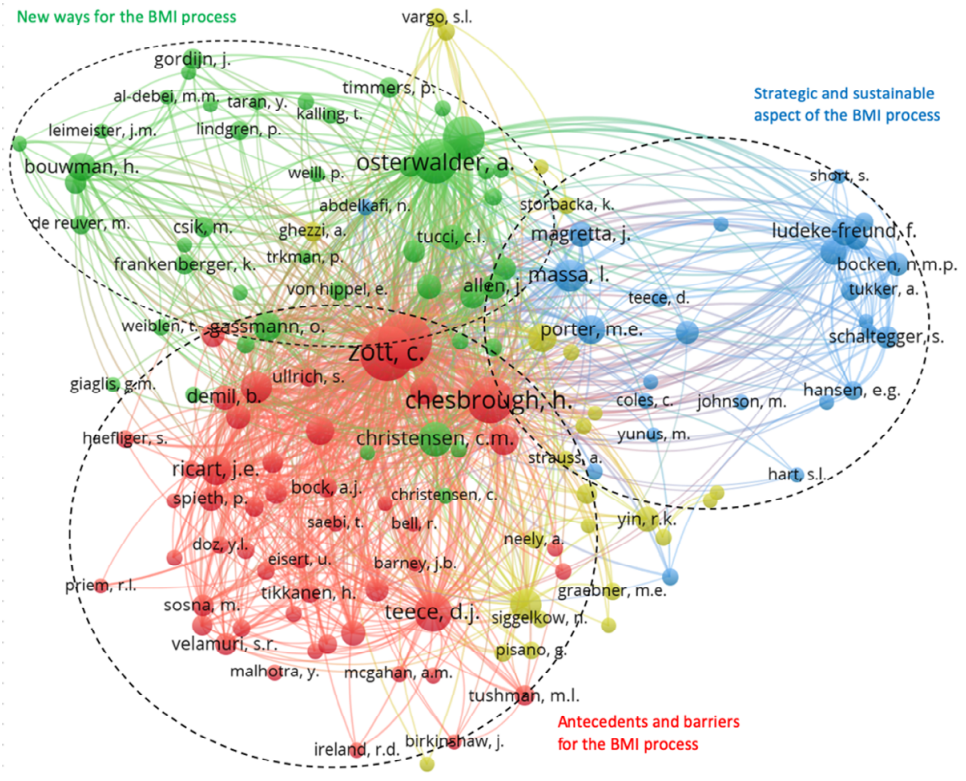
5.3 Intellectual structure, future trends, and emerging topics

The third research question asks about the intellectual structure, future trends, and emerging topics of the BMI process research field. For illumination, the authors utilised ACA, which allows one to develop an understanding of the prolonged effects of citations on a specific body of knowledge. The VOSviewer software calculates the author co-citations and creates a co-citation map that reveals similarities in authors' literature. Figure 6 presents an ACA network map for the BMI process literature.

Notably, the authors with the most co-citations were Zott (494), Amit (482), Chesbrough (340), Osterwalder (318), and Pigneur (272). The academics are represented by nodes, for which the following applies: the larger the node, the more co-citations the author has received and thus the greater the influence they have. The connections among the authors represent the number of co-cited papers printed in another publication. VOSviewer groups authors with similar research interests into coloured clusters. Those clusters can be seen as schools of thought that mirror common theoretical understandings (White and McCain, 1998; Zupic and Čater, 2015). The author co-citation map for the BMI process research field displays three schools of thought; the yellow nodes are unimportant due to their small size and dispersion.

The green cluster represents scholars who have attempted to discover new ways to innovate a business model with theories or concepts from other research domains, such as roadmapping (De Reuver et al., 2013; Schaller et al., 2018), collaboration (Johnson, 2010), systems thinking (Halecker and Hartmann, 2013), and system dynamics modelling (Cosenz, 2017; Cosenz and Noto, 2018). The central objective in this cluster is to offer analytical support for a BMI discovery-driven process. In this cluster, the BMI approaches focus on characterising the elements and processes as ongoing reactions to alterations in the business environment (Demil and Lecocq, 2010), evolutionary processes (Dunford et al., 2010), continuously repeating cycles (Schaller et al., 2018), and reiterative reiterating learning processes (Chanal and Caron-Fasan, 2010). The approaches in this cluster also highlight the need to reflect on double-loop learning (Moingeon and Lehmann-Ortega, 2010) and to see BMI as a discovery-oriented experimentation process instead of an analytical procedure (McGrath, 2010; Smith et al., 2010; Sosna et al., 2010).

