REVIEW PAPER

Managerial experimental approaches and business model dynamics: a systematic literature review

Luca Simone Macca[1] **· Gabriele Santoro**[1,2] **· Michael Christofi**[3]

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Abstract

Managerial Experimental Approaches (MEAs) such as Lean Startup (LS), Agile, Design Thinking (DT), and Growth Hacking (GH) have gained prominence in business and management for their potential to shape Business Model Dynamics (BMDs) through innovation, validation, pivoting, and scaling. The lack of research on the influence and implications of MEAs in BMDs and their interconnections motivates the present study. This study aims to provide a comprehensive understanding of the interplay between MEAs and BMDs by systematically reviewing the current state of research. Key findings reveal both shared and unique contributions of each MEA to BMDs, such as LS's focus on rapid validation, Agile's emphasis on adaptability, DT's role in fostering creativity and reducing biases, and GH's alignment with measurable, data-intensive scaling. The study also uncovers significant synergies among the approaches and gaps in the literature, highlighting the potential for a more integrative view of leveraging MEAs. As a key contribution, we propose an organizing framework synthesizing fragmented insights, guiding scholars and practitioners in tailoring MEAs to dynamic business environments. By bridging theoretical gaps and providing actionable insights, this research advances the understanding of MEAs' strategic value in shaping BMDs and lays the groundwork for future exploration.

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1 Introduction

Over the past decade, significant research in the realm of business and management has focused on new data-driven approaches that emphasize the use of scientific methods to innovate and experiment with business models. These approaches, which have gained considerable attention from both academia and practitioners, highlight the importance of systematic testing, iteration, and evidence-based decision-making (Bocken and Snihur 2020; Hampel et al. 2020a; Kraus et al. 2022a; Sanasi et al. 2023). Despite a lack of standardized terminology in the literature, there is substantial evidence indicating a rising trend among managers who are increasingly incorporating these new approaches (hereafter called managerial experimental approaches—MEAs), such as lean startup (LS (Bocken and Snihur 2020; Bortolini et al. 2021; Silva et al. 2021)), agile (Ghezzi and Cavallo 2020; Loss and Crave 2011; Sanasi et al. 2022), design thinking (DT (Baldassarre et al. 2020; He and Ortiz 2021; Liedtka 2011; Mortati et al. 2023)), and growth hacking (GH (Bargoni et al. 2023; Bargoni et al. 2024a, b; Bohnsack and Liesner 2019; Cavallo et al. 2023; Macca et al. 2025)), into their business practices. This adoption is driven by the manifold benefits these approaches offer, including sustained growth, the enhancement of innovation and adaptability (Rittershaus et al. 2023), the promotion of strategic agility (Sanasi et al. 2022), the assessment of potential risks and challenges (Linde et al. 2023), the facilitation of new strategy implementation (Magistretti et al. 2023), leveraging experimentation for cost reduction and maximizing results (Carroll and Casselman 2019), and expediting iterations and adjustments (He and Ortiz 2021). Furthermore, many recent studies reveal that MEAs may significantly shape enterprises' business models to a different extent (Cavallo et al. 2023; Ghezzi and Cavallo 2020; He and Ortiz 2021; Kraus et al. 2023; Linde et al. 2023). Specifically, these approaches intertwine with diverse facets of business model dynamics (BMDs), offering avenues for innovation, validation, pivoting, and scaling business ideas (Sanasi 2023). First, MEAs empower enterprises to catalyze innovative changes (Kraus et al. 2020b; Richter et al. 2017) and validate existing models (Silva et al. 2021). Second, MEAs provide the flexibility necessary for timely pivoting when confronted with evolving market landscapes, ensuring adaptability and resilience (Hampel et al. 2020b). Third, the inherent scalability associated with MEAs positions enterprises to scale and optimize their business models in alignment with emerging opportunities and challenges (Bargoni et al. 2023; Cavallo et al. 2023).

However, despite the increasing interest and scholarly attention in recent years, the implications of MEAs on BMDs are still unclear and not framed within a consistent literature stream. Within the domain of MEAs, the existing literature is characterized by a lack of comprehensive reviews that analyze each approach as an integrated whole rather than isolating them individually (see Appendix A for the existing reviews identified on the MEA concept and the differences from this systematic review). This fragmentation hinders a holistic understanding of the synergistic effects that MEAs may exert on BMDs. Moreover, the ambiguity surrounding the meaning, applications, impacts, and implications of MEAs in the context of BMDs further compounds this issue, making it difficult for researchers and practitioners to develop coherent strategies.

The importance of addressing these gaps is twofold. From a theoretical perspective, this research provides an opportunity to bridge disparate streams of knowledge and establish a unified framework that captures the nuanced interrelations between MEAs and BMDs. Such a framework is essential for advancing the conceptual understanding of BMDs, which, as a field, remains underdeveloped despite its critical role in business strategy and innovation. From a practical perspective, clarifying these interconnections, along with their specific peculiarities, offers actionable insights for practitioners seeking to leverage MEAs to innovate, adapt, and scale their business models effectively.

While recent advancements, such as the framework proposed by Sanasi (2023), have introduced a promising conceptualization of BMDs, significant gaps still need to be discovered. Specifically, Sanasi's framework identifies four key dynamics—business model innovation (BMI), business model validation (BMV), business model pivoting (BMP), and business model scaling (BMS)—but does not deeply explore the role of individual MEAs in shaping these dynamics. Our study directly addresses this limitation by systematically examining how MEAs contribute to these four dynamics, thus building on and extending Sanasi's work meaningfully.

This research stands out in three critical ways. First, we adopt a purely systematic literature review approach. Second, rather than exploring the term'experimentation' as a whole within the scientific context, our study analyzes different experimental approaches in the context of business and management. In this sense, the paper clarifies the role of each specific MEA, namely LS, DT, agile, and GH, in driving BMDs. This granularity not only enriches the conceptual understanding of MEAs but also provides clarity for practitioners navigating these approaches. Third, we propose an integrative framework consolidating the fragmented insights within the literature, offering a structured overview of how MEAs influence BMDs. By doing so, we address a pressing need for both theoretical cohesion and practical guidance in this field.

Therefore, these research gaps underscore the imperative for an in-depth investigation that not only bridges the existing divide between MEAs and BMDs but also elucidates the multifaceted dimensions of MEAs concerning their significance, applications, and implications within the context of BMDs.

The overarching aim of this study is to provide a comprehensive understanding of the relationship between MEAs and BMDs by bridging these two fields and offering a detailed examination of their interplay. Specifically, this research seeks to (1) review and investigate the existing state of research on MEAs and BMDs, (2) synthesize the findings into an organizing framework, and (3) pinpoint potential areas of poor knowledge that offer promising avenues for future investigation.

Our study makes significant contributions to both management research and practical applications. First, we elucidate the unique and shared mechanisms underlying MEAs—LS, Agile, DT, and GH—in fostering BMDs. Specifically, we highlight how iterative experimentation, customer-centricity, and context-specific adaptability emerge as critical innovation enablers. By systematically connecting these mechanisms to BMDs, our study provides actionable insights into how organizations can leverage each specific MEA in sustaining BMDs in different circumstances. Second, we present the first systematic analysis of the literature on this subject matter, offer-

ing a comprehensive picture of how the literature on this topic has evolved so far. Our systematic literature review identifies trends, recurring themes (e.g., collaboration, technology integration, and data-driven decision-making), and gaps in the literature. For instance, while LS and agile excel in rapid adaptation, DT emphasizes reducing cognitive biases, and GH focuses on measurable and data-driven experimentation. This synthesis clarifies conceptual overlaps and distinguishes each MEA's unique value propositions. Third, we introduce an organizing framework that not only organizes current literature but also serves as a foundation for future scholarly exploration and provides practical guidance for practitioners. The framework outlines the contextual, methodological, and strategic dimensions influencing MEAs' application to BMDs. For example, it emphasizes how LS aligns with technology startups, Agile with multidisciplinary teams, DT with sustainable innovation, and GH with data-intensive strategies. This framework guides future scholarly inquiries by identifying knowledge gaps (e.g., the underexplored intersection of MEAs with sustainability goals) and equips practitioners with a roadmap to tailor MEAs to specific challenges.

2 Conceptual boundaries of the review

In contemporary business and management research, the landscape of managerial practices constantly evolves, driven by the quest for innovation, efficiency, and strategic adaptation (Bargoni et al. 2024a, b; Sanasi 2023). In this dynamic context, using MEAs has become an essential driver of business model change and evolution (Becker and Endenich 2023; Coffay and Bocken 2023). The emerging literature on this topic (Cavallo et al. 2023; Fjeldstad and Snow 2018; Kerr et al. 2014; Liedtka 2015) has expanded exponentially, highlighting the need to establish clear boundaries for systematic review.

Despite the lack of a universally accepted and consistent definition, four main MEAs have been identified in the business and management literature, given their frequency of use by managers and entrepreneurs and as many scholars have deepened their concepts and developed new insights into them (see Table 1 for a list of the definitions we adopt in this study). These approaches were selected based on two main criteria: their frequent application in practice by managers and entrepreneurs and the extensive scholarly attention they have garnered, resulting in more profound conceptual development and the generation of new insights. While no universal definition of MEAs exists, this study anchors its selection on the existing literature and the systematic review methodology described in Sect. 3.2.3. A targeted search of major business and management databases, including Web of Science, Scopus, and Business Source Ultimate, revealed these four approaches as the most consistently discussed in connection with entrepreneurial and managerial experimentation, as well as their impact on business model dynamics. These approaches recur in high-impact publications and are frequently highlighted in studies emphasizing innovation-driven business environments (Björkdahl 2020; Cavallo et al. 2023; Fjeldstad and Snow 2018; Hampel et al. 2020a, b; Kerr et al. 2014; Klenner et al. 2022; Liedtka 2015; Sanasi et al. 2023). In particular, each approach has been extensively explored in practice-focused and scholarly discourses that delineate their processes, applications, and out-

Table 1 Definitions of terms addressed in our literature review

Term	Definition
Managerial experimental approaches	Collection of methods and strategies employed by managers and entrepreneurs to explore, test and refine various aspects of their business models. These approaches involve the systematic exploration and implementation of various innovative methods and techniques to enhance and innovate the way businesses operate. Essentially, they revolve around the experimentation process undertaken by managerial and entrepreneurial figures to optimize their managerial practices and achieve greater success in their endeavors (own interpretation)
Lean startup	Systematic and scientific approach to establishing and overseeing startups, aiming to swiftly deliver a desired product to customers. This method instructs entrepreneurs on effectively navigating the startup journey, providing guidance on when to adjust course, when to persist, and how to propel business growth with maximum speed. It is a principled strategy for the development of new products (Bocken and Snihur 2020; Bortolini et al. 2021; Ries 2011; Silva et al. 2021)
Agile	Microplanning and project management tool designed to introduce agility, adaptability, and speed into development projects. By utilizing Agile techniques and approaches, companies can effectively respond to disruptive technologies and meet the heightened customer demand for quicker value delivery. Agile facilitates a flexible and responsive framework for managing projects (Ghezzi and Cavallo 2020; de Borba et al. 2019; Loss and Crave 2011)
Design thinking	Non-linear, iterative problem-solving process that employs both analytical and creative methods. This user-centered innovation approach revolves around addressing complex problems through repeated cycles of inspiration, ideation, and implementation. It emphasizes a creative and empathetic perspective, fostering innovation in the development of solutions (Brown 2008; He and Ortiz 2021; Liedtka 2011)
Growth hacking	Blend of creative marketing, data analysis, and coding with an explicit focus on achieving rapid business growth. This process is described as the rapid experimentation that integrates marketing with information and communication technology to identify the most effective and efficient strategies for business expansion (Bohnsack and Liesner 2019; Ellis 2010). Recent literature suggests that growth hacking can also be applied to optimize, enhance, and innovate a business model, extending its scope beyond mere growth acceleration (Bargoni et al. 2023, 2024a, b; Cavallo et al. 2023; Santoro et al. 2024,)
Business model dynamics	All the ongoing modifications, alterations, and adaptations made to a company's business model to ensure the consistent sustained creation of value over time (Achtenhagen et al. 2013; Foss and Saebi 2018; Sanasi 2023)
Business model innovation	The active exploration of new patterns and strategies for a company, with the goal of discovering original ways to generate and capture value for stakeholders (Andries et al. 2013; Foss and Saebi 2018; Zott et al. 2011)
Businss model validation	The deep examination of the robustness of the foundational assumptions underlying a business model before allocating significant resources to it. This assessment ensures that the strategies of the chosen business model are not only feasible but also capable of delivering the expected returns, minimizing the risk of investing in models with uncertain outcomes (Shepherd and Gruber 2021; Silva et al. 2021)
Business model scaling	The rapid expansion of a new firm's user base without a commensurate increase in allocated resources. Companies strategically pursue scaling efforts to efficiently grow their business models, seizing market opportunities and maximizing impact without overloading resources (Cavallo et al. 2023; Picken 2017)
Business model pivoting	Shift of the current trajectory of a business model to test hypotheses that address emerging challenges. This adaptive process comes from learning and experimentation, allowing companies to flexibly adapt their models to better solve problems and meet evolving needs (Hampel et al. 2020b; Sanasi and Ghezzi 2022)

comes. While representative, selecting these four MEAs does not claim exclusivity but instead reflects their prominence in the literature as validated through a systematic review process. This rationale is further elaborated in the next section under the "search strategy" paragraph (3.2.3), where the methodology for their identification and selection is discussed in detail.

