



DOI 10.2478/sbe-2024-0040

SBE no. 19(2) 2024

INTEGRATING SUSTAINABILITY AND DIGITALIZATION IN BUSINESS MODEL INNOVATION. A BIBLIOMETRIC STUDY

Claudia OGREAN

Lucian Blaga University of Sibiu, Romania

Mihaela HERCIU

Lucian Blaga University of Sibiu, Romania

Mihai TICHINDELEAN

Lucian Blaga University of Sibiu, Romania

Abstract:

The aim of the study is to get a comprehensive understanding of the research landscape at the nexus between business model innovation, sustainability and/or digitalization, in order to determine key research patterns and trends. Accordingly, the following objectives have guided the development of the paper: (a) to examine the dynamics and structure of the research output (articles and citations) on the topic; (b) to explore the network of the most impactful articles; (c) to trace the origins of the research on the topic; (d) to decipher current developments in the research on the topic; and (e) to search for emerging trends in the research on the topic. An advanced search of the SCOPUS database was conducted to identify the relevant literature available; 1195 articles (published between 2014 and 2023) were selected and exported in VOSviewer for bibliometric analysis. The results suggest the emergence of a niche research area in the broad strategic management field, bringing together four related (sub)topics: (1) circular economy and sustainable business models; (2) tools, frameworks and processes for sustainable business model innovation; (3) digitalization and business model transformation; (4) business models for societal and sustainability transitions. For this research area to crystallize, the identified emerging research trends – on digital innovation and technology; strategic management and analytical methods; supply chain and manufacturing; policy, governance and sustainability – need to be further explored, both individually (in search of refinement and clarity) and collectively (in search of consistency and synergy).

Key words: *business model, innovation, sustainability, digitalization, VOSviewer*

1. Introduction

In its broadest sense, the **business model** depicts the logic behind how a business creates, delivers and captures value (Osterwalder et al., 2010). Conceived as “a system of interdependent activities” (Zott & Amit, 2010) that enables value creation and appropriation,

the business model provides a roadmap for how the business plans to operate, compete and succeed on the market. In general, though, the market is far from stable, and in order for a business to remain competitive, its business model must adapt (Saebi et al., 2017) or evolve (Demil & Lecocq, 2010). On the other hand, market dynamics may occasionally lead to the disruption of established industries and/or the emergence of new ones, bringing new business models into the market (Geissdoerfer, Morioka, et al., 2018) and/or transforming traditional ones (Loebbecke & Picot, 2015). Consequently, a wide variety of choices and endeavors are included under the generous umbrella of **business model innovation**.

The relevance of (business model and especially) business model innovation takes on new meanings when broader/global societal transitions occur, involving fundamental changes in how societies function and interact; this is the case with the **sustainability transition** (Bolton & Hannon, 2016) - and the rise of sustainable / circular business models, as well as with the **digital transformation** (Bouwman et al., 2019) - and the ascent of digital business models. The impact that the two transitions' (temporal) overlap has on business model innovation (research) serves as the foundation for this study, leading to the following **research questions**: (1) what is the intellectual structure at the intersection between business model innovation, sustainability and/or digitalization?; and (2) how might integrating sustainability and digitalization into business model innovation (research) foster synergies in the field?

When searching for "business model innovation" (by the "Article title, Abstract, Keywords" field), SCOPUS database returned a total of 3023 documents from 2000 to 2023; narrowing the search, by adding *sustainab** (to include sustainability related topics) and *digit** (to include digitalization related topics), 154 documents were return between 2004 and 2023. None of these articles fully addresses the intersection of *business model innovation, sustainability, and/or digitalization*, even though they discuss key issues related to the topic of interest, such as: "transformative sustainable business models in the light of the digital imperative" (Brenner, 2018), "digitalization, business model innovation, and sustainable industry" (Parida et al., 2019), "industry 4.0, digitization, and opportunities for sustainability" (Ghobakhloo, 2020), "digital technologies catalyzing business model innovation for circular economy (Ranta et al., 2021), "entrepreneurship, digital capabilities, and sustainable business model innovation" (Gao et al., 2022), or "the mechanism of sustainable business model innovation driven by the digital platform ecosystem" (X. Li et al., 2023).

Against this background, the **aim** of the study is to get a comprehensive understanding of the research landscape at the nexus *between business model innovation, sustainability and/or digitalization*, in order to determine key research patterns and trends. Accordingly, the following **objectives** have guided the development of the paper: (a) to examine the dynamics and structure of the research output (articles and citations) on the topic; (b) to explore the network of the most impactful articles; (c) to trace the origins of the research on the topic; (d) to decipher current developments in the research on the topic; and (e) to search for emerging trends in the research on the topic.

2. Research Methodology

An advanced search of the SCOPUS database was conducted utilizing proximity and boolean operators to identify the body of literature available at the intersection of *business model innovation*, *sustainability*, and/or *digitalization*. The SCOPUS database was chosen (rather than Web of Science) primarily because of its broader coverage (Singh et al., 2021) – taking into account the subject’s complexity and cross-disciplinary nature on the one hand, and its use in systematic literature reviews on related topics on the other (Acciarini et al., 2023).

In response to the search query (Table 1), SCOPUS returned 1263 records spanning the years 2000 (when the first article on the subject is registered) to 2023 (the most recent full year); nonetheless, nearly 95% of the articles (1195, or 94.6%) were published within the last ten years (2014-2023). These articles were then considered for analysis, in search of the most recent findings and trends.

Table 1. Identification and selection of documents for analysis

SCOPUS database	# records
1. Identification of documents	
Query in SCOPUS: Search within Article Title, Abstract, Keywords; Year: 2000-2023 [innov* W/2 "business model*"] AND [sustainab* OR green OR digit*]	n = 2461
2. Filtering of results	
By Language: English Excluded: Chinese, German, Spanish, Russian, Portuguese, Japanese, Italian, French, Ukrainian, Polish, Bosnian	n = 2407
By Document type: Article Excluded: Conference paper, Book chapter, Review, Book, Conference review, Editorial, Short survey, Note, Retracted, Letter, Erratum	n = 1310
By Publication stage: Final Excluded: Preprint	n = 1273
By Source Type: Journal Excluded: Trade Journal, Book series	n = 1263
3. Documents included in the analysis	
Timespan: 2014-2023	n = 1195

Source: Authors (based on SCOPUS data)

The resulted 1195 documents were exported (as CSV file) in VOSviewer (version 1.6.20), which is one of the preferred software tools used for bibliometric analysis (Tomaszewski, 2023). Data cleaning was then made using a thesaurus file (van Eck & Waltman, 2023) of merged terms - i.e., abbreviations and full phrases, singular and plural forms, British and American English spellings, different styles in cited references (for authors’ names and journals).

The analysis included both the statistical assessment of publications and citations (by year, journal, subject area, author, and country), and the examination of the visual maps built on bibliometric data. For the later, to determine the interconnections between the main interest topics, as well as their dynamics over time (Donthu et al., 2021), citation analysis

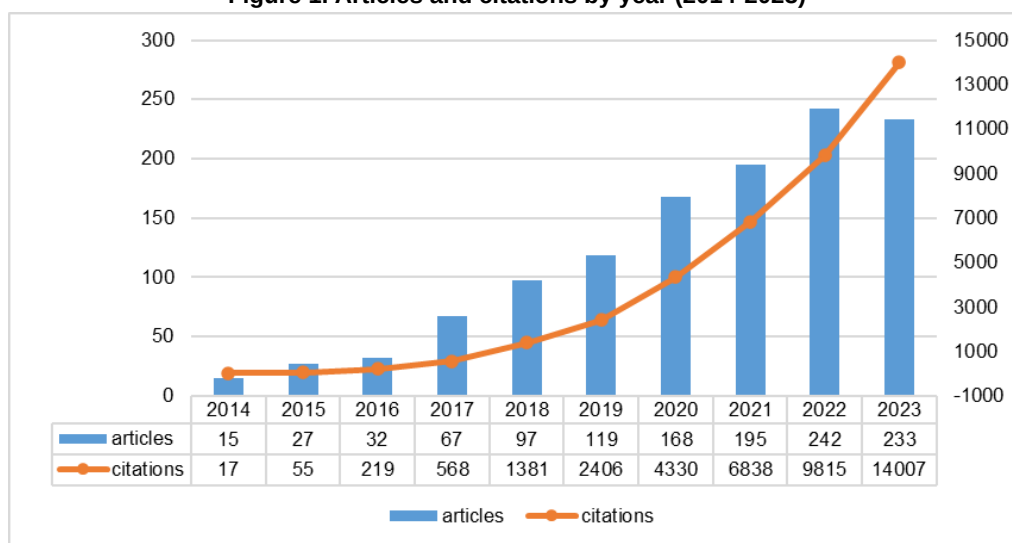
(using documents as unity of analysis), co-citation analysis (using cited references as a unit of analysis), bibliographic coupling (using documents as a unit of analysis), were combined with the co-word analysis (based on the co-occurrence of author keywords).

3. Data Analysis and Results

3.1. Publication- and citation-related statistics

A total of **1195 articles** covering the research area at the intersection between *innovation in business models / business model innovation*, on the one hand, and *sustainability and/or digitalization*, on the other hand, were published between 2014 and 2023 in SCOPUS journals; together, they collected 39636 citations during the analyzed timespan (Figure 1). About one in five of the articles (238, or 19.9%) were released in the first half of the decade (2014–2018), while four out of five articles (957, or 80.1%) were released in the second half (2019–2023); when it comes to citations, only about 5% of all citations (2240, or 5.7%) were accumulated between 2014 and 2018, and 95% of them (7396 citations, or 94.3%) were reached between 2019 and 2023. Overall, an average increase per year in published papers of 32.9% corresponds to an average increase per year in citations of 124.7%.