Figure 6 ACA of the BMI process literature, 2001–2018 (see online version for colours)



Source: VOSviewer

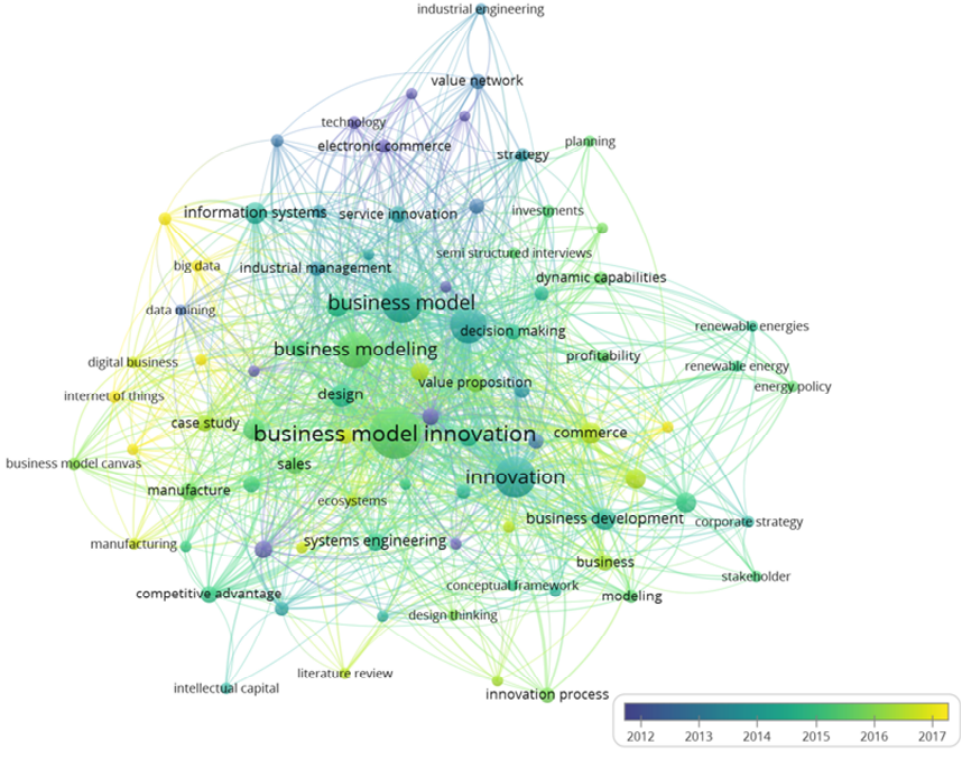
The red cluster considers not only antecedents but also potential barriers to the BMI process. Casadesus-Masanell and Ricart (2010) have described two phenomena that are responsible for prompting BMI. In the first phenomenon, companies that desire to conduct business in emerging markets need to innovate their business model due to the different economic, social, and cultural environments (Winterhalter et al., 2016). Doz and Kosonen (2010) have proposed the possible replication logic of a business model through the process of abstraction, analogical thinking, and adaptation. In their multiple case study analysis, the authors focussed on agility and flexibility within BMI. The second phenomenon, described by Casadesus-Masanell and Ricart (2010), involves post-industrial technologies, such as software, which demand entirely different business models. To successfully incorporate them into the business, those new technologies require disruptive business models (Khanagha et al., 2014). The literature has additionally discussed other antecedents to BMI, including stakeholder demands (Miller et al., 2014; Saebi et al., 2017; Velamuri et al., 2013), increasing globalisation of the business environment (Lee et al., 2012), shifting customer needs (Wirtz, 2016), changing competitive environments (Johnson et al., 2008; Markides and Oyon, 2010), technological progress (Baden-Fuller and Haefliger, 2013; Sabatier et al., 2012; Wirtz et al., 2010), strategic discontinuities (Doz and Kosonen, 2010), and crisis events (Sosna et al., 2010). Chesbrough (2010) has examined the barriers to the BMI process and has defined two specific types:

1 the structural or organisational barriers

2 the barriers of a cognitive nature.