The first, called LS, is a business methodology emphasizing the efficient and iterative development of products or services through a systematic and validated learning process (Silva et al. 2021). Eric Ries (2011), in his book "The Lean Startup," defined it as a "scientific approach to creating and managing startups and getting a desired product to customers' hands faster. It is a principled approach to new product development." The second, called Agile, is a microplanning or project management tool that brings agility, adaptability, and speed to development projects (de Borba et al. 2019). According to the Agile Practice Guide (2017), Agile techniques and approaches can enable companies to respond effectively to disruptive technologies and increased customer demand for more immediate value delivery. The third, called DT, is a nonlinear, iterative process of solving complex problems using analytical and creative practices (Brown 2008). It is defined as a user-centered innovation approach based on problem-solving and a process of repeated iterations between the three creative phases of inspiration, ideation, and implementation (Brown and Katz 2011). The last, called GH, combines creative marketing, data analysis, and coding with an absolute focus on growth (Bohnsack and Liesner 2019). According to Ellis (2010), GH is defined as "that process of rapid experimentation that links marketing and information and communications technology to identify the most effective and efficient ways to grow a business." Despite this, the recent literature indicates that GH can also be applied to optimize, improve, and innovate a business model (Bargoni et al. 2024a, b).

Within the existing body of literature, BMDs encompass the various modifications, adaptations, or alterations made to a company's business model to facilitate sustained value creation over time (Achtenhagen et al. 2013; Foss and Saebi 2018). Sanasi's (2023) framework offers a comprehensive perspective, delineating four key dynamics within business models. The first dynamic is represented by BMI, which focuses on discovering new value creation and capturing opportunities (e.g., Andries et al. 2013; Christofi et al. 2024a; Foss and Saebi 2018; Roy et al. 2025; Zott et al. 2011). Additionally, BMV constitutes a crucial dynamic to ensure the feasibility and viability of a firm's chosen business model strategies (Shepherd and Gruber 2021; Silva et al. 2021). Following successful validation, firms often embark on scaling efforts, strategically expanding their business models to capitalize on market opportunities (e.g., Cavallo et al. 2023; Picken 2017). Moreover, firms engage in strategic pivots within their business models to effectively navigate unforeseen challenges and adverse events (e.g., Hampel et al. 2020b; Sanasi and Ghezzi 2022).

For the purposes of this review, we investigate the implications of MEAs on BMDs using the following approach. Firstly, we consider all MEAs applied by managers and businesses, seeking to comprehensively examine the range of experimental approaches employed in organizational contexts. This ensures that we capture a wide array of activities and strategies, allowing us to identify patterns and commonalities across varied applications of MEAs. Secondly, we investigate the mechanisms

through which these approaches, whether applied directly or indirectly, influence the evolution and transformation of business models. This approach was adopted to ensure a focused and systematic review of studies that align with the intersection of MEAs and their effects on BMDs. As a result, some studies that do not fall within the boundaries we defined were excluded. For example, studies that exclusively analyze non-MEAs, as well as those that do not explicitly explore the effects of MEAs on BMDs, were excluded from our analysis. Likewise, research that primarily delves into BMDs without being relevant to the impact criteria specified in the MEAs was not considered within the boundaries of this review.

The relationship between MEAs and BMDs is investigated in light of the lack of scholarly attention to this intersection. The prevailing literature often treats MEAs— LS, agile, DT, and GH—as a heterogeneous subset rather than a collective entity (Bortolini et al. 2021; Liedtka 2011; Silva et al. 2020; Troisi et al. 2020). These four approaches, despite lacking a universally defined nomenclature of "managerial experimentation approaches," have been recurrently explored and validated across various studies in the expansive field of business and management (Bocken and Snihur 2020; Ganguly and Euchner 2018; Hampel et al. 2020a; Magistretti et al. 2023; Sanasi 2023; Sanasi et al. 2023; Weissbrod and Bocken 2017). Moreover, this lack leads to an ambiguous understanding of its scope and meaning.

Despite recent efforts to consolidate and evaluate studies across multiple domains of MEAs (Bortolini et al. 2021; Flechas and de 2021; Rittershaus et al. 2023; Sanasi 2023), there has been a conspicuous absence of comprehensive reviews clarifying how MEAs affect BMDs.

3 Methodology

3.1 Why this review?

The extensive range of MEAs and their implications for BMDs presents a landscape of considerable fragmentation within the business and management research field. This fragmentation stems from three core issues. First, there is a lack of unified terminology and conceptual frameworks across studies, leading to inconsistencies in how MEAs and their contributions to BMDs are defined and interpreted. For instance, while some studies focus narrowly on individual approaches such as LS or DT, others adopt broader or overlapping interpretations, creating conceptual ambiguity. Second, existing research often isolates individual MEAs, examining their effects in silos rather than exploring how these approaches interconnect and complement one another in shaping BMDs. Third, the rapidly evolving business landscape generates a proliferation of studies that, while valuable in isolation, fail to offer a synthesized, cohesive perspective, making it difficult for researchers and practitioners to draw integrated insights. The consequence of this fragmentation is a significant barrier to the accumulation of knowledge and the integration of findings within the field.

Given the substantial investments in MEAs and their potential impacts on BMDs, a deeper understanding of their effectiveness is needed. We opted to employ the method of a comprehensive SLR to fulfill the primary objective of enhancing our

knowledge of MEAs and their interconnections within BMDs. This methodological choice enables us to systematically identify, select, critically evaluate, and synthesize existing literature in a methodically rigorous, transparent, and reproducible manner, facilitating the derivation of robust conclusions regarding both the recognized and unrecognized aspects within the scrutinized research realm (Atewologun et al. 2017; Christofi et al. 2017, 2024b; Denyer and Tranfield 2009; Kraus et al. 2022b; Tranfield et al. 2003). Our decision aligns with the recommendations of prominent scholars (Christofi et al. 2021; Danese et al. 2018; Kraus et al. 2020a, 2024; Vrontis and Christofi 2021), who advocate for the systematic literature review approach due to several key advantages over traditional narrative reviews. First, this method improves the overall quality of the review procedure and its outputs (Danese et al. 2018; Leonidou et al. 2020). Second, it enables minimizing bias and mistakes, contributing to the reliability of the review process (Dada 2018; Tranfield et al. 2003). Third, the systematic approach promotes the validity of the process by ensuring the replicability of each step undertaken during the review (Wang and Chugh 2014). Additionally, it facilitates data synthesis and systematic literature mapping within the specific research domain (Crossan and Apaydin 2010; Kauppi et al. 2018). Finally, SLRs often yield frameworks that consolidate existing knowledge, providing valuable insights to both researchers and practitioners (Dada 2018; Nofal et al. 2018). Furthermore, the SLR methodology has found application in recent studies across various disciplines, including strategic management (Paul et al. 2023), organizational behavior (Kayas 2023), and innovation studies (Evers et al. 2023). Given these considerations, conducting a SLR is the best and most effective approach to achieving our research goal: providing a comprehensive and high-level review of MEAs and their interconnections within BMDs.

By doing so, this review addresses fragmentation in three distinct ways: (1) By analyzing and categorizing how different MEAs are defined and applied in existing research, this study establishes a unified conceptual framework that helps reconcile divergent interpretations and offers a standardized lens through which to understand MEAs and their implications for BMDs; (2) This review identifies and synthesizes insights across studies that have traditionally been explored in isolation. For example, while agile methods and DT are often treated as separate domains, this review uncovers their overlapping principles, such as iterative experimentation and user-centricity, and situates them within a broader context of BMDs; and (3) By systematically examining how MEAs collectively influence BMDs, this review highlights their synergistic potential. For instance, it explores how the iterative nature of LS complements the data-driven experimentation of GH, offering a comprehensive understanding of how these approaches can be strategically combined to enhance innovation, adaptability, and scalability.

3.2 Search protocol

3.2.1 Question formulation

An effective review depends on the formulation of precise research questions at the beginning of the review process (Nguyen et al. 2018). In formulating our research

inquiry, we concentrated our attention on the intersection of MEAs and their implications within BMDs. Consistent with the approach suggested by Adams et al. (2016), the research query was developed through a collaborative dialogue among research participants and by incorporating insights from both academic and industry experts. As a result of this collaborative process, the research question was formulated as follows: "How do MEAs contribute to and influence BMDs, and what are the relationships and interconnections between these two topics?".

3.2.2 Inclusion criteria

Following the methodology outlined by Wang and Chugh (2014) and Dada (2018), the systematic review's criteria for study inclusion were established based on three key factors. These encompassed (1) delineating the parameters for the search, (2) formulating the search queries, and (3) specifying the temporal scope of the search. Firstly, the search parameters encompass electronic databases, namely, Business Source Ultimate, Scopus, and Web of Science. The selection of these databases was grounded in their extensive coverage of business-related journals and their frequent utilization in contemporary systematic reviews. Secondly, aligning with the approach taken by Kauppi et al. (2018) and Muller-Seitz (2012), an inclusive set of search terms was devised to ensure broad coverage, acknowledging that this approach might yield a considerable number of hits unrelated to the specific topic under review. This strategy aimed to mitigate the risk of excluding potentially pertinent studies due to overly restrictive search criteria. Thirdly, to encompass all relevant literature without constraining the search to a predefined time span, the investigation extended until December 2023, marking the conclusion of the study period.

3.2.3 Search strategy

We searched the title, abstract, and keyword sections of the electronic databases using a method similar to that used by Danese et al. (2018), Christofi et al. (2017), and West and Bogers (2014). This approach was chosen because these fields typically contain the relevant search terms. Our search strategy was tailored to fit this research's scope, focus, and objectives, which aims to explore the interplay between MEAs and BMDs. To address the research gaps of this study, the search terms were organized into two thematic concepts representing MEAs and BMDs. This was determined by the study's objective to capture the interconnections between these two domains and to identify how MEAs influence BMDs in specific dimensions such as innovation, validation, pivoting, and scaling. In contrast to the latter set of keywords, which were not analyzed due to their broad, macro-level nature, our attention shifted toward specific concepts. Furthermore, we did not focus on the terms "managerial experimental approaches" and "business model dynamics" because no research currently analyzes these keywords collectively, only individually. Instead, we started by identifying keywords commonly used in the field and associated them with the two concepts central to our research, ensuring that the retrieved studies are directly relevant to the research focus. For MEAs, we refined our search to the most widely used experimental approaches in the managerial field, while for BMDs, we

used a recent framework proposed by Sanasi (2023) to filter micro-sections that are part of BMDs. Thus, in line with the research question of this work, we applied the following keywords: "experiment*," "agile," "design thinking," "lean start*," and "growth hack*" to represent MEAs. Likewise, we searched for keywords like "business model* AND innovat*", "business model* AND scal*", "business model* AND pivot*," and "business model* AND validat*" to represent aspects of BMDs. In addition, we combined the keywords for each concept using the OR operator to create a complete search term for that concept. Then, using the AND operator to combine these search terms, we created integrated search strings to explore further how these elements are related to each other. The initial search, following the specific criteria mentioned above, yielded a total of 3368 results.

This approach is particularly suited to the research's scope for several reasons. First, focusing on the interplay between MEAs and BMDs requires an integrative search strategy that goes beyond the isolated analysis of either domain, aligning with the study's objective to synthesize findings into an organizing framework. Second, the inclusion of MEAs as individual constructs rather than as part of a broader "experimentation" category underscores the study's aim to offer granular insights into the specific contributions of each MEA. Third, this tailored search aligns with the practical goal of guiding practitioners by providing actionable insights into how MEAs can drive different facets of BMDs.

3.2.4 Additional inclusion and exclusion criteria

The initial set of potentially pertinent articles underwent additional scrutiny based on various exclusion criteria. Initially, aligning with contemporary practices in systematic reviews (e.g., Dada 2018; Klang et al. 2014; Nguyen et al. 2018; Sauer and Seuring 2023), our search concentrated on peer-reviewed academic journals with full-text articles. Consequently, non-academic sources like book chapters, editorials, conference papers, extended abstracts, and book reviews were excluded. Articles not available in English were also excluded (Follmer and Jones 2018), aligning with the common scientific knowledge base found in major scientific journals (Kauppi et al. 2018). To maintain contextual relevance and address the research question, only results within the "Management" and "Business" fields were considered. These criteria yielded a sample of 1,025 results. Subsequently, after removing duplicates, the review was further refined to studies in peer-reviewed journals with an impact factor equal to or higher than 1.5. This criterion, drawn from Clarivate Analytics' Journal Citation Report (JCR), is a commonly adopted method in literature reviews for identifying scholarly debates and research trends in a specific area (Atewologun et al. 2017; Falagas et al. 2008), as suggested by Kraus et al. (2020b). Additionally, this limitation in our search criteria follows the standards observed in comprehensive reviews of literature found in prestigious business publications to guarantee that only studies of exceptional quality are included in our analysis (e.g., Atewologun et al. 2017; Franco-Santos and Otley 2018; Vrontis and Christofi 2021). Following the application of these exclusion criteria, we obtained a group of 314 items that met the requirements set within the boundaries of our review.

At this stage, similar to Kauppi et al. (2018), all authors reviewed the above-mentioned subset of 314 articles and evaluated them based on their titles and abstracts. This process reduced the set to 111 articles. The subsequent review phase adopted a more stringent approach, excluding studies that only marginally addressed the topic, thereby increasing the rigor of control through full-text analysis. As a result, this process led to the inclusion of 42 selected documents that significantly contributed to our understanding of the interconnections between MEAs and BMDs in the specific context under investigation.