Figure 1. Articles and citations by year (2014-2023)



Source: Authors (based on SCOPUS data)

More than nine tenths of the articles (1116, or 93.4%) have been cited at least once; the average number of citations per cited article is 35.5, and the h-index is 103. Also, there are ten articles that received more than 500 citations between 2014 and 2023, all of them being published in the last half of the decade (Table 2).

Table 2. Most cited articles (≥ 500 citations 2014-2023)

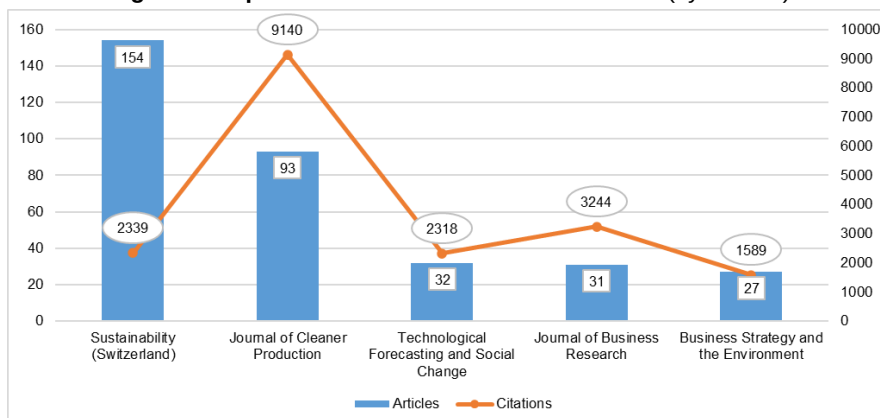
Topic	Reference
1. Digital transformation: A multidisciplinary reflection and research agenda	(Verhoef et al., 2021)
2. Additive manufacturing and sustainability: an exploratory study of the advantages and challenges	(Ford & Despeisse, 2016)
3. Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems	(Autio et al., 2018)
4. Reflections on societal and business model transformation arising from digitization and big data analytics: A research agenda	(Loebbecke & Picot, 2015)
5. Fortune favors the prepared: How SMEs approach business model innovations in Industry 4.0	(Müller et al., 2018)
6. Business model innovation for sustainability: Towards a unified perspective for creation of sustainable business models	(Evans et al., 2017)
7. The triple layered business model canvas: A tool to design more sustainable business models	(Joyce & Paquin, 2016)
8. Business models and supply chains for the circular economy	(Geissdoerfer, Morioka, et al., 2018)
9. From rapid prototyping to home fabrication: How 3D printing is changing business model innovation	(Rayna & Striukova, 2016)
10. Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective	(Frank et al., 2019)

Source: Authors (based on SCOPUS data)

There are **486 journals** hosting the 1195 articles. Of them, 5 journals published more than 20 articles each on the topic, accounting for over a quarter of all the articles (337, or 28.2%). Another 47 journals published between 4 and 19 articles each, contributing about another quarter of the total (308 articles, or 25.8%); finally, 434 journals published between one and three articles each, making up nearly half of all the articles (550 articles, or 46%). Overall, there are 31 journals (6.4% of all journals) with 5 articles or more published on the topic; together they host 561 articles (46.9% of all articles).

Over 90% of the journals (454, or 93.4%) were cited at least once, while 70 of them (or 14.4%) were cited at least 103 times (the h-index equivalent). The top five journals by the number of published articles are: *Sustainability (Switzerland)*; *Journal of Cleaner Production*; *Technological Forecasting and Social Change*; *Journal of Business Research*; and *Business Strategy and the Environment*. Combined, these journals account for over 25% of all articles and nearly 50% of all citations (18630, or 47%), although representing less than 1% of all journals (Figure 2).

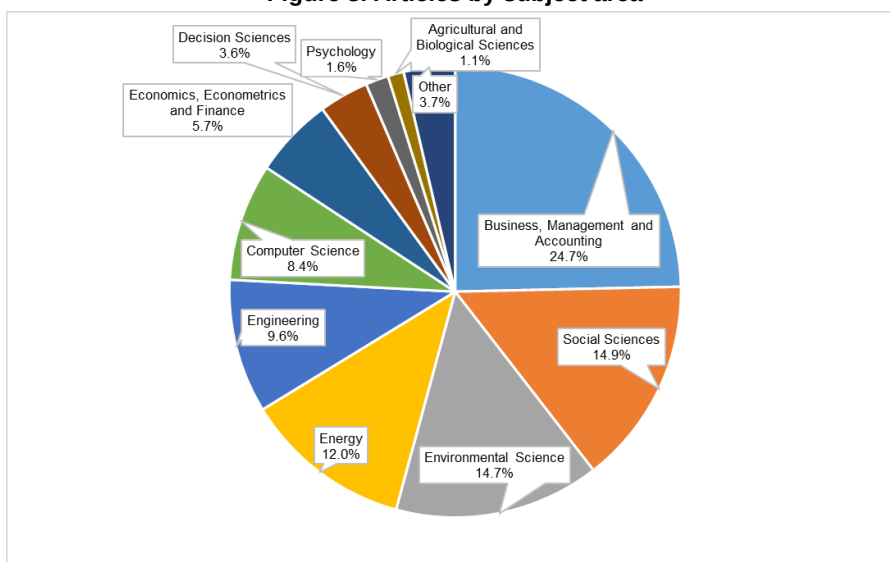
Figure 2. Top 5 Journals – Articles and Citations (by articles)



Source: Authors (based on SCOPUS data)

If considering the **subject areas** of the 486 journals, and implicitly of the published articles (N.B. each journal is categorized by SCOPUS into one or more subject areas, based on its overall scope and focus), there are 22 different entrances overall (Figure 3). Of them, *Business, Management and Accounting* is the best represented one, with 692 articles (57.9% of all articles), followed by *Social Sciences* (417 articles, or 34.9%), *Environmental Science* (413 articles, or 34.6%), *Energy* (338 articles, or 28.3%), and *Engineering* (269 articles, or 22.5%). Other relevant subject areas are *Computer Science* (236 articles, or 19.7% of all articles), *Economics, Econometrics and Finance* (161 articles, or 13.5%), *Decision Sciences* (100 articles, or 8.4%), *Psychology* (46 articles, or 3.8%), and *Agricultural and Biological Sciences* (32 articles, or 2.7%).

Figure 3. Articles by subject area



Source: Authors (based on SCOPUS data)

The 1195 articles are the result of contributions from **3237 authors**. About a tenth of the articles are single authored (133 articles, or 11.1%) while nine tenths are co-authored (1062 articles, or 88.9%). If considering the total of 3237 authors contributing to the 1195 articles, it results in an average of 2.7 authors per paper. There are 26 authors (less than 1% of all authors) with five or more articles published on the topic (Table 3).

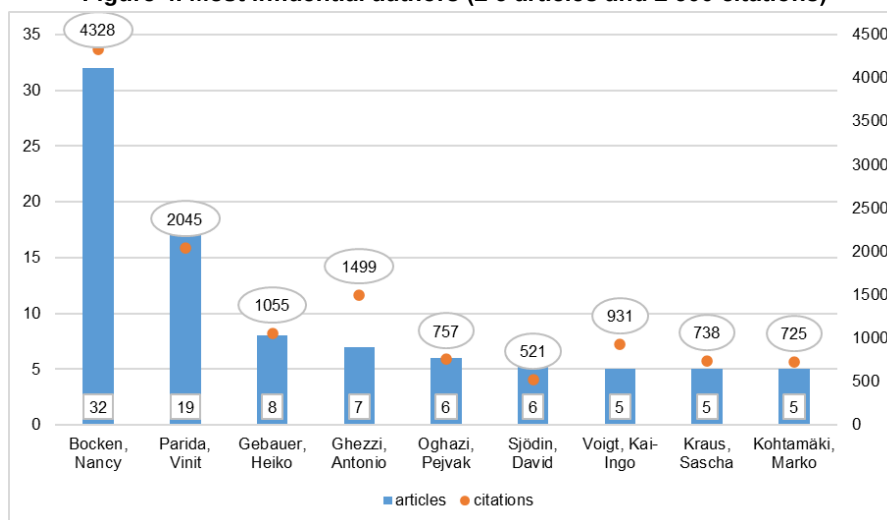
Table 3. Most prolific authors (≥ 5 articles)

Rank	Authors	Articles
1	Bocken, Nancy	32
2	Parida, Vinit	19
3 - 4	Elidjen; Sasmoko	11
5	Alamsjah, Firdaus	9
6 - 8	Gebauer, Heiko; Hoveskog, Maya; Lindgren, Peter	8
9	Ghezzi, Antonio	7
10 - 12	Oghazi, Pejvak; Sjödin, David; Trabucchi, Daniel	6
13 - 26	Baumgartner, Rupert J.; Buganza, Tommaso; Carayannis, Elias G.; Donner, Mechthild; Gomes, Clandia Maffini; Halila, Fawzi; Kneipp, Jordana Marques; Kohtamäki, Marko; Kraus, Sascha; Krcmar, Helmut; Messeni Petruzzelli, Antonio; Mihardjo, Leonardus; Spieth, Patrick; Voigt, Kai-Ingo	5

Source: Authors (based on SCOPUS data)

More than 90% of the 3237 authors (3027 or 93,5%) have been cited at least once, and about a tenth of them (338 authors or 10.44%) have been cited at least 103 times (the h-index equivalent). There are 62 authors who received 500 citations or more; of them, 26 contributed to only one article each, 27 contributed to between two and four articles each, 7 contributed to 5 to 8 articles each, while one contributed to 19 articles and another to 32 articles. On the other hand, there are 9 authors who contributed to five or more articles and received 500 citations or more (Figure 4).