The first type inhibits companies that prefer to concentrate their resources and capabilities in established areas where higher margins can be expected (Christensen, 1997). The second type is expressed in the inability to discover novel possibilities for conducting business. Bettis and Prahalad (1995) have observed that companies often rely on the dominant industry logic and thus are reluctant to engage in BMI. This type of barrier is also represented by the lack of defined responsibilities and leadership qualities for this change process (Chesbrough, 2010). Chesbrough (2010) has proposed that firms identify internal managers in charge of the change procedure for the business model by considering the organisation's culture, thus ensuring that the new business model is integrated adequately.

Figure 7 Temporal overlay on a keyword co-occurrence map for the BMI process literature, 2001–2018 (see online version for colours)



Source: VOSviewer

The blue cluster concentrates on the strategic and sustainable aspects of the BMI process (Magretta, 2002; Teece, 2010) and how the process might affect firm performance. In the scholarly debate, it has been acknowledged that BMI is a primary aspect in growth, corporate renewal, and survival (Nielsen and Montemari, 2012; Patzelt et al., 2008; Zott and Amit, 2007, 2008). Sabatier et al. (2012) have examined the impact of BMI on the dominant industry logic. Their research has noted that new entrants with traditional

business models adjust to the prevailing logic in developed markets. Conversely, disruptive business models challenge that logic by introducing new technologies which have the power to reshape established value creation processes. Another type of effect concerns individual company results. In an empirical research, Aspara et al. (2010) examined the economic effects of BMI, while Hall and Wagner (2012) investigated the influence of BMI on the sustainability management of a firm, and yet another study analysed the effect of BMI on a company's strategic flexibility (Bock et al., 2010, 2012).

Furthermore, the third research question aims to ascertain the topical foci in the BMI process knowledge base by utilising a keyword co-occurrence analysis. Zupic and Čater (2015, p.434) have stated, 'When words frequently co-occur in documents, it means that the concepts behind those words are closely related. The co-word analysis output is a network of themes and their relations that represent the conceptual space of the field'. We utilised the bibliometric software VOSviewer, set the search to all keywords, and limited the threshold to a minimum of nine cases (due to representation clarity) of a co-occurring keyword. The temporal keyword co-occurrence map (Figure 6) offers a visual representation of similarities and categorises themes regarding their prevalence across a specific timespan.

The research front of a knowledge base is dynamic by nature since new publications can influence scholarly activity (Hallinger and Suriyankietkaew, 2018). Consequently, the research front of a domain indicates the latest trend in the literature at a given time.

As expected, the most frequently co-occurring keywords in the dataset were BMI (177), business model (171), innovation (102), and business modelling (77). In addition to these co-occurrences, the following recent clusters (in yellow) – digital, big data, digital transformation, internet of things (IoT), and digital business – appeared. This result indicates that the topical foci, and thus the emerging topic of BMI, are heading toward digital business models with features such as the IoT, big data, and platforms. It insinuates that digital business models will be the new anchor point for organisations and a source of differentiation, competitive advantage, and opportunity exploitation. These results suggest a strategic entrepreneurship view as a discipline pillar for the BMI process literature.

Table 7 Change of business model components through digital technologies

Business model component	*Digital transformation*
Value proposition	Digitalisation and equipping products with new sensors (or effectors) imply the generation and consequently the collection of data and/or controllability.
Value creation	The digitalisation of automation technologies and of products facilitates highly automatised processes and ideally also accelerates the speed, resource efficiency, quality and flexibility of production.
Value delivery	Digital interfaces make it possible for companies to directly access their customers and to eliminate intermediaries. Conventionally unidirectional channels become bidirectional.
Value capture	The digitalisation of products and production processes often leads to service fees, brokerage revenue or income from lease and licensing rather than just selling products.

Source: Adapted from Prem (2015)

Digital transformation is recognised as a BMI activity (Schallmo et al., 2017a, 2017b), and it is a complex undertaking that encompasses significant opportunities and entails dissimulates substantial risks since it concerns reshaping the company. Becker et al. (2015) have proposed a link between digital transformation and business models, stating that BMI is the alteration of a business model by optimising company processes through information and communication technologies. Similarly, in relation to digitalisation, Botzkowski (2018) has recognised the partial or total transformation of business models by applying information and communication technologies to create value. Therefore, "exploiting digitisation goes hand-in-hand with BMI, which requires novel offerings and processes that define how value is created, delivered and captured between providers, customers, and other value chain actors" [Parida et al., (2019), p.2]. Table 7 illustrates the influence of digital transformation on individual business model components.