3.2.5 Further search processes

Following Dada (2018) and Endres and Weibler (2017), we then conducted a manual search of the reference lists associated with all selected studies (snowballing technique). This additional step resulted in the identification of seven more papers, bringing the total number of selected studies to 49. These identified studies underwent a comprehensive screening process using inclusion, exclusion, and quality criteria, including title, abstract, and full-text analysis. To ensure the comprehensiveness of our approach and to capture any potentially overlooked articles, we included extra studies suggested by experts (Nofal et al. 2018). We then shared our list of studies with two other experts and asked them to check if we missed anything important in our initial search. This final step contributed two more papers to our dataset. After carefully checking that the studies met our specific standards on what to include and what to exclude, we found a total of 51 articles in peer-reviewed academic journals through our comprehensive search process. The implementation of the review process is shown in Fig. 1.

3.2.6 Extraction, analysis, and synthesis

Data pertinent to all 51 articles were then collected in a structured data extraction form (Bailey et al. 2017; Nguyen et al. 2018; Rose et al. 2011; Tranfield et al. 2003). This form was carefully crafted to capture essential information such as publication details, authors' attributes, paper categorization, research method, and principal findings within the literature (see Appendix B for the main findings and Appendix C for the list of articles included in the review). The formulation of a systematic data extraction form facilitated the assimilation and interpretation of the content through both descriptive and thematic analyses applied to the reviewed field, effectively mapping the research landscape. This approach not only contributed to a comprehensive understanding of the relationships and interconnections among various concepts but also facilitated the synthesis of findings, ultimately resulting in the development of a comprehensive framework.
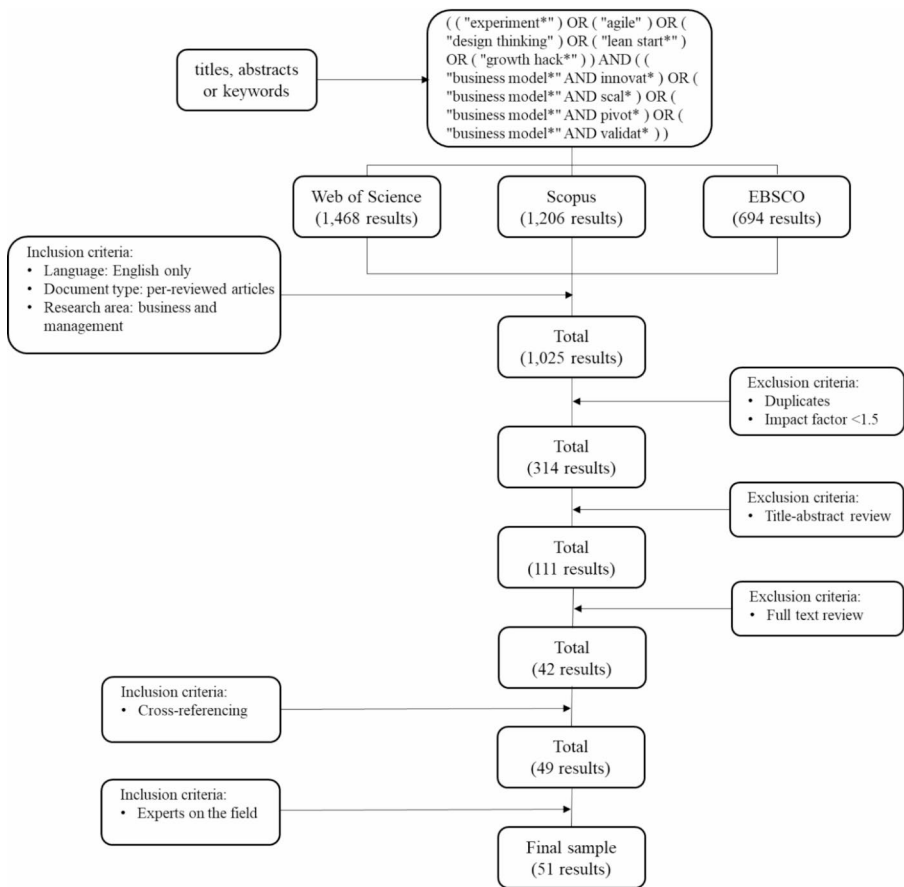
Fig. 1 Literature search strategy

4 Descriptive review of the literature

Upon reviewing the existing literature, distinct patterns emerged concerning the investigation of MEAs and their implications for BMDs. In this section, we delineate observations regarding the origins of collected data, research domains, publication years, article classifications, author attributes, and the methodologies employed. This serves as an initial exploration, providing a preliminary map of the existing literature and highlighting potential research gaps deserving further investigation.

4.1 Year of publication, type of paper, and methods employed

Since 2011, there has been a consistent upward trend in the annual publication of articles. Figure 2 provides a graphical representation of the increasing trend, reaching its highest point in 2020 with a total of 11 articles ($n=11$).

Interestingly, although the number of publications decreased in 2022, the trend picked up again in 2023, reaching a new peak with the same number of articles as in

Fig. 2 Article frequency analysis by type of source and year

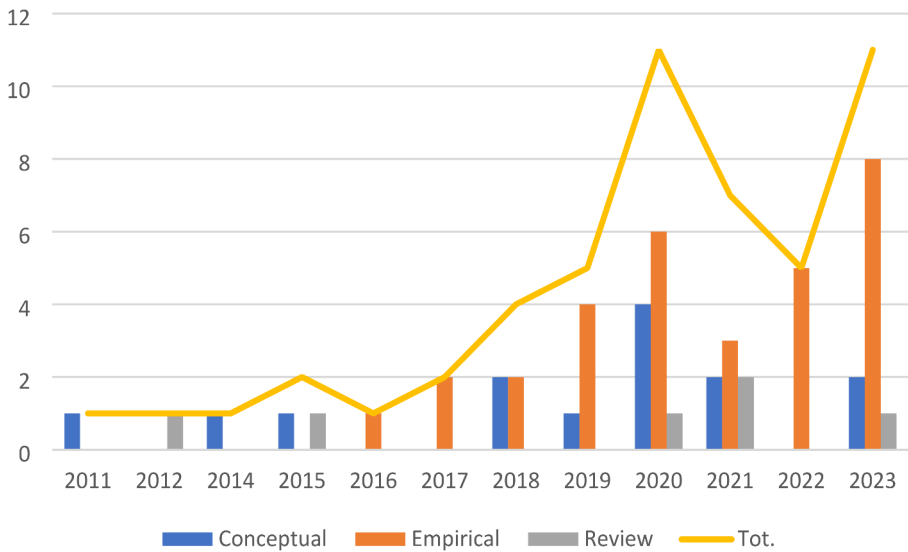2020. Despite the decade-long existence of this research stream, the results underscore that the field of MEAs and their relationship to BMDs continues to grow at a rapid pace. Specifically, the results reveal an exponential growth in scientific output over the past five years, indicating a rapid transition of the reviewed research area into an "adolescent" phase. Among the considered papers, conceptual contributions accounted for approximately 27% ($n=14$), with the predominant share belonging to empirical papers (61%, $n=31$). Within the realm of empirical papers, qualitative works were prevalent over quantitative studies. Furthermore, 12% of our sample included six literature reviews (e.g., structured and systematic literature reviews). However, it should be noted that these reviews focused only on a limited subset of the approaches analyzed in this study while examining each approach in a stand-alone view. Additionally, two studies employed a mixed-methods approach, integrating both qualitative and quantitative methods, while a predominant number relied on qualitative methodologies, exemplified by methods such as semi-structured interviews. In contrast, quantitative methodologies (e.g., questionnaires, datasets, or surveys) were notably absent, signaling a potential gap in the exploration of MEAs and their implications on BMDs. These results indicate a growing body of studies exploring this research stream and suggest a transition into a "growth" stage, with inquiries expanding into new contexts and directions, avoiding stagnation. However, the absence of quantitative methodologies, with only a minimal application of mixed methods, signifies a potential gap in the current exploration of MEAs and their implications on BMDs. This gap poses an opportunity for future research to bridge the divide by incorporating robust quantitative approaches. Such an endeavor would not only enhance the empirical foundation but also contribute to a more comprehensive understanding of the interconnections between MEAs and BMDs.

4.2 Journal outlets and citation impact

The majority of the articles (*n*=9, 18%) were published in the *Journal of Cleaner Production*, followed by *IEEE Transactions on Engineering Management*, *the International Journal of Entrepreneurial Behavior and Research, and the International Entrepreneurship and Management Journal*. Tied in third place are *Creativity and Innovation Management*, *Journal of Product Innovation Management*, *Journal of Small Business Management, Long Range Planning*, *Journal of Business Research,* and *Industrial Marketing Management*. All the other articles have been published in other journals. In particular, the sample comes from 31 different journals from different fields of research. Most are related to the areas of entrepreneurship, innovation, business, and management, as well as in areas less related to the topic. Table 2 presents the publications per journal.

To realize how different research publication sources affect the field, let us analyze the frequency with which articles in our sample are cited. To do so, the total citations were used as a unit of measure (Merigo et al. 2016). This was done in line with similar studies, and the data were retrieved from Google Scholar, which is a leading citation database (Bortolini et al. 2021; Klenner et al. 2022; Silva et al. 2020). The ten most cited articles are Liedtka (2015; 1017), Kerr et al. (2014; 792), Trimi and Berbegal-Mirabent (2012; 709), Ghezzi and Cavallo (2020; 664), Geissdoerfer et al. (2016; 608), Baldassarre et al. (2017; 459), Björkdahl (2020; 404), Fjeldstad et al. (2018; 373), Shepherd and Gruber (2021; 272), Weissbrod and Bocken 2017; 253). The most cited studies are published in *the Journal of Product Innovation Management, Journal of Economic Perspectives, International Entrepreneurship and Management Journal, Journal of Business Research, Journal of Cleaner Production, California Management Review, Long Range Planning,* and *Entrepreneurship: Theory and Practice.* Table 3 presents the most cited articles in the sample.

4.3 Authors' impact and geography

Table 4 reveals a landscape of varied productivity among the authors. First, the data highlights a clear contrast in productivity, with Ghezzi and Bocken emerging as the predominant contributors. Ghezzi leads with nine articles, followed closely by Bocken with 8. This concentration of output from these two authors suggests a significant influence, as they collectively contribute nearly half of the total articles in the dataset. The impact of citations, however, suggests a different situation. Bocken, despite having authored eight articles, emerges as the most influential author in terms of total citations, boasting a substantial count of 1767. This suggests that while some authors may not produce a high volume of work, their contributions carry significant weight and influence within the academic community. On the other end of the spectrum, authors like Sanasi, with fewer articles and citations, might be relatively new to the field or engaging with more niche topics. The publication starts years of these leading authors also contribute to the narrative. Ghezzi's significant output within a relatively short time since 2019 is noteworthy, indicating a prolific start of publications in this stream of research. On the other hand, Bocken's longer presence since 2016 has allowed for a sustained and influential contribution over time.

Table 2 Journals included in the sample

Journal title	No. of articles	Weight (%)	Total citations
JOURNAL OF CLEANER PRODUCTION	9	18	1643
IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT	3	6	97
INTERNATIONAL JOURNAL OF ENTREPRENEURIAL BEHAVIOR & RESEARCH	3	6	202
INTERNATIONAL ENTREPRENEURSHIP AND MANAGEMENT JOURNAL	3	6	712
CREATIVITY AND INNOVATION MANAGEMENT	2	4	164
JOURNAL OF PRODUCT INNOVATION MANAGEMENT	2	4	1072
JOURNAL OF SMALL BUSINESS MANAGEMENT	2	4	56
LONG RANGE PLANNING	2	4	587
JOURNAL OF BUSINESS RESEARCH	2	4	801
INDUSTRIAL MARKETING MANAGEMENT	2	4	149
ACADEMY OF MANAGEMENT JOURNAL	1	2	167
BUSINESS HORIZONS	1	2	53
BUSINESS PROCESS MANAGEMENT JOURNAL	1	2	142
CALIFORNIA MANAGEMENT REVIEW	1	2	404
CONTEMPORARY ACCOUNTING RESEARCH	1	2	7
ELECTRONIC MARKETS	1	2	77
ENTREPRENEURSHIP: THEORY AND PRACTICE	1	2	272
INTERNATIONAL MARKETING REVIEW	1	2	5
INNOVATION: ORGANIZATION & MANAGEMENT	1	2	72
INTERNATIONAL JOURNAL OF OPERATIONS & PRODUCTION MANAGEMENT	1	2	73
JOURNAL OF ECONOMIC PERSPECTIVES	1	2	792
JOURNAL OF KNOWLEDGE MANAGEMENT	1	2	17
JOURNAL OF SMALL BUSINESS AND ENTERPRISE DEVELOPMENT	1	2	22
JOURNAL OF RESEARCH IN MARKETING AND ENTREPRENEURSHIP	1	2	44
MANAGEMENT DECISION	1	2	203
MULTINATIONAL BUSINESS REVIEW	1	2	71
PRODUCTION PLANNING & CONTROL	1	2	54
RESEARCH-TECHNOLOGY MANAGEMENT	1	2	44
SMALL BUSINESS ECONOMICS	1	2	170
STRATEGIC ORGANIZATION	1	2	13
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	1	2	0

Based on the first author's geographical location, a clear pattern emerges, showing the predominant contributions from Italian authors, closely followed by significant contributions from the United Kingdom, Brazil, and the Netherlands (Fig. 3).