Figure 4. Most influential authors (≥ 5 articles and ≥ 500 citations)



Source: Authors (based on SCOPUS data)

The 3237 authors are based in 89 different **countries/territories** (Figure 5). Of these countries, there are five which contributed with more than 100 articles each (*Germany, Italy, United Kingdom, China* and *Sweeden*), and another six countries which contributed between 50 and 100 articles on the topic each (Table 4).

Figure 5. Distribution of articles by countries/territories

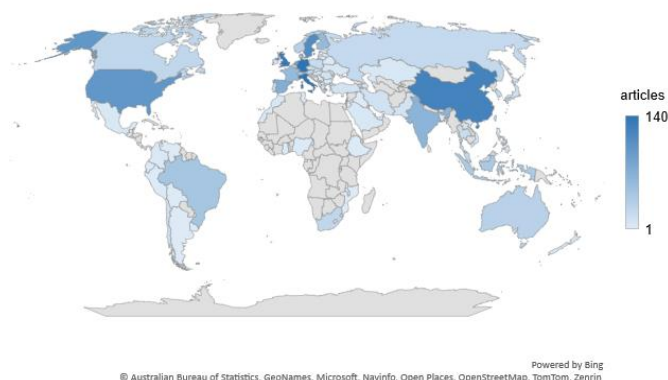


Table 4. Countries (≥ 50 articles)

Country	Articles
1. Germany	140
2. Italy	140
3. United Kingdom	135
4. China	123
5. Sweden	112
6. United States	99
7. Netherlands	86
8. Spain	73
9. India	65
10. Finland	58
11. France	57

Source: Authors (based on SCOPUS data)

3.2. Science mapping

Citation analysis – exploring the network of the most impactful articles

The citation analysis – using documents as the unit of analysis and 103 (the h-index equivalent) as the minimum number of citations of a document – led to 103 articles that met the threshold. The largest set of connected items being 54, these articles were further considered for analysis. Upon setting the minimum cluster size to 10, the resulting citation map, which basically compiles the most influential articles (and authors) of the decade (2014-2023) as well as the links among them, exhibits four clusters (Figure 6).

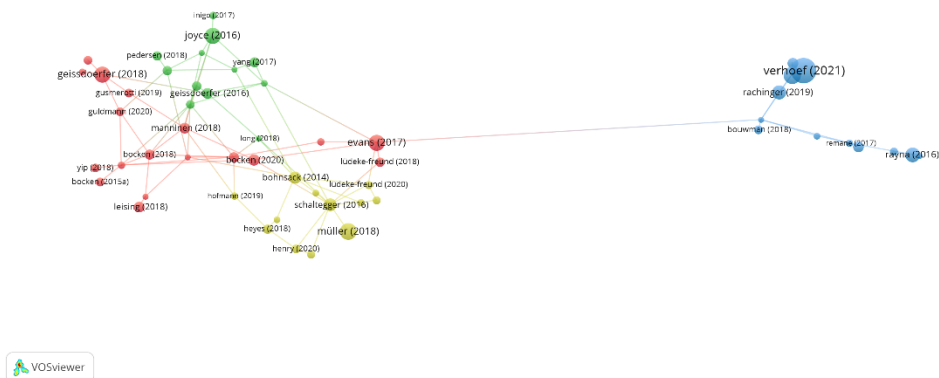
The citation map's four clusters allow for the identification of the following key research directions (and related subtopics) at the nexus of *business model innovation, sustainability* and/or *digitalization*:

Cluster 1 (red) comprises 18 articles contributing to the advancement of knowledge on **circular economy and sustainable business models**; based on the concerns addressed by these articles, three subthemes can be identified:

- **creating and innovating sustainable business models** - in relation to sustainability (Evans et al., 2017), and considering (the transition of) different industries/sectors - i.e., production (Diaz Lopez et al., 2019), banking (Yip & Bocken, 2018), and mobility (Sarasini & Linder, 2018). Organizational means, such as “sustainable business experimentation capability” (Weissbrod & Bocken, 2017), and goals like “sufficiency-driven business model” (N. M. P. Bocken & Short, 2016), or “resource-efficiency, circularity and cleaner production” (Diaz Lopez et al., 2019) are also addressed, while business model archetypes (Yip & Bocken, 2018) and taxonomies (Lüdeke-Freund et al., 2018) are developed;

- **business model innovation for the circular economy** – different frameworks – i.e., for “circular business experimentation” (N. M. P. Bocken et al., 2018), for “supply chain collaboration in circular buildings” (Leising et al., 2018), for “evaluating the environmental value propositions of circular economy business models” (Manninen et al., 2018), or “to compare circular and sustainable business models” (Geissdoerfer, Morioka, et al., 2018) are designed and tested to emphasize on the need for “learning cycles and sustainability checks” (N. M. P. Bocken et al., 2018), for stakeholders collaboration and/or support (Chiappetta Jabbour et al., 2020), and for internal and external alignment (Manninen et al., 2018);
- **drivers, barriers, and success factors** – for circular economy (Gusmerotti et al., 2019), circular business model (Donner et al., 2021) and circular business model innovation (Guldmann & Huulgaard, 2020) in specific contexts - i.e., sustainable start-up (N. M. P. Bocken, 2015), and/or sectors - i.e. manufacturing firms (Gusmerotti et al., 2019), or agriculture (Donner et al., 2021) – are explored; internal determinants/factors like “organization design and dynamic capabilities” (N. M. P. Bocken & Geradts, 2020) are emphasized and “unsustainable business model archetypes” (N. M. P. Bocken & Short, 2021) are also disclosed.

Figure 6. Citation map
(unit of analysis: documents; weights: citations)



Source: Authors (based on SCOPUS data and using VOSViewer)

Cluster 2 (green) comprises 12 articles on **tools, frameworks and processes for sustainable business innovation**. More specifically, they bring forward:

- a series of tools and frameworks for **designing** sustainable business models - namely: “the triple layered business model canvas” (Joyce & Paquin, 2016), “value mapping for sustainable business thinking” (N. Bocken et al., 2015), “design thinking to enhance the sustainable business modelling process” (Geissdoerfer et al., 2016), and “a process for sustainable value proposition design” (Baldassarre et al., 2017);
- the **understanding and experimentation** dimensions - by performing an “anatomy of sustainable business model innovation” (Shakeel et al., 2020), “exploring evolutionary

and radical approaches (of business model innovation for sustainability) through dynamic capabilities” (Inigo et al., 2017), and developing a framework “to enable a systemic form of sustainable business model experimentation” (N. Bocken et al., 2019);

- **value** creation, transfer and capture – through sustainable business models (Brehmer et al., 2018), sustainable business model innovation (Yang et al., 2017), and multi-stakeholder alignment (Velter et al., 2020);
- **industry specifics** - such as “critical success factors for the transition to business models for sustainability in the food and beverage industry in the Netherlands” (Long et al., 2018), and the “relationship between business model innovation, corporate sustainability, and organizational values within the fashion industry” (Pedersen et al., 2018).

Cluster 3 (blue) comprises 12 articles focusing on **digitalization and business model transformation**. More specifically, they bring forward:

- the impact of **digitalization** on business model (innovation) - explored through comprehensive literature reviews and/or research agendas – focusing on “digital transformation” (Verhoef et al., 2021) and “digital technology and business model innovation” (Ancillai et al., 2023) – and empirical studies – investigating “the impact of digitalization on business models” (Bouwman et al., 2018), “digitalization and its influence on business model innovation” (Rachinger et al., 2019), and “digital business models in traditional industries” (Remane et al., 2017);
- **technological advancements** and their impact on business model innovation – the research being focused either on specific technologies - 3D printing (Rayna & Striukova, 2016), “digitization and big data analytics” (Loebbecke & Picot, 2015) - or on aggregated technologies/specific industries - industry 4.0 (Weking et al., 2020) and manufacturing (Savastano et al., 2019);
- digital business model (innovation) in **SMEs** – in search of performance improvement (Bouwman et al., 2019), identifying “digital transformation paths” in COVID-19 context (Priyono et al., 2020), or enabling dynamic capabilities (Soluk et al., 2021);

Cluster 4 (yellow) comprises 12 articles) addressing **business models for societal and sustainability transitions**. More specifically, they bring forward:

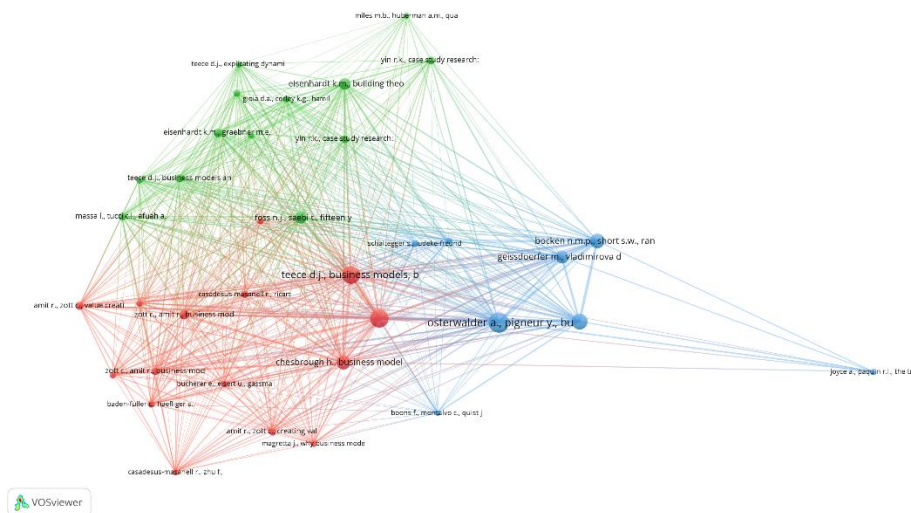
- **business models as enablers** of transition – the research being focused on developing comprehensive frameworks to link sustainable entrepreneurship and innovation with either the business models (Lüdeke-Freund, 2020) or the transformation towards sustainability (Schaltegger et al., 2016), to identify “new linkages between business model and transition research” (Bidmon & Knab, 2018), and to propose a systems understanding on “governing sustainability transitions through business model innovation” (Bolton & Hannon, 2016);
- **circular business models** driving/obstructing sustainability – built around the circular economy principles and practices, the articles analyze if “circular business models (act) as driver or obstructer of sustainability transitions” (Hofmann, 2019), while exploring “corporate-entrepreneur collaborations” (Veleva & Bodkin, 2018), “circular economy business models in service-oriented technology companies” (Heyes et al., 2018), and developing “a typology of circular start-ups” (Henry et al., 2020);

- **business model innovation** to align with both sustainability and technology transitions – against government regulation (Y. Li et al., 2016) and by integrating sustainable technologies (Bohnsack et al., 2014) or the sharing economy principles (Ciulli & Kolk, 2019) – in specific sectors, like Industry 4.0 (Müller et al., 2018) and electric vehicles (Bohnsack et al., 2014; Y. Li et al., 2016), or organizational settings, like SMEs (Müller et al., 2018).