Commonly accepted is that digital transformation generates dramatic changes in product and service offerings, competitiveness, and performance through enterprise-wide automation and modernisation. Therefore, digital transformation projects typically have a strategic orientation and thus encompass the alignment of the whole company. Important in such transformation endeavours is the sustainability aspect. Bican and Brem (2020) have proposed a conceptual framework based on a case study regarding digital business models that sustainably relate to innovation and are guided by a digital transformation process. The objective while transforming the business model digitally is to ensure that the innovation occurs sustainably. Parida et al. (2019) have also proposed an approach by linking digitalisation, BMI, and sustainability in industrial settings. Concretely, the authors have suggested approaching the BMI process from the standpoint of its sub-dimensions (i.e., value proposition, value creation, value delivery, and value capture) to acquire a better understanding of the influence of digitalisation on the whole business and to lead it more sustainably.

Regarding future trends in the BMI process, the strategic entrepreneurship view is relevant since competition is becoming increasingly difficult to counter due to the introduction of new technologies and the novel possibilities to innovate a business model, which also represent new opportunities for organisations. Those opportunities must be capitalised on to gain a sustainable competitive advantage.

6 Discussion

This bibliometric review about the BMI process applied science mapping to increase knowledge of this domain by analysing 362 Scopus-indexed documents. The review was a first attempt to provide a reference for academics interested in this research field. It is a useful guideline concerning highly relevant articles and authors in the BMI domain. This part of the article emphasises limitations in the methodology, delineates the authors' interpretations of the findings, and suggests future research avenues.

6.1 Limitations

Although science mapping offers a methodical and quantitative way to gain an overview of a research field, it is not a substitute for traditional review methods which analyse substantive findings. Therefore, this review is an initial step which should be followed by review syntheses that examine the results of research in the BMI process domain.

Additionally, a limitation occurred due to the sole concentration on Scopus-indexed publications. Indeed, the database allows better coverage of the knowledge base of a specific domain than Web of Science, but it does not offer complete coverage of scholarly activity. This means that the overall literature base for the BMI process is likely broader than that considered in this study. The authors addressed this limitation by additionally utilising a co-citation analysis. This analysis reviewed all documents in the reference lists of articles that were integrated into the dataset. Therefore, a more comprehensive database than that originally considered in Scopus could be integrated in the study.

Another limitation is the sole incorporation of articles and conference papers in the database, which omits books or book sections. Therefore, relevant literature, such as the famous book by Osterwalder and Pigneur (2010), business model generation, was not included in the analysis.

6.2 Interpretation, implications, and future research avenues

The exponential growth trajectory of scholarly activity demonstrates that this research field is rapidly evolving in line with the fast-changing environment that forces organisations to innovate their business models. This trend indicates that scholars still do not agree with the process approaches currently offered and that a better-suited process for innovation is necessary, especially in the context of digital transformation. The various analyses of citations and co-citations of influential authors and documents have multiple implications. The authors of the present paper suggest that the authors of these documents be searched to acquire an initial impressions of the research field, allowing interested scholars to more quickly obtain a grasp of this research domain. White and McCain (1998) have affirmed that an advantage of the bibliometric approach is its ability to recognise predominant authors and documents through empirical investigation of the literature. This study's citation and co-citation analyses noted academics who have, to date, significantly impacted the progress of this research field. Those scholars are Chesbrough, Christensen, Johnson, Kagermann, Demil, Lecocq, and Gassmann. Likewise, this review acknowledged central publications that have formed the development of the literature.

To evaluate the embeddedness of the BMI process literature, this study compared articles to the two main disciplines responsible for developing the research field: strategic management and innovation and entrepreneurship. The authors' basic assumption was that added nuance could help with deciphering the underlying dynamics of the concept and the evolution of the BMI research field. The various analyses determined that the BMI process literature is jointly based on both disciplines, with slightly deeper roots in strategic management. Indeed, scholars from both disciplines cite identical references irrespective of their scientific habit. Therefore, this research offers a scientific indication that aligns with Schneider and Spieth's (2013) observation that the most appropriated theoretical foundation for the BMI process is the strategic entrepreneurship perspective. Therefore, the evident heterogeneity of definitions in the research literature (Schneider and Spieth, 2013; Kraus et al., 2020) is not an outcome of divergent development among scholars. The authors of this review provided scientific evidence that the BMI processes have been jointly developed and formed by the disciplines of strategic management and innovation and entrepreneurship.