This geographical distribution underscores that the scholarly dialogue on the MEAs and BMDs debate transcends national boundaries and involves researchers from different parts of the world, with the most influential coming from Europe. It illustrates the participation of authors from a diverse set of 14 countries worldwide, underscoring the global nature of the scholarly conversation around this stream of research. The prevalence of contributions from authors in advanced economies, nota-

Table 3 List of the 10 most cited articles in the sample

Author(s)	Title	Year	Journal	Total citations	TC/ Year
Liedtka	Perspective: Linking Design Thinking with Innovation Outcomes through Cognitive Bias Reduction	2015	J. Prod. Innov. Manag	1017	113,00
Kerr et al	Entrepreneurship as Experimentation	2014	J. Econ. Perspect	792	79,20
Trimi and Berbegal-Mirabent	Business model innovation in entrepreneurship	2012	Int. Entrep. Manag. J	709	59,08
Ghezzi and Cavallo	Agile Business Model Innovation in Digital Entrepreneurship: Lean Startup Approaches	2020	J. Bus. Res	664	166,00
Geissdoerfer et al	Design thinking to enhance the sustainable business modelling process– A workshop based on a value mapping process	2016	J. Clean. Prod	608	76,00
Baldassarre et al	Bridging sustainable business model innovation and user-driven innovation: A process for sustainable value proposition design	2017	J. Clean. Prod	459	65,57
Björkdahl, J	Strategies for Digitalization in Manufacturing Firms	2020	Calif. Manag. Rev	404	101,00
Fjeldstad et al	Business models and organization design	2018	Long Range Plan	373	62,17
Shepherd and Gruber	The Lean Startup Framework: Closing the Academic–Practitioner Divide	2021	Entrep. Theory Pract	272	90,67
Weissbrod and Bocken	Developing sustainable business experimentation capability– A case study	2017	J. Clean. Prod	253	36,14

Table 4 List of the top 10 authors per number of articles in the sample

Authors	Articles	Total citations	Publication start year
Ghezzi	9	1273	2019
Bocken	8	1767	2016
Cavallo	5	905	2019
Sanasi	5	34	2022
Hultink	4	840	2016
Baldassarre	3	682	2017
Aguiar	2	160	2020
Brown	2	223	2020
Calabretta	2	611	2017
Cortimiglia	2	160	2020

bly Italy and the United Kingdom, suggests the global relevance and importance of the research area. These countries, with their well-established academic communities, contribute substantially to the ongoing discourse on the relationship between MEAs and BMDs. However, more engagement is encouraged from underrepresented countries or those not currently on this list. Encouraging scholars from a broader range of geographical locations to actively participate in the dialogue would enhance
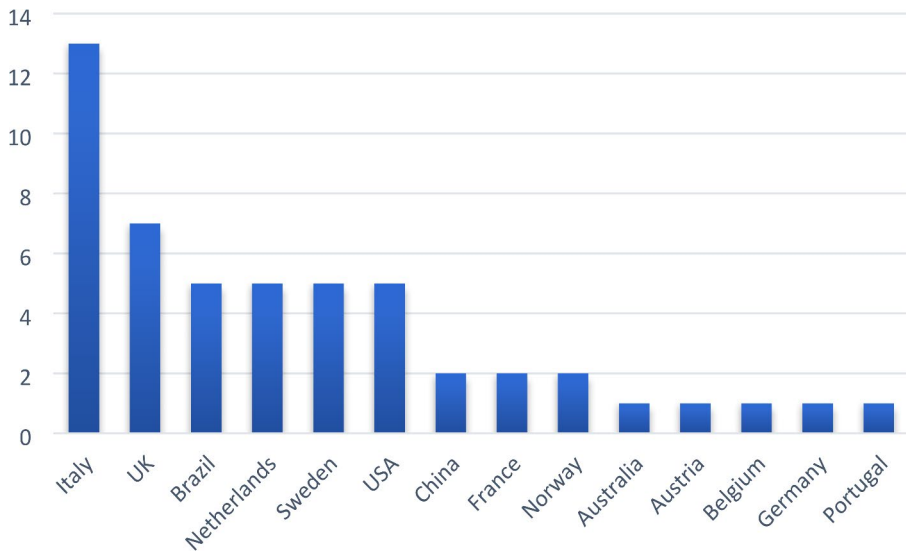
Fig. 3 First author's geographical location

the diversity of perspectives and contribute to a more comprehensive understanding of the investigated topic.

5 Thematic analysis of the literature

This section deals with the thematic analysis of our reviewed studies. The goal is to map out and understand the underlying theories that these studies are built upon or centered around. Although all selected articles address MEAs and BMDs, the studies focused on different aspects, with some overlap. For this reason, this section seeks to analyze the relationships and interconnections between MEAs and BMDs to highlight in each article which MEAs have been adopted and which BMDs have been addressed (see Appendix A). The results have been divided into two sub-sections. The first concerns the frequency of publication of studies examining the adoption of MEAs and their interconnections with BMDs. The second concerns a specific review of the collected studies highlighting the key factors of MEAs affecting specific BMDs. The last explores the main common threads of MEAs in the context of BMDs.

5.1 Publication trend on the type of MEAs and BMDs addressed

Our comprehensive analysis delves deeper into the frequency of adoption of MEAs, including LS, agile, DT, and GH. It explores their interconnections with specific BMDs, including BMI, BMV, BMS, and BMP. Figure 4 illustrates the allocation of studies according to the type of MEAs adopted and BMDs addressed.
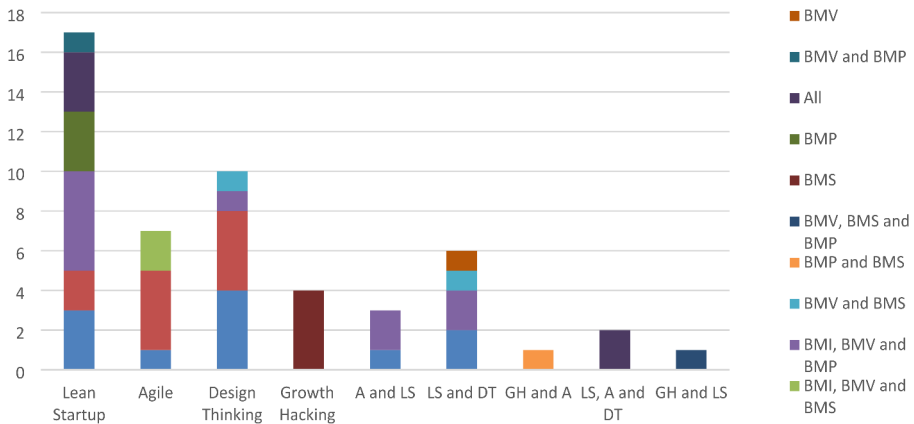
Fig. 4 Number of collected papers related to the type of MEAs and BMDs addressed

Most articles mainly deal with the LS approach (33%), which has analyzed this approach with different BMDs, primarily BMI, BMV, and BMP. The significant association between LS and BMI highlights a strategic inclination towards fostering continuous innovation in the core structures of business models. LS's emphasis on rapid prototyping, customer feedback, and iteration aligns with the imperative to constantly refine and enhance business models (Geissdoerfer et al. 2022). Similarly, the correlation with BMP indicates that organizations adopting LS are not only open to change but are proactive in pivoting their business models based on validated learning (Sanasi and Ghezzi 2022), demonstrating a commitment to adaptability and a willingness to adjust strategies in response to market dynamics. Moreover, the consistent link with BMV underscores LS's responsibility to thoroughly validate assumptions and hypotheses before committing to large-scale initiatives (De cock et al. 2020). This aligns with the iterative nature of LS, where quick feedback loops are integral to the development process (Bortolini et al. 2021; Ries 2011).

Other studies focus on DT (20%), which emerged as a versatile and mainly contextualized approach in dynamics related to BMI and BMV (Baldassare et al. 2020; Beltagui 2018). Addressing BMI reflects a commitment to creative problem-solving and customer-centricity (He and Ortiz 2021), emphasizing the generation of innovative solutions that positively impact the core structure of business models. Furthermore, the correlation with BMV emphasizes DT's iterative and user-focused nature (Klenner et al. 2022). Thus, validation of assumptions is integral to the DT process, ensuring that solutions are creative and resonate with end-users (Liedtka 2015).

Agile and GH approaches, despite less recognition (14%; 8%), present different influences on BMDs. The agile approach, known for its adaptability and iterative development (Sanasi et al. 2022), is frequently aligned with BMI, focusing on continuous innovation within the business model. Its nature enables organizations to adapt and innovate in response to changing market demands (He and Ortiz 2021). Thus, agile means implementing iterative processes with the customer, opening up new possibilities for BMI. Instead, GH, known for its data-driven and rapid experimentation approach (Troisi et al. 2020), is predominantly associated with addressing

BMS, underscoring its strategic focus on scaling existing business models efficiently and effectively (Cavallo et al. 2023; Ellis and Brown 2017). Therefore, this approach leverages data-driven and rapid experimentation techniques to identify and capitalize on growth opportunities and scale a business efficiently and effectively (Conway and Hemphill 2019).

Interestingly, some studies have also contextualized multiple approaches together, including Agile and LS (6%), LS and DT (12%), LS, Agile and DT (4%), GH and LS (2%), GH and Agile (2%), often to compare (Mansoori and Lackéus 2020; Sanasi et al. 2023), criticize (Bocken and Snihur 2020; Ganguly and Euchner 2018) or incorporate them (Carroll and Casselman 2019; Ghezzi and Cavallo 2020; Shepherd and Gruber 2021).

From an overall perspective, BMI emerges as a standard and integral focus across all approaches, highlighting the widespread acknowledgment of the need for continuous adaptation, creativity, and evolution within the fundamental structures of business models. Research in innovation management emphasizes the importance of constant BMI for organizational sustainability (Chesbrough 2004, 2010; Teece 2010). The observed trend across LS, Agile, DT, and GH aligns with the literature, underscoring the universal recognition of BMI as a strategic imperative for adapting to changing market dynamics (Baldassarre et al. 2017; Balocco et al. 2019; Bouwman et al. 2018; Ghezzi and Cavallo 2020).

BMV emphasizes the importance of testing and validating assumptions before making significant business decisions, aligning with the principles of experimentation inherent in these managerial approaches. This holds particular significance during the early stages of new venture development, as they frequently experience substantial and dynamic alterations in content and structure (Ghezzi and Cavallo 2020). The consistent attention to BMV resonates with studies emphasizing the significance of evidence-based decision-making and iterative development (Magistretti et al. 2023; Ries 2011). In particular, the literature recognizes that validation, rooted in experimentation, is integral to reducing uncertainty and enhancing strategic decision-making (Bocken and Snihur 2020; Carroll and Casselman 2019; Ganguly and Euchner 2018). Likewise, it also emphasizes the need for organizations to validate assumptions through experimentation, thereby reducing uncertainty and increasing the probability of success (Silva et al. 2021).

Similarly, BMS is partially addressed by LS, DT, and especially by GH, showcasing a strategic orientation towards expanding and optimizing existing business models, reflecting a dual focus on both innovation and efficient scalability. The strategic focus on BMS aligns with research on strategic growth management, highlighting the importance of scaling innovations strategically (Becker and Endenich 2023; Cavallo et al. 2023; Sanasi et al. 2023). Thus, this suggests a conscious effort by organizations to innovate, implement, and scale those innovations for successful market penetration.

While less frequent overall, BMP is mainly associated with LS, indicating a readiness to make strategic shifts based on validated learning, emphasizing a pragmatic and adaptive approach to investigate the underlying hypotheses of the business model (Ries 2011). The association between LS and BMP reflects a proactive stance toward strategic adaptation, aligning with studies on organizational agility and responsive-

ness (Ghezzi and Cavallo 2020; Teece 2018). Thus, firms leveraging LS are strategically positioned to pivot their business models, restoring its experimental-based viability and serving as an essential enabler in minimal situations, such as organizational crises or external events such as COVID-19 (Sanasi and Ghezzi 2022).

Based on our interpretation of the results, we have provided an overview of using MEAs to address BMDs (see Fig. 5).