Co-citation analysis – tracing the origins of the research on the topic

The co-citation analysis - using cited references as the unit of analysis and a threshold of minimum 20 citations per cited reference - revealed 36 items (of the 70456 cited references), grouped in three clusters (Figure 7). The publication years of these articles range from 1989 (Eisenhardt, 1989) to 2018 (Foss & Saebi, 2018; Geissdoerfer, Vladimirova, et al., 2018; Teece, 2018), with one in six articles (6 out of 36) being published in 2010. Together, the 36 articles gathered about 2007 citations (therefore an average of 55.75 citations per article); three of them were cited more than 100 times (Chesbrough, 2010; Teece, 2010; Zott et al., 2011).

Figure 7. Co-citation map
(unit of analysis: cited references; weights: citations)



Source: Authors (based on SCOPUS data and using VOSviewer)

The three clusters in the co-citation map mirror three main research themes and subsequent contributions that were foundational in the development of the set of articles under analysis, shaping the development of knowledge in the (niche) area that lies at the nexus of *business model innovation, sustainability and/or digitalization*:

Cluster 1 (red, 15 articles) - the strategic role of **business models** in driving innovation, value creation, and competitive advantage (particularly in the context of rapidly changing technological environments):

- defining and conceptualizing business models (Magretta, 2002), (Zott et al., 2011);

- business model design and firm performance (Zott & Amit, 2007), (Zott & Amit, 2008), (Zott & Amit, 2010), (Demil & Lecocq, 2010);
- centrality of business models in strategy and innovation (Teece, 2010), (Casadesus-Masanell & Ricart, 2010), (Baden-Fuller & Haefliger, 2013);
- business model innovation as a driver of competitive advantage (Johnson et al., 2008), (Chesbrough, 2010), (Bucherer et al., 2012), (Casadesus-Masanell & Zhu, 2013);
- value creation and capture through business model (Amit & Zott, 2001), (Amit & Zott, 2012).

Cluster 2 (green, 13 articles) - aligning **business model innovation** with dynamic capabilities (through robust theories, methodologies and research) for sustained competitive advantage:

- evolution and challenges in business model innovation research (Barney, 1991), (Massa et al., 2017), (Foss & Saebi, 2017), (Foss & Saebi, 2018);
- dynamic capabilities as a strategic imperative (Teece et al., 1997), (Teece, 2007), (Teece, 2018);
- theory building and methodological rigor in research (Eisenhardt, 1989), (Miles & Huberman, 1994), (Eisenhardt & Graebner, 2007), (Yin, 2009), (Gioia et al., 2013), (Yin, 2014).

Cluster 3 (blue, 8 articles) - **integrating sustainability** principles into business model innovation for long-term (economic, social, and environmental) value creation:

- business model innovation as a catalyst of sustainability and economic performance (Schaltegger et al., 2012), (Boons et al., 2013), (Boons & Lüdeke-Freund, 2013), (Evans et al., 2017), (Geissdoerfer, Vladimirova, et al., 2018);
- development of sustainable business model archetypes (N. M. P. Bocken et al., 2014);
- tools and frameworks for designing sustainable business models (Osterwalder et al., 2010), (Joyce & Paquin, 2016).

Bibliographic coupling analysis– deciphering current developments in the research on the topic

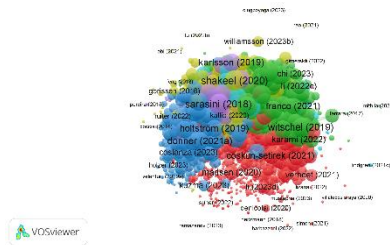
The bibliographic coupling analysis - using documents as the unit of analysis - considered all the 1195 articles, regardless of the number of citations they received (as the analysis was searching for patterns in the research themes/topics). Of the 1195 articles, the largest set of connected items consisted of 1122 articles; the network visualization map generated organized them in 6 clusters after choosing a minimum cluster size of 50 (Figure 8.a.).

Following the selection of the 36 articles with the highest total link strength (for symmetry with the co-citation analysis) - to narrow the focus on the thematic areas and the main contributions of the research at the nexus of *business model innovation, sustainability and/or digitalization* over the last decade (2014-2023) - 3 clusters became apparent in the bibliographic coupling map (Figure 8.b.) (N.B. due to the limited number of articles - about 3% of the whole sample - the results need to be corroborated with supplementary results, such as those produced from the citation analysis or the co-word analysis):

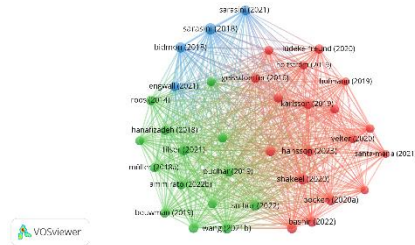
Figure 8. Bibliographic coupling map

(unit of analysis: documents; weights: total link strength)

8.a. All linked items (1122)



8.b. Top 36 items



Source: Authors (based on SCOPUS data and using VOSViewer)

Cluster 1 (red, 18 articles) – design, implementation and evolution of **sustainable business models**:

- frameworks, models and taxonomies for sustainable business models (Bashir et al., 2022), (Lüdeke-Freund et al., 2018), (Shakeel et al., 2020), (Lüdeke-Freund, 2020);
- barriers, drivers, and dynamic capabilities for innovation (N. M. P. Bocken & Geradts, 2020), (Hansson et al., 2023), (Inigo et al., 2017), (Velter et al., 2020);
- circular economy applications (N. Bocken & Konietzko, 2022), (Carraresi & Bröring, 2021), (Donner & De Vries, 2021), (Hofmann, 2019), (Santa-Maria et al., 2021);
- sector-specific applications and case studies (Geissdoerfer et al., 2016), (Holtström et al., 2019), (Karlsson et al., 2019), (Ringvold et al., 2023), (Täuscher & Abdelkafi, 2018).

Cluster 2 (green, 14 articles) – **business model innovation in digital transformation** context:

- impact of digitalization on business models, (SME) performance, and broader ecosystems (Ancillai et al., 2023), (Bouwman et al., 2019), (Witschel et al., 2019), (Wang & Chebo, 2021), (Snihur & Bocken, 2022), (Müller et al., 2018), (Iheanachor et al., 2021);
- drivers and frameworks for business model innovation and competitive advantage (Ammirato et al., 2022), (Pucihar et al., 2019), (Hanafizadeh et al., 2018), (Filser et al., 2021);
- innovation for (sustainable) value creation, capturing and transfer (Roos, 2014), (Brehmer et al., 2018), (Olofsson et al., 2018).

Cluster 3 (blue, 4 articles) – **business model** (innovation) to support **sustainability and societal transitions**:

- connecting business model (research) with transition (theory) (Bidmon & Knab, 2018), (Sarasini & Linder, 2018);
- business model innovation processes and practices for sustainability transition (Engwall et al., 2021), (Sarasini & Langeland, 2021).

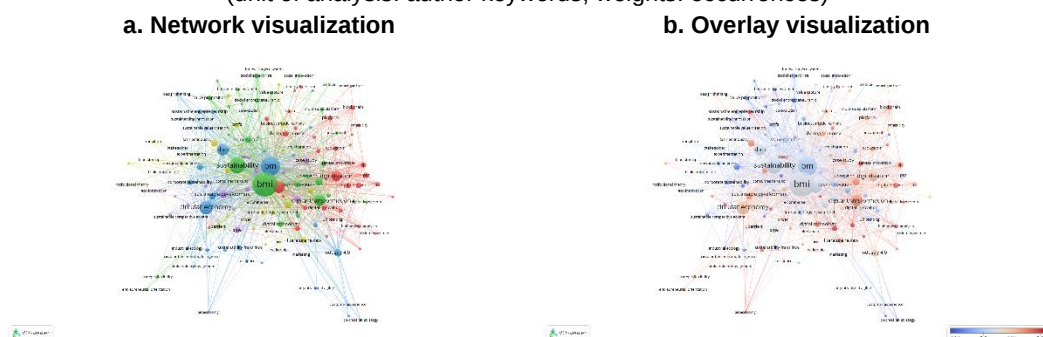
Co-word analysis – searching for emerging trends in the research on the topic

The co-occurrence analysis – considering author keywords as the unit of analysis and five as the minimum number of occurrences of a keyword – led to 148 keywords that met the threshold (of the total 3255 keywords resulted after integrating the thesaurus file).