The ACA revealed that the BMI process research field is represented in three broadly defined schools of thought. Those individual clusters are the green cluster with new BMI process approaches; the red cluster with requirements and barriers to the BMI process; and the blue cluster, which focuses on strategy and sustainability aspects during the BMI process. This diversity in the literature exemplifies that the BMI process is a complex undertaking. Managerial implications can be deduced from the fact that the world is changing quickly and that, in the future, two topics will be important for business models and their innovation: digital transformation and sustainability. To accomplish the digital transformation of their business model in a sustainable way, practitioners should rely on the strategic entrepreneurship view by pursuing exploitation and exploration activities within their BMI endeavours. Academics should advance a holistic approach to the process, including how to overcome barriers, pinpoint specific requirements, find alignment with an organisation's strategy, and develop a long-term sustainability perspective.

In the keyword analysis, many recent keywords were associated to the digital transformation of a business model. Keywords like data mining, industry 4.0, big data, and IoT appeared and are, among other things, the next value-creating opportunity for organisations. However, the exact path of the digital transformation process for business models has not been studied to date. Different approaches have been proposed in the literature (Becker et al., 2017; Kreutzer, 2017; Schallmo et al., 2017a, 2020), but a unified view will seemingly not be reached soon. Indeed, other scholars have observed that authors are addressing this phenomenon with different theoretical perspectives and thus advancing various process approaches. Nonetheless, the authors of this review suggest that the BMI process literature concentrate on the digital transformation of business models, the antecedents and requisites for digitalisation, the specificities of the process, and the potential outcomes for future digital business models.

Research should further focus on research methodologies and deduce a well-suited approach for the BMI process domain. A sustainable transformation path from an established to a prospective business model has not been well developed, which is reflected in the lack of recommended activities while undergoing this process. Particularly with the fast-advancing digital transformation, a roadmap for the process is needed as a guideline for companies to ensure sustainable implementation. This review posits that BMI process research may benefit from theoretical input from systems thinking, roadmapping, dynamic system modelling, and other literature streams which might support resolving the actual disagreement in the BMI process research domain and offer guidance for digital transformation.

7 Conclusions

The findings from this review provide a baseline for further exploration of the specific features of the BMI process. The review contributes to the academic development of the BMI research domain by offering a citation-based and thus unbiased synopsis of the underlying knowledge structure. This bibliometric literature review is the first of its kind for the BMI process research field. It differentiates itself from other BMI reviews (e.g., Foss and Saebi, 2017; Schneider and Spieth, 2013; Spieth et al., 2014; Taran et al., 2015) through two qualities. First, this review sought to develop an inclusive understanding of the BMI process literature by connecting it to its disciplinary specificities. Second, it

applied science-mapping methods to deliver a systematic and bibliometric overview of the research field (e.g., BMI process), thus offering greater neutrality and accuracy than traditional literature reviews (Tranfield et al., 2003). The main contribution of this review is that it enriches comprehension of the evolution of the BMI process literature and offers a more historical view of its foundation, thus enabling determination of its future direction, oriented towards digital transformation and sustainability to achieve business models with a competitive advantage.

The limitations of this review (e.g., only documents published in journals and conference papers as well as the focus on Scopus-indexed publications) point to promising avenues for future research in this domain. From a methodological perspective, future research should focus on integrating other disciplines that might benefit the BMI literature (e.g., roadmapping or systems thinking), hence supplementing these results and the actual debate.

Although there are some limitations, this article provides an overarching impression that includes the approach's past, present, and future. Therefore, it is suitable as a starting point for researchers new to the field who want to join the conversation, especially because it investigates the abundant BMI literature and bypasses several biased conceptual propositions in this research domain.

One observation of this review is that the predominant authors and publications are also those found for the general research field of business models. Therefore, a specific knowledge base for the BMI process has not yet emerged. Likewise, Foss and Saebi (2017, p.201) have affirmed that "the literature does not seem to have aspirations of developing a distinct theory of BMI". Consequently, we propose simplifying and clarifying the concept, as well as developing theoretical models based on cumulative empirical studies to structure this stream of management research.

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