5.2 Key factors of MEAs affecting BMDs

Following meticulously examining the identified scholarly works, we initiated our analysis by employing an open coding approach to identify first-order categories, encapsulating the fundamental dynamic concepts embedded within each paper. Subsequently, axial coding was undertaken to elucidate the interrelationships between these first-order concepts, culminating in their consolidation into second-order themes (Corbin and Strauss 2008). Through an iterative process characterized by comparative analyses and inquiry, we sought commonalities among concepts, thereby facilitating their grouping into coherent categories (Somekh and Lewin 2005). In the last step of this analysis stage, we organized the second-order themes into overarching theoretical dimensions (Dacin et al. 2010). To ensure the robustness and validity of our identified themes, we engaged in peer debriefing, a methodological step designed to mitigate researcher bias and enhance the reliability of our findings (Lincoln and Guba 1985). This involved soliciting feedback from two experts proficient in the domain of business growth and managerial strategies, who concurred with the distinctiveness and representativeness of the identified themes. Furthermore, we encouraged the experts to propose additional themes should they perceive any gaps in the current thematic representation, thereby enriching the comprehensiveness of our analysis. Figure 6 visually depicts the conceptual map derived from the reviewed papers, delineating their respective indicative themes.
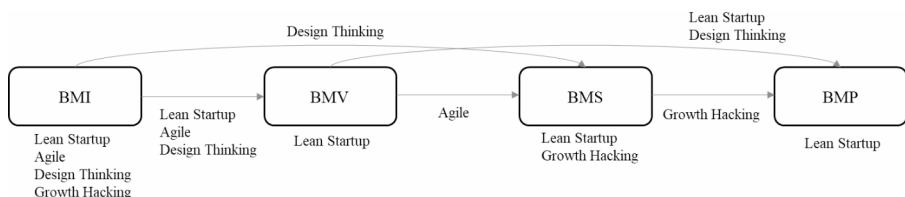
Fig. 5 Conceptual overview of how MEAs are engaged in BMDs. *Note* According to the results of scientific investigations, LS methodology is encompassed within all BMDs. Similarly, Agile methodology is integrated within BMI, also finding application between BMI and BMV, and also between BMV and BMS. DT is acknowledged as a methodology applicable in BMI, between BMI and BMV, between BMI and BMS, and between BMV and BMP. Lastly, GH predominantly finds application in BMS and in the transitions between BMS and BMP
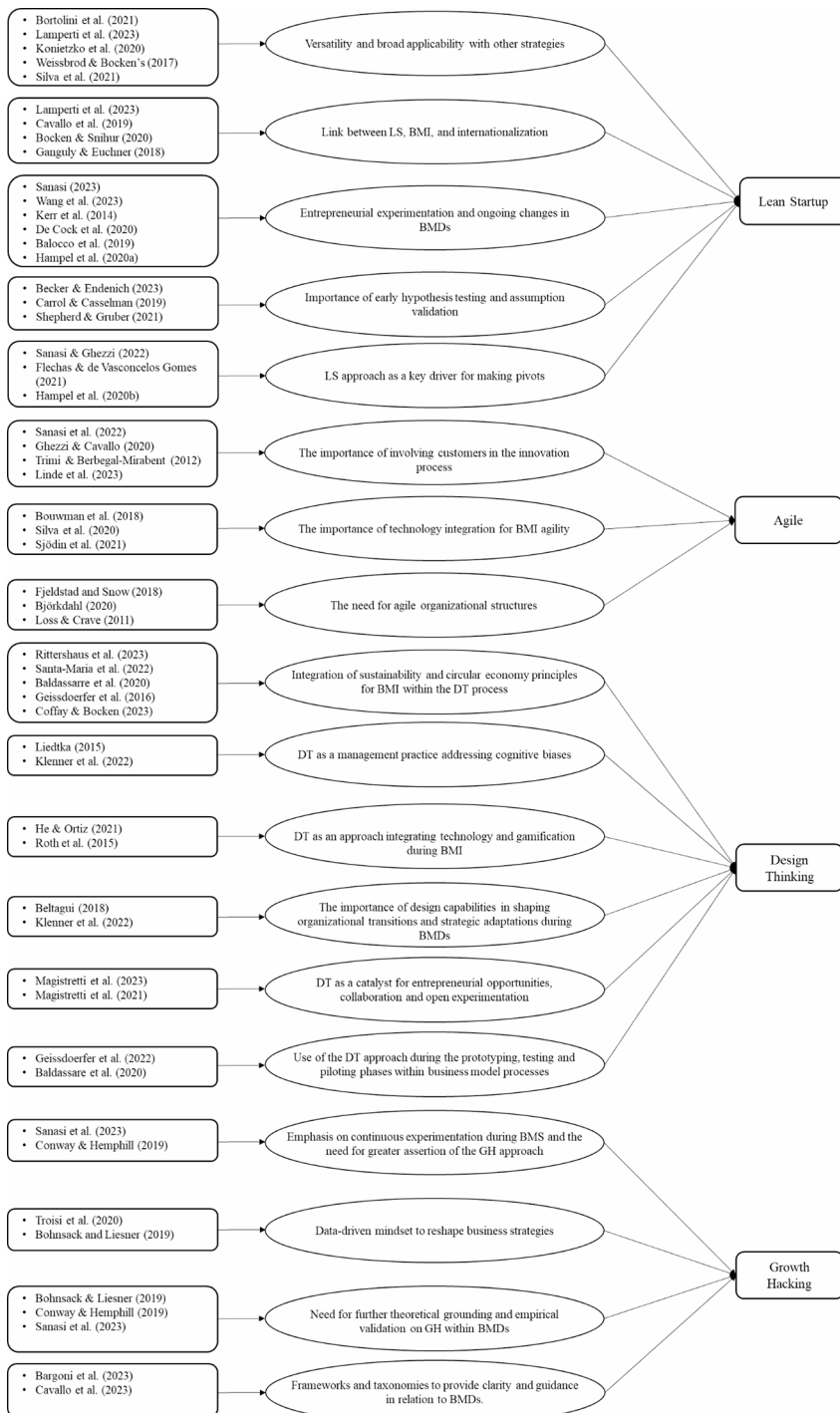
Fig. 6 Conceptual map of the reviewed papers related to MEAs and BMDs

5.2.1 Lean startup approach

The collection of studies on adopting the LS approach yielded several insights that contribute to a nuanced understanding of its influence on BMDs across various domains.

A primary strand of literature underscored the versatility and broad applicability of the LS approach. For example, Bortolini et al. (2021) emphasized its effectiveness in guiding startups to find viable business models through agile and iterative validation processes, underscoring how LS principles are not confined to specific sectors but offer a universal framework for fostering innovation. This concept is also addressed in Lamperti et al.'s (2023) investigation of how small and medium-sized enterprises leverage LS methodologies for digital servitization in navigating disrupted markets. They presented a digital servitization journey model, emphasizing collaboration's role in BMI. Following, the exploration of LS approaches was extended into the context of international entrepreneurship and BMI, emphasizing mutual connections and adaptation to new customer needs. This adaptability positioned LS as a pivotal approach that transcends the boundaries of traditional startup settings, proving valuable for organizations of varying sizes and industries. In addition, Konietzko et al. (2020) have confirmed the application of LS in the circular economy context. In particular, they laid the foundation for understanding how circular business models can be effectively experimented with and improved, identifying key factors such as assumption development, analysis of available means, mindset impact, and improvement principles.

Another stream of research has shed light on the challenges firms face in executing LS experiments quickly and on the potential integration of LS with other strategies. In particular, Weissbrod and Bocken (2017) exploration of innovation activities within a time-sensitive context established a link between LS thinking, triple-bottom-line value creation, and organizational capabilities. However, challenges in executing experiments quickly were highlighted, revealing the tension between the desire to plan project activities and the imperative for rapid action. This result highlighted a practical challenge in applying the approach, calling attention to the importance of overcoming implementation hurdles for optimal results. Instead, Silva et al. (2021) provided valuable insights into how new technology ventures integrate LS with complementary strategies such as market research, business planning, lab-to-market approaches, and stage-gate approaches. This result implied that the LS approach operates synergistically with existing strategic frameworks, emphasizing the need for startups to adopt a comprehensive toolkit rather than relying solely on the LS methodology.

From another perspective, the studies by Lamperti et al. (2023), Cavallo et al. (2019), and Bocken and Snihur (2020) collectively established a link between LS, BMI, and internationalization. In particular, the first ones found that, in small and medium-sized enterprises operating in the business-to-business context, organizations adapt after initial validation rather than quickly attracting new customers, as proposed by the LS for digital startups. The seconds highlighted that LS methodologies can be instrumental in facilitating domestic entrepreneurship and as a strategy for firms venturing into international markets. The last ones viewed that the LS

approach has been portrayed as a catalyst for novel business models, emphasizing the iterative experimentation process as a strategic organizing mechanism that fosters innovation. Similarly, Ganguly and Euchner (2018) highlighted the central role of business experiments in achieving breakthrough innovations within established companies, arguing for the need to adopt an experimental mindset and leverage BMI. Conducting business experiments, prototyping, and iterating on value propositions have been seen as essential components for mitigating risks associated with new business models. This latest study, in particular, reinforced the idea that innovation, not only in startups but also in established organizations, requires a willingness to experiment and iterate on existing business models.

Many studies have combined the concept of entrepreneurship with experimentation and analyzed the various aspects. Sanasi (2023) explored the role of entrepreneurial experimentation in various BMDs, suggesting a connection between experimental approaches, particularly the LS method, and ongoing changes in business models. A supporting example can be given by Wang et al. (2023), who investigated the impact of business models on company success, using SHEIN's business model as a case study. Specifically, the success was attributed to entrepreneurial orientation, with the LS approach enabling agile development and improvement of the iterative business model. Moreover, Kerr et al. (2014) and De Cock et al. (2020) highlighted the fundamental role of experimentation in entrepreneurship and growth-oriented ventures. These studies emphasized the high-risk propensity as a key driver of success, with the LS method gaining popularity for its iterative approach and quick learning cycles. Furthermore, combining experimentation with existing market knowledge emerged as a critical success factor, emphasizing the need for a balanced approach to innovation. Therefore, the iterative nature of LS has been depicted not merely as a process but as a strategic mechanism that facilitates continuous learning and adaptation.

In a similar perspective, Becker and Endenich (2023), Carrol and Casselman (2019), and Shepherd and Gruber (2021) emphasized early hypothesis testing and underscored the significance of validating assumptions early in the entrepreneurial process. Adopting lean principles early in developing a business concept and applying rigorous hypothesis testing resulted in substantial reductions in time and expense in product development.

Another line of research has considered the LS approach as a key driver for making pivots in different contexts. For example, Sanasi and Ghezzi (2022) argued that pivots serve as dynamic and flexible responses to rapidly address unexpected assumptions, demonstrating the adaptability of LS in the face of crises. The authors also introduced a temporal dimension to the LS discourse, emphasizing the crucial role of strategic agility and the need for organizations to swiftly navigate uncertainties inherent in crises. Similarly, Flechas and de Vasconcelos Gomes (2021) conducted a systematic literature review on entrepreneurs' pivot decisions in startups. Notably, they introduced a framework delineating four stages of the pivot process, providing a structured approach to understanding and analyzing pivot decisions. Finally, Hampel et al. (2020b) explored ventures' challenges when pivoting, particularly the potential risks of disrupting relationships with key stakeholders. In particular, connecting with stakeholders by exposing struggles during the pivot was found to create bonds and help rebuild connections.

To sum up, the versatility and broad applicability of the LS approach underscore its value as a universal framework for fostering innovation across diverse industries and organizational contexts. This adaptability positions LS as a method for start-ups and a strategic tool for navigating uncertainty, encouraging experimentation, and enabling sustainable BMDs. By integrating LS with other methodologies and addressing implementation challenges, firms can unlock their full potential, ensuring that LS experimentation drives rapid learning and meaningful, context-specific business transformations.

5.2.2 Agile approach

Implementing agile approaches in organizations has become a crucial focus in contemporary literature, driven by the need for businesses to adapt and thrive in dynamic and uncertain environments.

A prevailing theme across multiple studies was the pursuit of strategic agility. High-reputation firms, as highlighted by Sanasi et al. (2022), strategically leveraged agile experimentation, emphasizing continuous testing and iteration to navigate uncertainties in BMI. This strategic mindset extended to collaborative networks (Loss and Crave 2011) and digital entrepreneurship (Ghezzi and Cavallo 2020), highlighting a shared emphasis on strategic adaptability in dynamic environments.

Customer-centricity emerged as a unifying principle in the agile approach to BMI. The studies by Sanasi et al. (2022), Linde et al. (2023), Ghezzi and Cavallo (2020), and Trimi and Berbegal-Mirabent (2012) underscored the importance of involving customers in the innovation process. Whether through stress testing, revenue model design, or LS approaches, organizations recognized the pivotal role of understanding and co-creating value with customers in shaping agile business models.

Moreover, the agile approach resonated by emphasizing adaptability in experimentation and iteration. In particular, the ability to quickly adapt, de-risk assumptions, and experiment in secondary markets emerged as a shared approach to fostering adaptability and learning (Sanasi et al. 2022).

Studies by Sjödin et al. (2021) and Linde et al. (2023) have shed light on integrating technology, specifically artificial intelligence, as a catalyst for BMI agility. The identified capabilities, such as efficient data handling and algorithm development, aligned with the broader theme of leveraging technology to enhance organizational capabilities. This integration was not only a tool for innovation but a fundamental aspect of strategic agility in a technologically evolving landscape (Bresciani et al. 2021).

A common thread among other studies was the systematic development of frameworks or methods to enhance agile practices. Particularly, Bouwman et al.'s (2018) stress testing method, Sjödin et al.'s (2021) co-evolutionary framework, and Silva et al.'s (2020) systematic review provided structured approaches to understanding and implementing agile practices, serving as valuable tools for practitioners seeking guidance in dealing with the complexities of BMI.

Fjeldstad and Snow's (2018) exploration of the link between business models and organization design introduced an overarching theme of organizational adaptability, demonstrating how value configuration impacts organization design and how col-

laborative organizational forms support open and agile business models (Linde et al. 2023; Sjodin et al. 2021; Loss and Crave 2011). This theme underscored the importance of aligning internal structures with the principles of agility to facilitate seamless BMI.

Finally, Björkdahl's (2020) study converged on the challenges and strategies associated with digital transformation. It revealed that not all examined companies are adequately prepared to capitalize on digitalization, primarily directing their efforts toward enhancing efficiency rather than fostering growth. The main obstacles included the complexity of identifying profitable combinations of competencies, assets, and data from digital technologies, as well as challenges in orchestrating and exploiting them within agile organizational structures. Moreover, the emphasis on strategies that align with existing operations while facilitating a protracted digital transformation underscored the need for an agile and flexible methodology.

To sum up, the Agile approach highlights the critical role of adaptability, customer-centricity, and technological integration in fostering effective BMI. By aligning internal structures with agile principles, organizations can more effectively navigate the complexities of dynamic markets and leverage strategic agility to sustain competitive advantage. This demonstrates that Agile is not merely a methodology for operational efficiency but a strategic enabler of innovation and resilience, offering a pathway to align rapid technological advancements with evolving market needs.