When the minimum cluster size was set to 15, five clusters emerged (Figure 9.a. and Table 6), allowing for the deciphering of the main research topics and threads of the analyzed decade: cluster 1 (red) – led by **innovation** (93 occurrences) and focused on digitalization and technological innovation; cluster 2 (green) – led by **business model innovation** (407 occurrences) and focused on business models, digital transformation, and innovation ecosystems; cluster 3 (blue) – led by **business model** (236 occurrences) and focused on sustainable business models and circular economy; cluster 4 (yellow) – led by **entrepreneurship** (31 occurrences) and focused on entrepreneurship, innovation, and organizational change; cluster 5 (violet) – led by **sustainable development** (40 occurrences) and focused on strategy, competitive advantage, and sustainable development.

Figure 9. Co-occurrence map

(unit of analysis: author keywords; weights: occurrences)



Source: Authors (based on SCOPUS data and using VOSViewer)

Table 6. Co-occurrence of author keywords – clusters' composition

Cluster 1 (red, 34 items)
innovation , digitalization, sharing economy, digital servitization, internet of things, product–service system, artificial intelligence, covid-19, digital innovation, blockchain, ecosystem, platform, start-up, servitization, big data, electric vehicle, renewable energy, bibliometric analysis, digital business model, fintech, governance, energy transition, smart city, sustainable operations, manufacturing, supply chain management, technology, transport, value co-creation, 3d printing, circular supply chain, energy efficiency, risk management, smart contract
Cluster 2 (green, 32 items)
business model innovation , sustainability, digital transformation, dynamic capability, value creation, digital technology, open innovation, social enterprise, digital platform, value proposition, social entrepreneurship, digital economy, innovation management, co-creation, multi-sided platform, value capture, collaboration, social innovation, emerging markets, incumbent, bottom of the pyramid, digital leadership, india, innovation ecosystem, frugal innovation, business model innovation for sustainability, developing economies, service, strategic flexibility, entrepreneurial orientation, system dynamics, tourism
Cluster 3 (blue, 32 items)
business model , circular economy, sustainable business model, industry 4.0, circular business model, sustainable innovation, corporate sustainability, sustainability transition, sustainable entrepreneurship, digital business model innovation, framework, sustainable value creation, corporate social responsibility, multiple case study, resilience, design thinking, bioeconomy,

industrial ecology, organizational agility, complexity, stakeholder, firm performance, circular business model innovation, sustainability innovation, co-evolution, taxonomy, business model experimentation, customer experience, financial performance, transformational performance, co-creation strategy, stakeholder engagement

Cluster 4 (yellow, 30 items)

entrepreneurship, sustainable business model innovation, sustainable development goal, literature review, digitization, business model for sustainability, innovative business model, business model canvas, barriers, sustainable consumption, sustainable business, life cycle analysis, creativity, lean startup, driver, experimentation, retail, pandemic, business model design, transition, performance, consumer behavior, leadership, effectuation, fashion industry, institutional theory, organizational change, fashion, business strategy, human resource management

Cluster 5 (violet, 20 items)

sustainable development, SME, strategy, case study, disruptive innovation, china, resource efficiency, technological innovation, competitive advantage, eco-innovation, service innovation, e-commerce, strategic management, value chain, pls-sem, triple bottom line, marketing, sustainable competitive advantage, fsqca, policy

Source: Authors (based on SCOPUS data and using VOSViewer)

If considering the average publication year linked to the 148 items, the overlay visualization of the co-occurrence (of author keywords) map (Figure 9.b.) provides a glimpse on the most topical/current issues (N.B., the closer an item is to red on the map, the more recent it is). The most recent keywords, by cluster, are: **supply chain management** (cluster 1), **system dynamics** (cluster 2), **bioeconomy** (cluster 3), **driver** (cluster 4), and **policy** (cluster 5). The top 10% of keywords by average publication year, when all keywords are taken into account (regardless of the clusters they belong to), are as follows: supply chain management, bibliometric analysis, bioeconomy, policy, digital business model innovation, framework, manufacturing, fsqca, covid 19, strategic management, system dynamics, multiple case study, blockchain, digital servitization, and governance. The list above suggests that the research on the topic is currently carried on in four interconnected areas: digital innovation and technology; strategic management and analytical methods; supply chain and manufacturing; policy, governance and sustainability.

4. Discussion and Conclusions

Considering the stated aim and objectives, the study's findings led to the following conclusions, contributing to the comprehensive understanding of the research landscape at the nexus between *business model innovation, sustainability and/or digitalization*:

On the **dynamics and structure of the research output**: 1195 articles were published in SCOPUS journals (and generated 39636 citations) between 2014 and 2023; about 80% of the articles and 95% of the citations occurred in the second half of the decade, showing a **growing interest** on the topic. Of the 486 journals hosting the 1195 articles, 5 are the **most impactful** ones, accounting for over 25% of all articles and nearly 50% of all citations: Sustainability (Switzerland), Journal of Cleaner Production, Technological Forecasting and Social Change, Journal of Business Research, and Business Strategy and the Environment. When examining the **subject areas**, there are a total of 22; with almost 60% of all articles, Business, Management, and Accounting is the most well-represented

one, followed by Social Sciences and Environmental Science. A total of 3237 **authors** contributed to the 1195 articles; of them, the **most prolific and influential** (9) ones have 5 or more articles each and received 500 citations or more each: Nancy Bocken, Vinit Parida, Antonio Ghezzi, Heiko Gebauer, Kai-Ingo Voigt, Pejvak Oghazi, Sascha Kraus, Marko Kohtamäki, and David Sjödin. The 3237 authors are based in 89 different **countries/territories**; five of them, contributing with more than 100 articles each, are the **most productive** ones: Germany, Italy, United Kingdom, China and Sweden.

On the **network of the most impactful articles**: the citation analysis led to the detection of the following key research directions (and related subtopics) at the nexus of *business model innovation, sustainability and/or digitalization*: (1) **circular economy and sustainable business models** (creating and innovating sustainable business models; business model innovation for the circular economy; drivers, barriers, and success factors); (2) **tools, frameworks and processes for sustainable business innovation** (frameworks and tools for designing sustainable business models; the understanding and experimentation dimensions of the process; value creation, transfer and capture; industry specifics); (3) **digitalization and business model transformation** (the impact of digitalization on business model innovation; technological advancements and their impact on business model innovation; digital business model innovation in SMEs); (4) **business models for societal and sustainability transitions** (business models as enablers of transition; circular business models driving/obstructing sustainability; business model innovation to align with both sustainability and technology transitions).

On the **origins of the research on the topic**: the co-citation analysis led to the identification of three main research themes that were foundational in the development of the set of articles under analysis: (1) the strategic role of **business models** in driving innovation, value creation, and competitive advantage (particularly in the context of rapidly changing technological environments); (2) aligning **business model innovation** with dynamic capabilities (through robust theories, methodologies and research) for sustained competitive advantage; (3) **integrating sustainability** principles into business model innovation for long-term (economic, social, and environmental) value creation.

On the **current developments in the research on the topic**: the bibliographic coupling analysis led to the deciphering of the following thematic areas and main contributions during the reference period: (1) design, implementation and evolution of **sustainable business models** (frameworks, models and taxonomies for sustainable business models; barriers, drivers, and dynamic capabilities for innovation; circular economy applications; sector-specific applications and case studies); (2) **business model innovation in digital transformation** context (impact of digitalization on business models, (SME) performance, and broader ecosystems; drivers and frameworks for business model innovation and competitive advantage; innovation for (sustainable) value creation, capturing and transfer); (3) **business model (innovation) to support sustainability and societal transitions** (connecting business model (research) with transition (theory); business model innovation processes and practices for sustainability transition).

On the **emerging trends in the research on the topic**: the co-occurrence of author keywords analysis identified five clusters – corresponding to five research topics and threads that dominated the research in the last decade: cluster 1 - led by **innovation** and focused

on digitalization and technological innovation; cluster 2 - led by **business model innovation** and focused on business models, digital transformation, and innovation ecosystems; cluster 3 - led by **business model** and focused on sustainable business models and circular economy; cluster 4 - led by **entrepreneurship** and focused on entrepreneurship, innovation, and organizational change; and cluster 5 - led by **sustainable development** and focused on strategy, competitive advantage, and sustainable development. When further considering the average publication year linked to the author keywords, in search for the “hottest” research topics of nowadays, the analysis revealed the following most recent keywords (by cluster): **supply chain management** (cluster 1), **system dynamics** (cluster 2), **bioeconomy** (cluster 3), **driver** (cluster 4), and **policy** (cluster 5).

In conclusion, the results of the performed analyses suggest the emergence of a niche research area in the broad strategic management field, bringing together four related (sub)topics: (1) circular economy and sustainable business models; (2) tools, frameworks and processes for sustainable business model innovation; (3) digitalization and business model transformation; (4) business models for societal and sustainability transitions. For this research area to crystallize, the identified emerging research trends – on digital innovation and technology; strategic management and analytical methods; supply chain and manufacturing; policy, governance and sustainability – need to be further explored, both individually (in search of refinement and clarity) and collectively (in search of consistency and synergy).

5. Acknowledgement

This work is supported by the Ministry of Research, Innovation and Digitization through Program 1 - Development of the national research-development system, Subprogram 1.2 -Institutional performance- Projects for financing excellence in RDI, contract no. 28PFE / 30.12.2021.

6. References

- Acciarini, C., Cappa, F., Boccardelli, P., & Oriani, R. (2023). How can organizations leverage big data to innovate their business models? A systematic literature review. *Technovation*, 123, 102713. <https://doi.org/10.1016/j.technovation.2023.102713>
- Amit, R., & Zott, C. (2001). Value creation in E-business. *Strategic Management Journal*, 22(6–7), 493–520. <https://doi.org/10.1002/smj.187>
- Amit, R., & Zott, C. (2012). Creating Value Through Business Model Innovation. *MIT Sloan Management Review*. <https://sloanreview.mit.edu/article/creating-value-through-business-model-innovation/>
- Ammirato, S., Linzalone, R., & Felicetti, A. M. (2022). Business model innovation drivers as antecedents of performance. *Measuring Business Excellence*, 26(1), 6–22. <https://doi.org/10.1108/MBE-01-2021-0012>
- Ancillai, C., Sabatini, A., Gatti, M., & Perna, A. (2023). Digital technology and business model innovation: A systematic literature review and future research agenda. *Technological Forecasting and Social Change*, 188, 122307. <https://doi.org/10.1016/j.techfore.2022.122307>

- Autio, E., Nambisan, S., Thomas, L. D. W., & Wright, M. (2018). Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems. *Strategic Entrepreneurship Journal*, 12(1), 72–95. <https://doi.org/10.1002/sej.1266>
- Baden-Fuller, C., & Haefliger, S. (2013). Business Models and Technological Innovation. *Long Range Planning*, 46(6), 419–426. <https://doi.org/10.1016/j.lrp.2013.08.023>
- Baldassarre, B., Calabretta, G., Bocken, N. M. P., & Jaskiewicz, T. (2017). Bridging sustainable business model innovation and user-driven innovation: A process for sustainable value proposition design. *Journal of Cleaner Production*, 147, 175–186. <https://doi.org/10.1016/j.jclepro.2017.01.081>
- Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- Bashir, M., Alfalih, A., & Pradhan, S. (2022). Sustainable business model innovation: Scale development, validation and proof of performance. *Journal of Innovation & Knowledge*, 7(4), 100243. <https://doi.org/10.1016/j.jik.2022.100243>
- Bidmon, C. M., & Knab, S. F. (2018). The three roles of business models in societal transitions: New linkages between business model and transition research. *Journal of Cleaner Production*, 178, 903–916. <https://doi.org/10.1016/j.jclepro.2017.12.198>
- Bocken, N., Boons, F., & Baldassarre, B. (2019). Sustainable business model experimentation by understanding ecologies of business models. *Journal of Cleaner Production*, 208, 1498–1512. <https://doi.org/10.1016/j.jclepro.2018.10.159>
- Bocken, N., & Konietzko, J. (2022). Circular business model innovation in consumer-facing corporations. *Technological Forecasting and Social Change*, 185, 122076. <https://doi.org/10.1016/j.techfore.2022.122076>
- Bocken, N. M. P. (2015). Sustainable venture capital – catalyst for sustainable start-up success? *Journal of Cleaner Production*, 108, 647–658. <https://doi.org/10.1016/j.jclepro.2015.05.079>
- Bocken, N. M. P., & Geradts, T. H. J. (2020). Barriers and drivers to sustainable business model innovation: Organization design and dynamic capabilities. *Long Range Planning*, 53(4), 101950. <https://doi.org/10.1016/j.lrp.2019.101950>
- Bocken, N. M. P., Schuit, C. S. C., & Kraaijenhagen, C. (2018). Experimenting with a circular business model: Lessons from eight cases. *Environmental Innovation and Societal Transitions*, 28, 79–95. <https://doi.org/10.1016/j.eist.2018.02.001>
- Bocken, N. M. P., & Short, S. W. (2016). Towards a sufficiency-driven business model: Experiences and opportunities. *Environmental Innovation and Societal Transitions*, 18, 41–61. <https://doi.org/10.1016/j.eist.2015.07.010>
- Bocken, N. M. P., & Short, S. W. (2021). Unsustainable business models – Recognising and resolving institutionalised social and environmental harm. *Journal of Cleaner Production*, 312, 127828. <https://doi.org/10.1016/j.jclepro.2021.127828>
- Bocken, N. M. P., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, 65, 42–56. <https://doi.org/10.1016/j.jclepro.2013.11.039>
- Bocken, N., Rana, P., & Short, S. W. (2015). Value mapping for sustainable business thinking. *Journal of Industrial and Production Engineering*, 32(1), 67–81. <https://doi.org/10.1080/21681015.2014.1000399>
- Bohnsack, R., Pinkse, J., & Kolk, A. (2014). Business models for sustainable technologies: Exploring business model evolution in the case of electric vehicles. *Research Policy*, 43(2), 284–300. <https://doi.org/10.1016/j.respol.2013.10.014>
- Bolton, R., & Hannon, M. (2016). Governing sustainability transitions through business model innovation: Towards a systems understanding. *Research Policy*, 45(9), 1731–1742. <https://doi.org/10.1016/j.respol.2016.05.003>

- Boons, F., & Lüdeke-Freund, F. (2013). Business models for sustainable innovation: State-of-the-art and steps towards a research agenda. *Journal of Cleaner Production*, 45, 9–19. <https://doi.org/10.1016/j.jclepro.2012.07.007>
- Boons, F., Montalvo, C., Quist, J., & Wagner, M. (2013). Sustainable innovation, business models and economic performance: An overview. *Journal of Cleaner Production*, 45, 1–8. <https://doi.org/10.1016/j.jclepro.2012.08.013>
- Bouwman, H., Nikou, S., & De Reuver, M. (2019). Digitalization, business models, and SMEs: How do business model innovation practices improve performance of digitalizing SMEs? *Telecommunications Policy*, 43(9), 101828. <https://doi.org/10.1016/j.telpol.2019.101828>
- Bouwman, H., Nikou, S., Molina-Castillo, F. J., & De Reuver, M. (2018). The impact of digitalization on business models. *Digital Policy, Regulation and Governance*, 20(2), 105–124. <https://doi.org/10.1108/DPRG-07-2017-0039>
- Brehmer, M., Podoynitsyna, K., & Langerak, F. (2018). Sustainable business models as boundary-spanning systems of value transfers. *Journal of Cleaner Production*, 172, 4514–4531. <https://doi.org/10.1016/j.jclepro.2017.11.083>
- Brenner, B. (2018). Transformative Sustainable Business Models in the Light of the Digital Imperative—A Global Business Economics Perspective. *Sustainability*, 10(12), 4428. <https://doi.org/10.3390/su10124428>
- Bucherer, E., Eisert, U., & Gassmann, O. (2012). Towards Systematic Business Model Innovation: Lessons from Product Innovation Management. *Creativity and Innovation Management*, 21(2), 183–198. <https://doi.org/10.1111/j.1467-8691.2012.00637.x>
- Carraresi, L., & Bröring, S. (2021). How does business model redesign foster resilience in emerging circular value chains? *Journal of Cleaner Production*, 289, 125823. <https://doi.org/10.1016/j.jclepro.2021.125823>
- Casadesus-Masanell, R., & Ricart, J. E. (2010). From Strategy to Business Models and onto Tactics. *Long Range Planning*, 43(2–3), 195–215. <https://doi.org/10.1016/j.lrp.2010.01.004>
- Casadesus-Masanell, R., & Zhu, F. (2013). Business model innovation and competitive imitation: The case of sponsor-based business models. *Strategic Management Journal*, 34(4), 464–482. <https://doi.org/10.1002/smj.2022>
- Chesbrough, H. (2010). Business Model Innovation: Opportunities and Barriers. *Long Range Planning*, 43(2–3), 354–363. <https://doi.org/10.1016/j.lrp.2009.07.010>
- Chiappetta Jabbour, C. J., Seuring, S., Lopes De Sousa Jabbour, A. B., Jugend, D., De Camargo Fiorini, P., Latan, H., & Izeppi, W. C. (2020). Stakeholders, innovative business models for the circular economy and sustainable performance of firms in an emerging economy facing institutional voids. *Journal of Environmental Management*, 264, 110416. <https://doi.org/10.1016/j.jenvman.2020.110416>
- Ciulli, F., & Kolk, A. (2019). Incumbents and business model innovation for the sharing economy: Implications for sustainability. *Journal of Cleaner Production*, 214, 995–1010. <https://doi.org/10.1016/j.jclepro.2018.12.295>
- Demil, B., & Lecocq, X. (2010). Business Model Evolution: In Search of Dynamic Consistency. *Long Range Planning*, 43(2–3), 227–246. <https://doi.org/10.1016/j.lrp.2010.02.004>
- Diaz Lopez, F. J., Bastein, T., & Tukker, A. (2019). Business Model Innovation for Resource-efficiency, Circularity and Cleaner Production: What 143 Cases Tell Us. *Ecological Economics*, 155, 20–35. <https://doi.org/10.1016/j.ecolecon.2018.03.009>
- Donner, M., & De Vries, H. (2021). How to innovate business models for a circular bio-economy? *Business Strategy and the Environment*, 30(4), 1932–1947. <https://doi.org/10.1002/bse.2725>
- Donner, M., Verniquet, A., Broeze, J., Kayser, K., & De Vries, H. (2021). Critical success and risk factors for circular business models valorising agricultural waste and by-products. *Resources, Conservation and Recycling*, 165, 105236. <https://doi.org/10.1016/j.resconrec.2020.105236>

- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *The Academy of Management Review*, 14(4), 532. <https://doi.org/10.2307/258557>
- Eisenhardt, K. M., & Graebner, M. E. (2007). Theory Building From Cases: Opportunities And Challenges. *Academy of Management Journal*, 50(1), 25–32. <https://doi.org/10.5465/amj.2007.24160888>
- Engwall, M., Kaulio, M., Karakaya, E., Miterev, M., & Berlin, D. (2021). Experimental networks for business model innovation: A way for incumbents to navigate sustainability transitions? *Technovation*, 108, 102330. <https://doi.org/10.1016/j.technovation.2021.102330>
- Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E. A., & Barlow, C. Y. (2017). Business Model Innovation for Sustainability: Towards a Unified Perspective for Creation of Sustainable Business Models. *Business Strategy and the Environment*, 26(5), 597–608. <https://doi.org/10.1002/bse.1939>
- Filser, M., Kraus, S., Breier, M., Nenova, I., & Puumalainen, K. (2021). Business model innovation: Identifying foundations and trajectories. *Business Strategy and the Environment*, 30(2), 891–907. <https://doi.org/10.1002/bse.2660>
- Ford, S., & Despeisse, M. (2016). Additive manufacturing and sustainability: An exploratory study of the advantages and challenges. *Journal of Cleaner Production*, 137, 1573–1587. <https://doi.org/10.1016/j.jclepro.2016.04.150>
- Foss, N. J., & Saebi, T. (2017). Fifteen Years of Research on Business Model Innovation: How Far Have We Come, and Where Should We Go? *Journal of Management*, 43(1), 200–227. <https://doi.org/10.1177/0149206316675927>
- Foss, N. J., & Saebi, T. (2018). Business models and business model innovation: Between wicked and paradigmatic problems. *Long Range Planning*, 51(1), 9–21. <https://doi.org/10.1016/j.lrp.2017.07.006>
- Frank, A. G., Mendes, G. H. S., Ayala, N. F., & Ghezzi, A. (2019). Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective. *Technological Forecasting and Social Change*, 141, 341–351. <https://doi.org/10.1016/j.techfore.2019.01.014>
- Gao, S., Ma, X., & Zhao, X. (2022). Entrepreneurship, Digital Capabilities, and Sustainable Business Model Innovation: A Case Study. *Mobile Information Systems*, 2022, 1–13. <https://doi.org/10.1155/2022/5822423>
- Geissdoerfer, M., Bocken, N. M. P., & Hultink, E. J. (2016). Design thinking to enhance the sustainable business modelling process – A workshop based on a value mapping process. *Journal of Cleaner Production*, 135, 1218–1232. <https://doi.org/10.1016/j.jclepro.2016.07.020>
- Geissdoerfer, M., Morioka, S. N., De Carvalho, M. M., & Evans, S. (2018). Business models and supply chains for the circular economy. *Journal of Cleaner Production*, 190, 712–721. <https://doi.org/10.1016/j.jclepro.2018.04.159>
- Geissdoerfer, M., Vladimirova, D., & Evans, S. (2018). Sustainable business model innovation: A review. *Journal of Cleaner Production*, 198, 401–416. <https://doi.org/10.1016/j.jclepro.2018.06.240>
- Ghobakhloo, M. (2020). Industry 4.0, digitization, and opportunities for sustainability. *Journal of Cleaner Production*, 252, 119869. <https://doi.org/10.1016/j.jclepro.2019.119869>
- Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking Qualitative Rigor in Inductive Research: Notes on the Gioia Methodology. *Organizational Research Methods*, 16(1), 15–31. <https://doi.org/10.1177/1094428112452151>

- Guldmann, E., & Huulgaard, R. D. (2020). Barriers to circular business model innovation: A multiple-case study. *Journal of Cleaner Production*, 243, 118160. <https://doi.org/10.1016/j.jclepro.2019.118160>
- Gusmerotti, N. M., Testa, F., Corsini, F., Pretner, G., & Iraldo, F. (2019). Drivers and approaches to the circular economy in manufacturing firms. *Journal of Cleaner Production*, 230, 314–327. <https://doi.org/10.1016/j.jclepro.2019.05.044>
- Hanafizadeh, P., Mehrabioun, M., Badie, K., & Soofi, J. B. (2018). A Systemic Framework for Business Model Design and Development -Part A: Theorizing Perspective. *Systemic Practice and Action Research*, 31(4), 437–461. <https://doi.org/10.1007/s11213-017-9435-6>
- Hansson, A. M., Pedersen, E., Karlsson, N. P. E., & Weisner, S. E. B. (2023). Barriers and drivers for sustainable business model innovation based on a radical farmland change scenario. *Environment, Development and Sustainability*, 25(8), 8083–8106. <https://doi.org/10.1007/s10668-022-02389-1>
- Henry, M., Bauwens, T., Hekkert, M., & Kirchherr, J. (2020). A typology of circular start-ups: An Analysis of 128 circular business models. *Journal of Cleaner Production*, 245, 118528. <https://doi.org/10.1016/j.jclepro.2019.118528>
- Heyes, G., Sharmina, M., Mendoza, J. M. F., Gallego-Schmid, A., & Azapagic, A. (2018). Developing and implementing circular economy business models in service-oriented technology companies. *Journal of Cleaner Production*, 177, 621–632. <https://doi.org/10.1016/j.jclepro.2017.12.168>
- Hofmann, F. (2019). Circular business models: Business approach as driver or obstructer of sustainability transitions? *Journal of Cleaner Production*, 224, 361–374. <https://doi.org/10.1016/j.jclepro.2019.03.115>
- Holtström, J., Bjellerup, C., & Eriksson, J. (2019). Business model development for sustainable apparel consumption: The case of Houdini Sportswear. *Journal of Strategy and Management*, 12(4), 481–504. <https://doi.org/10.1108/JSMA-01-2019-0015>
- Iheanachor, N., David-West, Y., & Umukoro, I. O. (2021). Business model innovation at the bottom of the pyramid – A case of mobile money agents. *Journal of Business Research*, 127, 96–107. <https://doi.org/10.1016/j.jbusres.2021.01.029>
- Inigo, E. A., Albareda, L., & Ritala, P. (2017). Business model innovation for sustainability: Exploring evolutionary and radical approaches through dynamic capabilities. *Industry and Innovation*, 24(5), 515–542. <https://doi.org/10.1080/13662716.2017.1310034>
- Johnson, M. V., Christensen, C. M., & Kagermann, H. (2008). Reinventing your business model. *Harvard Business Review*, 86(12), 50–59.
- Joyce, A., & Paquin, R. L. (2016). The triple layered business model canvas: A tool to design more sustainable business models. *Journal of Cleaner Production*, 135, 1474–1486. <https://doi.org/10.1016/j.jclepro.2016.06.067>
- Karlsson, N. P. E., Hoveskog, M., Halila, F., & Mattsson, M. (2019). Business modelling in farm-based biogas production: Towards network-level business models and stakeholder business cases for sustainability. *Sustainability Science*, 14(4), 1071–1090. <https://doi.org/10.1007/s11625-018-0584-z>
- Leising, E., Quist, J., & Bocken, N. (2018). Circular Economy in the building sector: Three cases and a collaboration tool. *Journal of Cleaner Production*, 176, 976–989. <https://doi.org/10.1016/j.jclepro.2017.12.010>
- Li, X., Zhang, L., & Cao, J. (2023). Research on the mechanism of sustainable business model innovation driven by the digital platform ecosystem. *Journal of Engineering and Technology Management*, 68, 101738. <https://doi.org/10.1016/j.jengtecman.2023.101738>

- Li, Y., Zhan, C., De Jong, M., & Lukszo, Z. (2016). Business innovation and government regulation for the promotion of electric vehicle use: Lessons from Shenzhen, China. *Journal of Cleaner Production*, 134, 371–383. <https://doi.org/10.1016/j.jclepro.2015.10.013>
- Loebbecke, C., & Picot, A. (2015). Reflections on societal and business model transformation arising from digitization and big data analytics: A research agenda. *The Journal of Strategic Information Systems*, 24(3), 149–157. <https://doi.org/10.1016/j.jsis.2015.08.002>
- Long, T. B., Looijen, A., & Blok, V. (2018). Critical success factors for the transition to business models for sustainability in the food and beverage industry in the Netherlands. *Journal of Cleaner Production*, 175, 82–95. <https://doi.org/10.1016/j.jclepro.2017.11.067>
- Lüdeke-Freund, F. (2020). Sustainable entrepreneurship, innovation, and business models: Integrative framework and propositions for future research. *Business Strategy and the Environment*, 29(2), 665–681. <https://doi.org/10.1002/bse.2396>
- Lüdeke-Freund, F., Carroux, S., Joyce, A., Massa, L., & Breuer, H. (2018). The sustainable business model pattern taxonomy—45 patterns to support sustainability-oriented business model innovation. *Sustainable Production and Consumption*, 15, 145–162. <https://doi.org/10.1016/j.spc.2018.06.004>
- Magretta, J. (2002). Why business models matter. *Harvard Business Review*, 80(5), 86–92, 133.
- Manninen, K., Koskela, S., Antikainen, R., Bocken, N., Dahlbo, H., & Aminoff, A. (2018). Do circular economy business models capture intended environmental value propositions? *Journal of Cleaner Production*, 171, 413–422. <https://doi.org/10.1016/j.jclepro.2017.10.003>
- Massa, L., Tucci, C. L., & Afuah, A. (2017). A Critical Assessment of Business Model Research. *Academy of Management Annals*, 11(1), 73–104. <https://doi.org/10.5465/annals.2014.0072>
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed). Sage Publications.
- Müller, J. M., Buliga, O., & Voigt, K.-I. (2018). Fortune favors the prepared: How SMEs approach business model innovations in Industry 4.0. *Technological Forecasting and Social Change*, 132, 2–17. <https://doi.org/10.1016/j.techfore.2017.12.019>
- Olofsson, S., Hoveskog, M., & Halila, F. (2018). Journey and impact of business model innovation: The case of a social enterprise in the Scandinavian electricity retail market. *Journal of Cleaner Production*, 175, 70–81. <https://doi.org/10.1016/j.jclepro.2017.11.081>
- Osterwalder, A., Pigneur, Y., & Clark, T. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. Wiley.
- Parida, V., Sjödin, D., & Reim, W. (2019). Reviewing Literature on Digitalization, Business Model Innovation, and Sustainable Industry: Past Achievements and Future Promises. *Sustainability*, 11(2), 391. <https://doi.org/10.3390/su11020391>
- Pedersen, E. R. G., Gwozdz, W., & Hvass, K. K. (2018). Exploring the Relationship Between Business Model Innovation, Corporate Sustainability, and Organisational Values within the Fashion Industry. *Journal of Business Ethics*, 149(2), 267–284. <https://doi.org/10.1007/s10551-016-3044-7>
- Priyono, A., Moin, A., & Putri, V. N. A. O. (2020). Identifying Digital Transformation Paths in the Business Model of SMEs during the COVID-19 Pandemic. *Journal of Open Innovation: Technology, Market, and Complexity*, 6(4), 104. <https://doi.org/10.3390/joitmc6040104>
- Pucihar, A., Lenart, G., Kljajić Borštnar, M., Vidmar, D., & Marolt, M. (2019). Drivers and Outcomes of Business Model Innovation—Micro, Small and Medium-Sized Enterprises Perspective. *Sustainability*, 11(2), 344. <https://doi.org/10.3390/su11020344>
- Rachinger, M., Rauter, R., Müller, C., Vorraber, W., & Schirgi, E. (2019). Digitalization and its influence on business model innovation. *Journal of Manufacturing Technology Management*, 30(8), 1143–1160. <https://doi.org/10.1108/JMTM-01-2018-0020>