5.2.3 Design thinking approach

This section explores the multifaceted dimensions of DT's influence on various aspects of organizational strategy and BMDs.

The first line of research emphasized the integration of sustainability and circular economy principles within the context of DT. Rittershaus et al. (2023) proposed a conceptual methodology for small and medium enterprises to transition toward circular value creation, highlighting the need for practical tools applicable to resource-constrained small and medium enterprises. On a parallel track, Santa-Maria et al. (2022) introduced the Circular Sprint framework, addressing the complexity hindering the development of sustainable and circular business models. Both studies provided actionable insights, emphasizing the alignment of DT with sustainable practices and the necessity of a comprehensive framework for circular BMI.

Other studies have also contributed to the discourse on sustainable BMI through the lens of DT. Baldassarre et al. (2020) introduced a prototyping tool to solve the "design-implementation gap," aiming to implement sustainable business model ideas early on iteratively. On the other hand, Geissdoerfer et al. (2016) focused on developing a workshop framework, the'Value Ideation' process, which combines DT and sustainable BMI. Together, these studies underscored the significance of integrating sustainable considerations into the design process and the need for practical tools to bridge the gap between ideation and implementation. Moreover, Coffay and Bocken (2023) introduced the "Sustainable By Design" tool, focusing on the importance of dynamic capabilities and organizational design for developing sustainable business models. In parallel, Liedtka (2015) explored how DT can potentially reduce cognitive biases in decision-making processes, emphasizing DT's internal consistency and

coherence as a management practice. Thus, these studies highlighted the need for deep organizational design work to foster sustainability through practical tools or by addressing cognitive biases to enhance innovation outcomes.

In a similar strand of research, some studies showcased the versatility of DT, from guiding sustainable business model development to infusing innovation processes with ludic elements. In particular, He and Ortiz (2021) focused on developing a design framework for sustainable BMI, emphasizing the need for bespoke methods and technology integration. Instead, Roth et al. (2015) used the DT approach to explore the intersection of gamification, creativity, and innovation within corporate settings, suggesting potential avenues for research into the gamification of BMI.

In addition, the studies proposed by Beltagui (2018) and Klenner et al. (2022) underscored the importance of design capabilities in shaping organizational transitions and strategic adaptations during BMDs. The first ones delved into the role of design capabilities as facilitators in the servitization process, suggesting a three-stage evolution of new product development processes. In a complementary vein, the second one explored how DT practices enable the enactment of cognitive effectuation principles, revealing a reciprocal relationship between DT and effectuation theory.

Moreover, Geissdoerfer et al. (2022) explored the conceptual boundaries between prototyping, experimentation, and piloting, offering clear definitions and highlighting their distinct purposes in the BMI, BMV, and BMP processes. Additionally, the role of design agencies in entrepreneurship has been explored in Magistretti et al.'s (2023) study, which introduced a process model based on design sprints (an approach that merges some DT and LS practices) to facilitate the emergence and development of entrepreneurial opportunities. Another study by Magistretti et al. (2021) delved into how companies in highly regulated markets, such as Johnson & Johnson, overcome barriers to innovation using the Design Sprint approach. Furthermore, these studies underscored the importance of knowledge transfer (Issac et al. 2024) and co-creation. Notably, design agencies have been recognized as facilitators in mediating the emergence and development of entrepreneurial opportunities, emphasizing collaboration and open experimentation.

To sum up, the application of DT reveals its transformative potential in bridging the gap between ideation and implementation, particularly in the realms of sustainability and innovation. By fostering deep collaboration, reducing cognitive biases, and introducing bespoke tools, DT equips organizations to navigate complex challenges and achieve long-term and sustainable value creation. Thus, DT serves as more than a creative process; it is emerging as a strategic mechanism for aligning innovation practices with organizational goals, enabling businesses to innovate responsibly and effectively in a rapidly changing world.

5.2.4 Growth hacking approach

Examining the studies on GH, they mainly emphasized the significance of continuous experimentation, challenging the traditional notion that experimentation is limited to the early stages of market validation. Specifically, research by Sanasi et al. (2023) revealed that technology-based startups continue to experiment extensively during the scaling phase. This also aligned with the GH mindset highlighted by Conway and

Hemphill (2019), emphasizing the iterative and analytical nature of the GH process. Moreover, both studies accentuated the strategic nature of experimentation during the scaling phase, in the sense that companies experiment with different channels to pursue rapid growth. Sanasi et al. (2023) spotlighted the focus on value delivery mechanisms, growth metrics, and the integration of GH methods, while Conway and Hemphill (2019) elaborated on the iterative and analytical process, emphasizing A/B testing and the selection of effective traction channels.

Moreover, GH has been consistently portrayed as a data-informed and data-driven approach. The studies by Troisi et al. (2020) and Bohnsack and Liesner (2019) specifically delved into the impact of big data analytics on marketing decision-making, illustrating how a data-driven mindset can reshape strategies and lead to economic advantages.

From another perspective, studies highlighted some challenges both in skill acquisition and in the terminology associated with GH, recognizing the need for further theoretical grounding and empirical validation (Bohnsack and Liesner 2019; Conway and Hemphill 2019; Sanasi et al. 2023).

In addition, GH has been explored not only as a means of achieving rapid growth but also as a strategy for adapting to international markets. In particular, Bargoni et al. (2023) proposed that GH can instill a data-driven mindset in marketing decision-making, facilitating the adaptation of dynamic capabilities to the ever-changing international competitive landscape. In addition to highlighting the global relevance and adaptability of GH strategies, they also proposed research propositions related to the phases of GH and identified three critical dimensions, including big data analytics, digital marketing, and coding and automation.

Moreover, some studies contributed frameworks and taxonomies to provide clarity and guidance. Specifically, Bargoni et al. (2023) proposed a conceptual framework for companies to develop international dynamic marketing capabilities. Bohnsack and Liesner (2019) introduced a GH framework and a taxonomy of patterns, offering a modular approach. Cavallo et al. (2023) proposed a computer simulation method designed explicitly for BMS.

To summarize, GH transcends its reputation as a startup-focused methodology by demonstrating its strategic importance in scaling, adapting to international markets, and leveraging data-driven experimentation for sustainable growth. By integrating big data analytics, automation, and adaptive marketing strategies, GH provides a modular and scalable framework for businesses seeking rapid growth in volatile environments. This underscores GH's relevance as a tactic for short-term gains and a critical component of long-term strategic planning and innovation.

5.3 Key common threads of MEAs in BMDs context

Following the same analysis process as in the previous section, Fig. 7 provides a visual depiction of the conceptual map derived from the reviewed papers related to the main characteristics that MEAs share regarding BMDs.

At the heart of MEAs lies the emphasis on iterative experimentation. Whether in the form of rapid validation cycles (LS), continuous testing and iteration through sprints (Agile), prototyping and ideation (DT), or continuous strategic experimen-
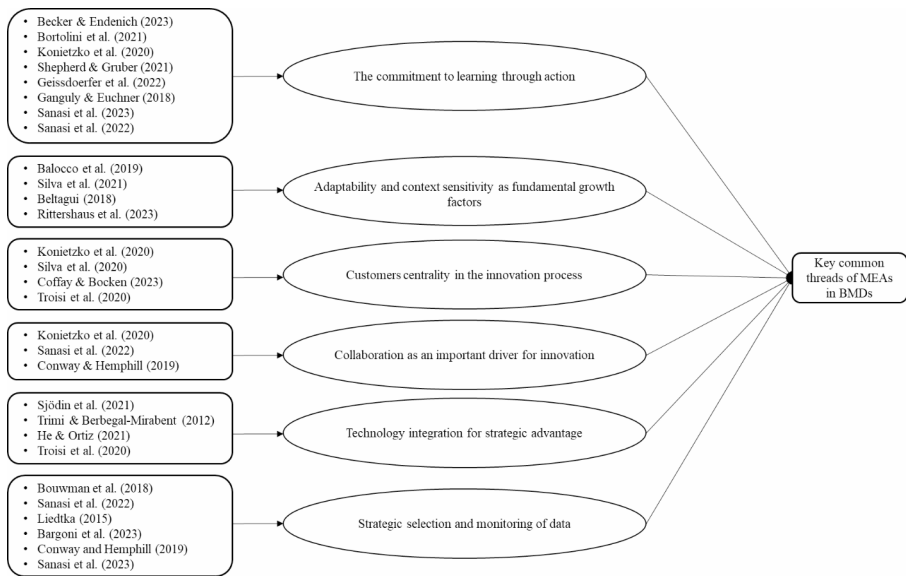
Fig. 7 Conceptual map of the key common threads of MEAs in BMDs context

tation (GH), these approaches share a commitment to learning through action. As explored by many scholars, the LS philosophy emphasizes rapid learning and adaptation cycles (Becker and Endenich 2023; Bortolini et al. 2021; Konietzko et al. 2020; Shepherd and Gruber 2021). This iterative mindset transcends LS and is reflected in Agile methodologies, where continuous adaptation, as noted by Sanasi et al. (2022), is a linchpin for strategic agility. DT and GH, in their ways, also pivot around iterative processes, showcasing the intrinsic value of learning through repeated cycles of experimentation (Geissdoerfer et al. 2022; Ganguly and Euchner 2018; Sanasi et al. 2023). Together, these methodologies underscore the intrinsic value of learning through repeated cycles of action, yet the extent to which they synergistically influence BMDs remains insufficiently analyzed.

A critical literature synthesis reveals significant conceptual overlaps and distinctions across MEAs. All approaches emphasize adaptability, with studies highlighting the necessity of tailoring methodologies to specific contexts, industries, and organizational challenges (Balocco et al. 2019; Beltagui 2018; Silva et al. 2021). For instance, while LS and Agile excel in fostering rapid responses to technological advancements (Sjödin et al. 2021), DT offers unique insights into reducing cognitive biases through experimental frameworks (Liedtka 2015). Conversely, GH leverages big data and analytics to drive measurable BMS and optimization (Troisi et al. 2020).

These distinctions are crucial for understanding how MEAs contribute to the four key BMDs: innovation, validation, pivoting, and scaling. While LS and Agile focus on quick iteration to adapt and validate, DT prioritizes customer-centric ideation for innovation, and GH targets data-driven scaling. By situating these methodologies within a unified framework, it becomes evident that their combined application can

create synergistic benefits, enhancing organizations' ability to respond to complex and dynamic market conditions.

The centrality of customers in the innovation process resonates across all the MEAs. From the customer validation focus of LS (Konietzko et al. 2020) to the collaborative involvement of customers in Agile practices (Silva et al. 2020), the co-creation of value in DT (Coffay and Bocken 2023), and the sustained emphasis on customer-centric strategies for growth in GH (Troisi et al. 2020), these methodologies recognize the pivotal role of understanding and meeting customer needs in shaping successful business models. Yet, while all approaches emphasize customer involvement, the specific mechanisms and depth of engagement vary, requiring a nuanced application to maximize relevance and effectiveness.

A consistent thread woven throughout literature is the importance of collaboration. Whether in LS's emphasis on circular-oriented teams (Konietzko et al. 2020), Agile's multidisciplinary teams (Sanasi et al. 2022), or GH's call for diverse skill sets (Conway and Hemphill 2019), collaboration emerges as another critical enabler of MEAs' success. The fusion of creativity, analytical capabilities, and technological acumen is highlighted as pivotal for organizations aiming to assemble effective teams to execute these approaches successfully.

Furthermore, integrating technology serves as a unifying thread across MEAs, offering strategic advantages for BMDs. LS and Agile adapt to technological advancements (Sjödin et al. 2021; Trimi and Berbegal-Mirabent 2012), DT integrates technology for sustainable business model development (He and Ortiz 2021), and GH leverages big data analytics and digital tools (Troisi et al. 2020). This alignment with technological progress underscores the importance of staying at the forefront of digital advancements to gain and sustain competitive advantages in BMDs.

Finally, another line of research underscores the strategic selection and monitoring of analytical data and the critical role of data-driven decision-making in connecting MEAs to BMDs. LS promotes an experimental mindset and quick learning cycles, Agile approach fosters customer interaction and strategic decision-making process (Bouwman et al. 2018; Sanasi et al. 2022), DT advocates for reducing cognitive biases through experimentation (Liedtka 2015), and GH underscores the importance of data-driven experimentation tied to measurable growth objectives (Bargoni et al. 2024a, b; Conway and Hemphill 2019; Sanasi et al. 2023).

While MEAs individually contribute valuable insights to BMDs, their combined impact offers untapped potential for fostering innovation and scalability. This synthesis underscores the need for a more integrative approach, where the strengths of each methodology are leveraged holistically to address the complexities of modern business environments. By doing so, this study aims to demonstrate how MEAs, as an integrated whole, contribute to advancing BMDs and set the stage for more nuanced investigations into their interdependencies and practical applications.