- Ranta, V., Aarikka-Stenroos, L., & Väisänen, J.-M. (2021). Digital technologies catalyzing business model innovation for circular economy—Multiple case study. *Resources, Conservation and Recycling*, 164, 105155. <https://doi.org/10.1016/j.resconrec.2020.105155>
- Rayna, T., & Striukova, L. (2016). From rapid prototyping to home fabrication: How 3D printing is changing business model innovation. *Technological Forecasting and Social Change*, 102, 214–224. <https://doi.org/10.1016/j.techfore.2015.07.023>
- Remane, G., Hanelt, A., Nickerson, R. C., & Kolbe, L. M. (2017). Discovering digital business models in traditional industries. *Journal of Business Strategy*, 38(2), 41–51. <https://doi.org/10.1108/JBS-10-2016-0127>
- Ringvold, K., Saebi, T., & Foss, N. (2023). Developing Sustainable Business Models: A Microfoundational Perspective. *Organization & Environment*, 36(2), 315–348. <https://doi.org/10.1177/10860266221117250>
- Roos, G. (2014). Business Model Innovation to Create and Capture Resource Value in Future Circular Material Chains. *Resources*, 3(1), 248–274. <https://doi.org/10.3390/resources3010248>
- Saebi, T., Lien, L., & Foss, N. J. (2017). What Drives Business Model Adaptation? The Impact of Opportunities, Threats and Strategic Orientation. *Long Range Planning*, 50(5), 567–581. <https://doi.org/10.1016/j.lrp.2016.06.006>
- Santa-Maria, T., Vermeulen, W. J. V., & Baumgartner, R. J. (2021). Framing and assessing the emergent field of business model innovation for the circular economy: A combined literature review and multiple case study approach. *Sustainable Production and Consumption*, 26, 872–891. <https://doi.org/10.1016/j.spc.2020.12.037>
- Sarasini, S., & Langeland, O. (2021). Business model innovation as a process for transforming user mobility practices. *Environmental Innovation and Societal Transitions*, 39, 229–248. <https://doi.org/10.1016/j.eist.2021.04.005>
- Sarasini, S., & Linder, M. (2018). Integrating a business model perspective into transition theory: The example of new mobility services. *Environmental Innovation and Societal Transitions*, 27, 16–31. <https://doi.org/10.1016/j.eist.2017.09.004>
- Savastano, M., Amendola, C., Bellini, F., & D'Ascenzo, F. (2019). Contextual Impacts on Industrial Processes Brought by the Digital Transformation of Manufacturing: A Systematic Review. *Sustainability*, 11(3), 891. <https://doi.org/10.3390/su11030891>
- Schaltegger, S., Freund, F. L., & Hansen, E. G. (2012). Business cases for sustainability: The role of business model innovation for corporate sustainability. *International Journal of Innovation and Sustainable Development*, 6(2), 95. <https://doi.org/10.1504/IJISD.2012.046944>
- Schaltegger, S., Lüdeke-Freund, F., & Hansen, E. G. (2016). Business Models for Sustainability: A Co-Evolutionary Analysis of Sustainable Entrepreneurship, Innovation, and Transformation. *Organization & Environment*, 29(3), 264–289. <https://doi.org/10.1177/1086026616633272>
- Shakeel, J., Mardani, A., Chofreh, A. G., Goni, F. A., & Klemeš, J. J. (2020). Anatomy of sustainable business model innovation. *Journal of Cleaner Production*, 261, 121201. <https://doi.org/10.1016/j.jclepro.2020.121201>
- Singh, V. K., Singh, P., Karmakar, M., Leta, J., & Mayr, P. (2021). The journal coverage of Web of Science, Scopus and Dimensions: A comparative analysis. *Scientometrics*, 126(6), 5113–5142. <https://doi.org/10.1007/s11192-021-03948-5>
- Snihur, Y., & Bocken, N. (2022). A call for action: The impact of business model innovation on business ecosystems, society and planet. *Long Range Planning*, 55(6), 102182. <https://doi.org/10.1016/j.lrp.2022.102182>
- Soluk, J., Miroshnychenko, I., Kammerlander, N., & De Massis, A. (2021). Family Influence and Digital Business Model Innovation: The Enabling Role of Dynamic Capabilities. *Entrepreneurship Theory and Practice*, 45(4), 867–905. <https://doi.org/10.1177/1042258721998946>

- Täuscher, K., & Abdelkafi, N. (2018). Scalability and robustness of business models for sustainability: A simulation experiment. *Journal of Cleaner Production*, 170, 654–664. <https://doi.org/10.1016/j.jclepro.2017.09.023>
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350. <https://doi.org/10.1002/smj.640>
- Teece, D. J. (2010). Business Models, Business Strategy and Innovation. *Long Range Planning*, 43(2–3), 172–194. <https://doi.org/10.1016/j.lrp.2009.07.003>
- Teece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, 51(1), 40–49. <https://doi.org/10.1016/j.lrp.2017.06.007>
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533.
- Tomaszewski, R. (2023). Visibility, impact, and applications of bibliometric software tools through citation analysis. *Scientometrics*, 128(7), 4007–4028. <https://doi.org/10.1007/s11192-023-04725-2>
- van Eck, N. J., & Waltman, L. (2023, October 31). *VOSviewer Manual for VOSviewer version 1.6.20*. https://www.vosviewer.com/documentation/Manual_VOSviewer_1.6.20.pdf
- Veleva, V., & Bodkin, G. (2018). Corporate-entrepreneur collaborations to advance a circular economy. *Journal of Cleaner Production*, 188, 20–37. <https://doi.org/10.1016/j.jclepro.2018.03.196>
- Velter, M. G. E., Bitzer, V., Bocken, N. M. P., & Kemp, R. (2020). Sustainable business model innovation: The role of boundary work for multi-stakeholder alignment. *Journal of Cleaner Production*, 247, 119497. <https://doi.org/10.1016/j.jclepro.2019.119497>
- Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Qi Dong, J., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122, 889–901. <https://doi.org/10.1016/j.jbusres.2019.09.022>
- Wang, R., & Chebo, A. K. (2021). The Dynamics of Business Model Innovation for Technology Entrepreneurship: A Systematic Review and Future Avenue. *SAGE Open*, 11(3), 2158244021110299. <https://doi.org/10.1177/215824402111029917>
- Weissbrod, I., & Bocken, N. M. P. (2017). Developing sustainable business experimentation capability – A case study. *Journal of Cleaner Production*, 142, 2663–2676. <https://doi.org/10.1016/j.jclepro.2016.11.009>
- Weking, J., Stöcker, M., Kowalkiewicz, M., Böhm, M., & Krcmar, H. (2020). Leveraging industry 4.0 – A business model pattern framework. *International Journal of Production Economics*, 225, 107588. <https://doi.org/10.1016/j.ijpe.2019.107588>
- Witschel, D., Döhla, A., Kaiser, M., Voigt, K.-I., & Pfletschinger, T. (2019). Riding on the wave of digitization: Insights how and under what settings dynamic capabilities facilitate digital-driven business model change. *Journal of Business Economics*, 89(8–9), 1023–1095. <https://doi.org/10.1007/s11573-019-00950-5>
- Yang, M., Evans, S., Vladimirova, D., & Rana, P. (2017). Value uncaptured perspective for sustainable business model innovation. *Journal of Cleaner Production*, 140, 1794–1804. <https://doi.org/10.1016/j.jclepro.2016.07.102>
- Yin, R. K. (2009). *Case study research: Design and methods*. SAGE Publications, Inc.
- Yin, R. K. (2014). *Case study research: Design and methods*. SAGE.
- Yip, A. W. H., & Bocken, N. M. P. (2018). Sustainable business model archetypes for the banking industry. *Journal of Cleaner Production*, 174, 150–169. <https://doi.org/10.1016/j.jclepro.2017.10.190>
- Zott, C., & Amit, R. (2007). Business Model Design and the Performance of Entrepreneurial Firms. *Organization Science*, 18(2), 181–199. <https://doi.org/10.1287/orsc.1060.0232>

- Zott, C., & Amit, R. (2008). The fit between product market strategy and business model: Implications for firm performance. *Strategic Management Journal*, 29(1), 1–26. <https://doi.org/10.1002/smj.642>
- Zott, C., & Amit, R. (2010). Business Model Design: An Activity System Perspective. *Long Range Planning*, 43(2–3), 216–226. <https://doi.org/10.1016/j.lrp.2009.07.004>
- Zott, C., Amit, R., & Massa, L. (2011). The Business Model: Recent Developments and Future Research. *Journal of Management*, 37(4), 1019–1042. <https://doi.org/10.1177/0149206311406265>