5.4 Organizing framework explanation

We thoroughly examine and combine the results of the studies we found in this review to create an organizing framework (Fig. 8). This framework brings together all the insights gathered from the literature findings, along with how we classified
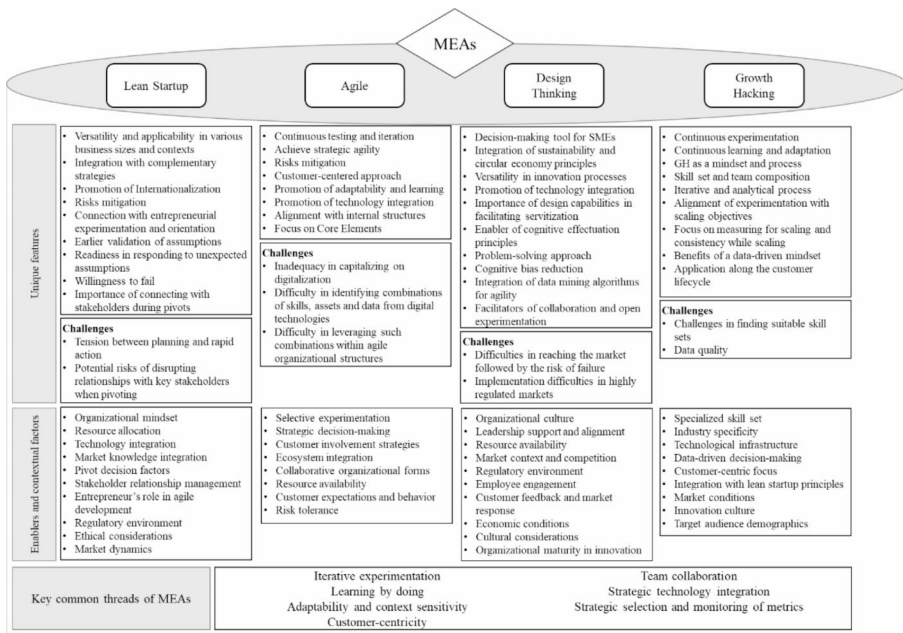
MEAs

Lean Startup | Agile | Design Thinking | Growth Hacking

Unique features

Lean Startup:
- Versatility and applicability in various business sizes and contexts
- Integration with complementary strategies
- Promotion of Internationalization
- Risks mitigation
- Connection with entrepreneurial experimentation and orientation
- Earlier validation of assumptions
- Readiness in responding to unexpected assumptions
- Willingness to fail
- Importance of connecting with stakeholders during pivots

Challenges
- Tension between planning and rapid action
- Potential risks of disrupting relationships with key stakeholders when pivoting

Agile:
- Continuous testing and iteration
- Achieve strategic agility
- Risks mitigation
- Customer-centered approach
- Promotion of adaptability and learning
- Promotion of technology integration
- Alignment with internal structures
- Focus on Core Elements

Challenges
- Inadequacy in capitalizing on digitalization
- Difficulty in identifying combinations of skills, assets and data from digital technologies
- Difficulty in leveraging such combinations within agile organizational structures

Design Thinking:
- Decision-making tool for SMEs
- Integration of sustainability and circular economy principles
- Versatility in innovation processes
- Promotion of technology integration
- Importance of design capabilities in facilitating servitization
- Enabler of cognitive effectuation principles
- Problem-solving approach
- Cognitive bias reduction
- Integration of data mining algorithms for agility
- Facilitators of collaboration and open experimentation

Challenges
- Difficulties in reaching the market followed by the risk of failure
- Implementation difficulties in highly regulated markets

Growth Hacking:
- Continuous experimentation
- Continuous learning and adaptation
- GH as a mindset and process
- Skill set and team composition
- Iterative and analytical process
- Alignment of experimentation with scaling objectives
- Focus on measuring for scaling and consistency while scaling
- Benefits of a data-driven mindset
- Application along the customer lifecycle

Challenges
- Challenges in finding suitable skill sets
- Data quality

Enablers and contextual factors

Lean Startup:
- Organizational mindset
- Resource allocation
- Technology integration
- Market knowledge integration
- Pivot decision factors
- Stakeholder relationship management
- Entrepreneur's role in agile development
- Regulatory environment
- Ethical considerations
- Market dynamics

Agile:
- Selective experimentation
- Strategic decision-making
- Customer involvement strategies
- Ecosystem integration
- Collaborative organizational forms
- Resource availability
- Customer expectations and behavior
- Risk tolerance

Design Thinking:
- Organizational culture
- Leadership support and alignment
- Resource availability
- Market context and competition
- Regulatory environment
- Employee engagement
- Customer feedback and market response
- Economic conditions
- Cultural considerations
- Organizational maturity in innovation

Growth Hacking:
- Specialized skill set
- Industry specificity
- Technological infrastructure
- Data-driven decision-making
- Customer-centric focus
- Integration with lean startup principles
- Market conditions
- Innovation culture
- Target audience demographics

Key common threads of MEAs
- Iterative experimentation
- Learning by doing
- Adaptability and context sensitivity
- Customer-centricity
- Team collaboration
- Strategic technology integration
- Strategic selection and monitoring of metrics

Fig. 8 Organizing framework derived from thematic analysis of the literature related to MEAs and BMDs

the different MEAs and their relationship to BMDs, particularly the unique features, enablers, and contextual factors, as well as the key common threads of MEAs. In particular, in the first part of the framework, we explain the unique features of each MEA in relation to BMDs, followed by the challenges of adopting such approaches. Next, we integrate the enablers and contextual factors that may enhance this relationship and affect successful implementation. We also report all the key common threads of MEAs to highlight the main functions, characteristics, and contexts that each approach needs to be applied in the business and management field.

6 Theoretical and practical implications

This study has provided a comprehensive understanding of the interplay between MEAs and BMDs by systematically reviewing the current state of research. Key findings reveal the specific contribution of each MEA to BMDs, such as LS's focus on rapid validation, Agile's emphasis on adaptability, DT's role in fostering creativity and reducing biases, and GH's alignment with measurable, data-intensive scaling. Accordingly, our study provides some important theoretical insights. First, we believe we are pioneering by presenting a systematic review that systematically analyzes the implications of MEAs—LS, agile, DT, and GH—on BMDs. By doing so, it synthesizes disparate research streams and provides a consolidated overview of how these approaches influence BMI, BMV, BMP, and BMS. This clarity addresses the lack of integration and fragmented insights prevalent in the existing literature. Con-

sequently, we identify and organize distinct research sub-domains within the MEAs-BMDs interface, elucidating their focus, trends, gaps, and fundamental concepts (Lamperti et al. 2023; Sanasi 2023; Sanasi et al. 2022; Troisi et al. 2020). This mapping underscores MEAs as a nascent yet rapidly evolving field, emphasizing their importance for advancing theoretical perspectives on BMDs. Second, our research suggests that the subject being examined is a newly developing area of study within the realm of business and management (Becker and Endenich 2023; Björkdahl 2020; Hampel et al. 2020a, b; Mansoori and Lackéus 2020). With this recognition, this systematic literature review contributes substantially to the understanding of the different avenues that can be pursued in advancing theory. Furthermore, the application of the systematic literature review method aims to establish robust evidence upon which future scholars can build (Christofi et al. 2017; Vrontis and Christofi 2021). By expanding our literature search beyond just MEAs and BMDs, we want to inspire researchers from various fields and prompt them to use this study as a starting point to explore further and expand this area of research. Third, this study introduces a robust organizing framework that integrates contextual, methodological, and strategic dimensions of MEAs' influence on BMDs. This framework maps existing knowledge and serves as a springboard for future research. For example, it outlines how LS aligns with high-tech startups, Agile with cross-functional teams, DT with innovation in uncertain markets, and GH with growth-focused enterprises. Moreover, it identifies gaps in empirical research, such as the limited exploration of MEAs' synergies in hybrid business models. By providing a structured roadmap, this contribution enables researchers to design targeted studies that further unravel the intricate dynamics between MEAs and BMDs. Fourth, to the best of our knowledge, this study represents the first comprehensive overview of MEAs as an overarching concept, encompassing the predominantly explored approaches within the business and management literature concerning BMDs (Cavallo et al. 2023; Geissdoerfer et al. 2022; Ghezzi and Cavallo 2020). Lastly, this review brings attention to new areas of research that haven't received much focus before. It also highlights the inconsistencies in theory and practical evidence that have been overlooked (Bortolini et al. 2021; Cavallo et al. 2019; Silva et al. 2020). These observations lay the groundwork for a nascent research endeavor that can significantly contribute to the development of this field by addressing the identified gaps. For example, while existing research highlights customer involvement as a critical enabler across all MEAs, the depth and engagement mechanisms vary significantly between methodologies. Our framework resolves these discrepancies by categorizing and contextualizing customer-centric practices across LS, Agile, DT, and GH, offering a critical perspective that sharpens the theoretical foundation of MEAs in BMDs. This critical analysis not only contributes to a more comprehensive understanding of the intricate relationship between MEAs and their impact on BMDs but also stimulates conceptual development and empirical investigations in a domain of pronounced theoretical and practical significance in the contemporary era.

By mapping and integrating the literature on MEAs and their relationship with BMDs, our study provides valuable insights and guidance for practitioners as well. First, the study clarifies the characteristics and roles of each MEA, helping managers, entrepreneurs, and employees understand how these approaches are structured

and how they can be employed in organizations. Second, it offers insights into the various interconnections and implications between MEAs and BMDs, as well as key implementation drivers and factors within each MEA that underlie and influence this relatedness. In this sense, managers and entrepreneurs may find a useful synthesis and systematization of the different MEAs they can implement when they need to innovate their enterprise's strategy, validate it, scale it, or pivot. Hence, this study identifies and discusses the peculiarities of each MEA, elaborating on how these can be used for different business model dynamics.

For example, LS emphasizes rapid validation cycles to test hypotheses efficiently, Agile focuses on iterative development and cross-functional collaboration to maintain strategic agility, DT prioritizes customer-centric ideation to foster innovation, and GH leverages data-driven experimentation for measurable growth and scalability. Practitioners can use these insights to select the most suitable approach for their specific business challenges, such as validating a new business idea (LS), responding swiftly to market changes (Agile), generating innovative solutions (DT), or scaling operations efficiently (GH). This keeps practitioners abreast of current trends and empowers them to make informed decisions when contemplating or implementing experimental approaches in their business strategies.

Third, the study's insights into the implications of MEAs on BMDs extend to practical applications, aiding managers and entrepreneurs in better assessing and managing risks associated with innovation, pivoting, and scalability. Practitioners can proactively identify potential risks and implement more effective risk mitigation strategies by comprehending how experimental approaches influence different aspects of the business model. For example, iterative cycles in LS and Agile help mitigate uncertainty during BMV, while DT's emphasis on reducing cognitive biases enhances decision-making quality in BMI, and GH, with its focus on analytics and metrics, enables precise tracking of BMS outcomes and risk management.

7 Limitations and further developments

Similar to any other systematic review, this study has its own set of limitations. One primary limitation is that the conclusions drawn in this systematic review are derived from information obtained from three specific scientific databases utilizing a specific keyword search formula. We recognize that any keyword search approach has constraints, potentially leading to the oversight of pertinent papers related to the review's topic. However, we firmly believe that the publications identified in this study adequately represent the prevailing body of existing literature on the subject. Consequently, encompassing every published work may not be imperative or practical (Bakker 2010). Despite this, future researchers can delve into similar literature available in alternative databases by employing different keywords. Additionally, it's important to note that our review specifically focuses on the MEAs about BMDs. Thus, excluding studies that do not explicitly explore this link may result in overlooking potentially valuable insights from related research that indirectly contribute to understanding the broader implications of experimentation on business models. Therefore, future research could adopt a more inclusive approach by considering

studies that indirectly contribute to understanding MEAs' effects on BMDs, involving a broader set of inclusion criteria to capture relevant insights from studies that may not explicitly focus on the relationship between MEAs and BMDs. Third, the study focuses on well-established MEAs such as LS, Agile, DT, and GH. However, the rapidly evolving landscape of managerial practices may introduce new MEAs not covered in this review, potentially limiting the comprehensiveness of the findings. Thus, future research could focus on continuously monitoring and exploring newly emerging MEAs to ensure the review remains up-to-date. Last, the lack of a universally defined nomenclature for MEAs introduces challenges in interpreting and comparing studies. Moreover, the heterogeneity in terminologies across literature may lead to potential ambiguities in synthesizing findings. Therefore, researchers and scholars could work towards establishing standardized terminology for MEAs to mitigate nomenclature-related challenges. A universally accepted set of terms would enhance clarity and facilitate more accurate comparisons and synthesis of findings across studies.

Moreover, by analyzing the review results descriptively and thematically and synthesizing the information for this study, we identified numerous areas where research has not yet ventured. These gaps offer promising avenues for scholars to explore further. In addition to these potential future directions, we have also discovered several paths for successful future investigation. Based on the analysis and synthesis of the papers reviewed, Table 5 outlines a set of research questions designed to guide future studies, organized into categories based on the main themes identified during the analysis.

8 Conclusions

This systematic review embarks on a critical exploration of the relationship between MEAs and BMDs in the context of contemporary business and management research. The growing significance of MEAs in shaping business practices for rapid and strategic growth has been widely acknowledged in the literature. However, despite the increasing interest, there is a notable lack of comprehensive reviews that holistically analyze the impact of MEAs on BMDs. The motivation for this systematic review is rooted in the existing research gaps. The literature on MEAs has grown but lacks a unified conceptualization that diversifies them according to the BMDs addressed. Likewise, the literature on BMDs has grown yet lacks a unified conceptualization, with only recent efforts presenting a framework outlining essential dynamics. Moreover, while Sanasi's (2023) study provided a valuable narrative overview of BMDs and suggested a link to managerial approaches within them, it did not systematically explore the relationship between MEAs and BMDs. This review established focused research to bridge the divide and elucidate the multifaceted dimensions of MEAs concerning their significance, applications, and implications within the context of BMDs. By providing a structured review and analysis, synthesizing existing knowledge, and identifying avenues for future research, this study laid the foundation for a deeper understanding of the interconnections between MEAs and BMDs. Consequently, we sought to advance the knowledge of the topic and encouraged the

Table 5 Research questions for future agenda

Section	Research questions
Trends on the type of MEAs and BMDs addressed	What are the key success factors and challenges associated with the simultaneous application of different MEAs in organizations?
	How do organizations sustain the momentum of continuous innovation and adaptation initiated by MEAs over an extended period?
	What role do leadership styles and change management practices play in fostering a culture of experimentation and validation within organizations?
	How can organizations balance the need for rapid experimentation with ethical considerations in MEAs implementation?
	How do organizations balance short-term gains and long-term sustainability in the context of MEAs-driven business model changes?
	How do external factors, such as economic conditions, geopolitical events, or global pandemics, influence the effectiveness of MEAs in BMDs?
Key factors of MEAs affecting BMDs	How can organizations effectively integrate MEAs to create a cohesive and synergistic approach for BMDs?
	How do cultural factors influence the adoption and adaptation of MEAs in driving BMDs, and what role does organizational culture play in the successful integration?
	How do organizations navigate ethical considerations and societal responsibilities when employing MEAs to cope with BMDs?
	To what extent can the principles of MEAs be successfully applied across diverse industries, and what industry-specific factors influence the adaptation of these approaches in shaping BMDs?
	Can hybrid frameworks that combine elements of LS, Agile, DT and GH provide a more effective strategy for specific business contexts, and what are the key components of successful hybridization?
	What is the quantitative economic impact of MEAs and BMDs on organizational performance, including factors such as revenue growth, cost reduction, and market share expansion?
	How do organizations reconcile the principles of MEAs with varying regulatory environments, and what strategies can be devised to navigate regulatory challenges effectively within BMDs?
	What are the most effective metrics for assessing the success of MEAs, and how can organizations develop standardized measurement frameworks for benchmarking their initiatives?
	How are emerging digital technologies influencing the application and effectiveness of MEAs in BMDs, and what implications does this have for organizational adaptability and competitiveness?
Key common threads of MEAs in BMDs context	What potential impacts can emerging MEAs, not covered in the current analysis, have on BMDs, and how do organizations integrate these approaches into their innovation and business strategies?
	What role does employee engagement play in the successful implementation of MEAs, and how does it contribute to the achievement of BMD goals?
	What are the optimal team compositions and collaboration dynamics for successful MEAs implementation in BMDs?
	How do organizations measure and evaluate the impact of technology integration within MEAs on BMDs, and what metrics are most relevant for assessing the success of technological advancements in this context?

integration of different theories and concepts, paving the way for innovative research directions that will push the frontiers of this expanding research stream.

Appendix A: reviews of the MEAs concept

Study	Goal	Method	Key findings	Differences from the present study
Sanasi (2023)	To explore the concept of BMDs and its overlap with entrepreneurial experimentation	Interpretive and narrative literature review (1995 to 2023)	Theoretical framework outlining key phenomena in business model dynamics, including innovation, validation, scaling, and pivots. Identifies a link between this dynamic nature and entrepreneurial experimentation as a response to the inherent uncertainty in the dynamics of business models	Conducts an interpretive review of the literature Generically explores the term "experimentation" within the scientific context Does not investigate the interrelationships between entrepreneurial experimentation and BMDs
Silva et al. (2020)	To analyze the impacts and potentialities of lean startup, agile methodologies and customer development within business model innovation and validation	Systematic literature review (71 articles)	Concept map displaying the current state of research with the centralized topic on lean startup, customer development and agile methodologies. Identifies some categories, including investigation-benefits, limitations and difficulties; integration with another methodology or proposition of a new model/framework; size of the organization; industry sector; and location	As managerial approaches, only considers lean startup and agile Does not delineate the scope of lean startup or agile as distinct from related approaches such as growth hacking or design thinking Does not analyze the scope of lean startup or agile methodologies with regard to BMDs
Geiss-doerfer et al. (2022)	To clarify the concept of prototyping, experimentation, and piloting in business model innovation pursuits	Structured literature review (cross-reference searches and a key informant interview study)	Identification of definitions, similarities and differences among "prototyping", "experimentation" and "piloting", demonstrating that the concepts serve different purposes at different stages of the business model innovation process in B2B companies	Focuses on clarifying the concept and meaning of experimentation Focuses on business model innovation process Uses cross-sectional research and key informant interviews

Study	Goal	Method	Key findings	Differences from the present study
Bortolini et al. (2021)	To conduct a comprehensive historical literature review to link lean startup concepts and activities with past theories and alternative methods for validating business models	Systemtic literature review (118 articles)	Highlights lean startup as a practical and contemporary application of the School of Learning strategy and effected entrepreneurship; Identifies tools and methods that support the lean startup in the business model validation process	Identifies tools and methods complementing lean startup Focuses on selected research areas that contributed to the origins of lean startup research Focuses on business model validation process
Present paper	To review the current state of research and consolidate the literature on the intersection of MEAs (lean startup, agile, design thinking and growth hacking) and BMDs (business model innovation, validation, pivoting and scaling)	Systematic literature review (until December 2023; 51 articles)	Establishes a framework and an overview to consolidate the similarities, differences and interconnections between MEAs (lean startup, agile, design thinking and growth hacking) and BMDs (business model innovation, validation, scaling and pivoting). Analyzes how MEAs are included in BMDs, what are the key factors of MEAs that affect BMDs, and common trends in the current framework	N/A

Appendix B: How each of the papers explains the interconnections of MEAs on BMDs

N	Author (year)	MEAs involved	BMDs addressed	Main findings
1	Carroll and Casselman (2019)	Lean Start-up, Agile and Design Thinking	All	The study introduced the Lean Discovery Process as a methodology for digital startups, emphasizing early hypothesis testing in both product development and business model shaping. It showed benefits such as cost reduction, efficient experimentation through online survey software, and scalability with online panels
2	Shepherd and Gruber (2021)	Lean Start-up, Agile and Design Thinking	All	The study focused on the Lean Startup framework, identifying five main building blocks, including business model, validated learning/customer development, minimum viable product, perseverance vs. pivoting, market-opportunity navigation. It emphasized the need to bridge the gap between academia and practitioners, urging further research to enhance comprehension and application

N	Author (year)	MEAs involved	BMDs addressed	Main findings
3	Baldas-sarre et al. (2017)	Lean Startup and Design Thinking	BMI and BMV	The study proposed a process for sustainable value proposition design, involving a thorough and iterative approach. It provided a methodological framework for managers to map stakeholders, understand their needs, and integrate them into a more meaningful and enriching value proposition
4	Man-soori and Lackéus (2020)	Lean Startup and Design Thinking	BMV and BMS	The study compared effectuation with five other entrepreneurial methods. It identified strengths and weaknesses, contributing to the emerging field of entrepreneurial methods as a design-oriented inquiry
5	Gan-guly and Euchner (2018)	Lean Startup and Design Thinking	BMI, BMV and BMP	The study emphasized well-designed business experiments as a tool for mitigating risks associated with conducting experiments within an established company. It discussed methods for designing and conducting experiments, managing critical issues in a corporate context
6	Mag-istretti et al. (2023)	Lean Startup and Design Thinking	BMV	The study introduced a process model based on defining, framing, experimenting, and learning. It emphasized the role of design agencies in supporting entrepreneurial venture creation through design practices such as user focus, prototyping, and visualization
7	Geiss-doerfer et al. (2022)	Lean Startup and Design Thinking	BMI, BMV and BMP	The study clarified conceptual boundaries between prototyping, experimentation, and piloting, identifying similarities and differences
8	Mag-istretti et al. (2021)	Lean Startup and Design Thinking	BMI and BMV	The study introduced the 3 T model (Team, Time, and Tools) as microfoundational dimensions, emphasizing cross-functional teams, appropriate timing, and prototyping tools. It highlighted the importance of experimentation, knowledge transfer, co-creation, and prototyping in boosting innovation in highly regulated markets
9	Hampel et al. (2020a)	Lean Startup	BMI	The study emphasized the importance of experimentation in corporate entrepreneurship and innovation within established firms. It identifies a gap in existing literature regarding experimentation in this context
10	Konietz-ko et al. (2020)	Lean Startup	BMI and BMV	The study identified key factors for experimentation and improvement. Provided a foundation for understanding how circular business models can benefit from Lean Startup principles
11	Weiss-brod and Bocken (2017)	Lean Startup	BMI, BMV and BMP	The study highlighted practical challenges in implementing LS, providing a balanced perspective on its application in the context of triple bottom line value creation
12	Lamper-ti et al. (2023)	Lean Startup	BMI, BMV and BMP	The study investigated LS's role in digital servitization for SMEs in the business-to-business context, highlighting adaptation over rapid customer attraction
13	Cavallo et al. (2019)	Lean Startup	BMI, BMV and BMP	Connected BMI with internationalization, suggesting LS methodologies for firms entering international markets
14	Becker and En-denich (2023)	Lean Startup	All	The study explored the influence of entrepreneurial ecosystems on the management control systems of earliest-stage startups, with a focus on amplifying mechanisms promoting the LS philosophy

N	Author (year)	MEAs involved	BMDs addressed	Main findings
15	Sanasi (2023)	Lean Startup	All	The study explored the concept of BMDs and the role of entrepreneurial experimentation in various BMDs. The study suggested a connection between experimental approaches, particularly the LS method, and ongoing changes in business models
16	Kerr et al. (2014)	Lean Startup	BMI, BMV and BMP	The study underscored the crucial role of experimentation in entrepreneurship, highlighting the willingness to fail as a key driver of success
17	Balocco et al. (2019)	Lean Startup	BMI and BMV	The study proposed a lean framework supporting digital ventures in the business model change process. It demonstrated the applicability and benefits of integrating lean principles into the business model change process in a digital context
18	Bocken and Snihur (2020)	Lean Startup	BMI, BMV and BMP	The study discussed the impact of LS methodology on business model innovation, emphasizing the positive opportunities presented by LS. The study viewed experimentation as a strategic organizing process that creates affordances for innovation
19	Silva et al. (2021)	Lean Startup	All	The study discussed integration of LS with complementary strategies such as market research and business planning for opportunity exploitation
20	Bortolini et al. (2021)	Lean Startup	BMI and BMV	The study highlighted the LS methodology's value in operationalizing an effectual and bricolage approach to entrepreneurship, extending beyond product development to include marketing, sales, and all elements of a startup's business model
21	De Cock et al. (2020)	Lean Startup	BMV and BMP	The study stressed the importance of combining LS experimentation with existing market knowledge for meaningful outcomes
22	Flechas et al. (2021)	Lean Startup	BMP	The study introduced a framework delineating four stages of the pivot process, providing a structured approach to understanding and analyzing pivot decisions
23	Sanasi and Ghezzi (2022)	Lean Startup	BMP	The study investigated business model transformation or pivoting in response to the disruptions caused by the Covid-19 pandemic. They suggested that pivots can serve as strategic responses to quickly address unexpected falsification of assumptions
24	Hampel et al. (2020b)	Lean Startup	BMP	The study explored the challenges and risks faced by ventures when they have to pivot. Connecting with stakeholders by exposing struggles during the pivot was found to create bonds and help in rebuilding connections
25	Wang et al. (2023)	Lean Startup	BMI	The study examined the impact of business models on company success, citing SHEIN's success attributed to iterative improvement through LS
26	Sanasi et al. (2023)	Growth Hacking and Lean Startup	BMV, BMS and BMP	The study focused on the post-market validation phase in technology-based startups, revealing that entrepreneurial experimentation persists during the scaling phase. It emphasized continuous experimentation, a focus on value delivery mechanisms, selection of growth metrics aligned with scaling objectives, and integration of the GH method with LS principles

N	Author (year)	MEAs involved	BMDs addressed	Main findings
27	Conway and Hemphill (2019)	Growth Hacking and Agile	BMP and BMS	The study highlighted the necessity of a diverse skill set in GH teams, effective implementation requirements, an iterative and analytical process, creative thinking in choosing traction channels, and the synergy with agile marketing
28	Cavallo et al. (2023)	Growth Hacking	BMS	The study explored how digital startups may approach the scaling phase and the role of GH in this process. It laid the foundation for theoretical understanding and positioning of GH in the context of business-model research
29	Bargoni et al. (2023)	Growth Hacking	BMS	The study introduced a framework combining perspectives from international dynamic marketing capabilities and information technology literature. Key findings propose research propositions related to growth hacking phases, critical dimensions, and emphasize big data analytics, digital marketing, and coding and automation
30	Troisi et al. (2020)	Growth Hacking	BMS	The study identified common strategies and tactics employed by B2B companies in different sectors, applying the GH model to reshape traditional marketing decision-making processes. It highlighted the benefits of a data-driven mindset and reinforces main marketing variables through big data adoption
31	Bohnsack and Liesner (2019)	Growth Hacking	BMS	The study introduced a GH framework, a taxonomy of 34 GH patterns, and emphasized a modular approach. It discussed opportunities and challenges associated with GH, positioning the taxonomy as a measurement and communication tool for firms
32	Rittershaus et al. (2023)	Design Thinking	BMI	The study emphasized the applicability of the proposed tools in the plastics sector, illustrating a decision-making process involving design thinking tools, contradiction matrix, and environment mapping
33	Beltagui (2018)	Design Thinking	BMI and BMV	The study uncovered design capabilities as facilitators of servitization, allowing a manufacturing firm to develop service offerings that build on resources such as knowledge and experience
34	Baldassarre et al. (2020)	Design Thinking	BMI and BMV	The study integrated sustainable BMI with business experimentation and strategic design, utilizing prototyping for early implementation. It emphasized the importance of considering desirability, feasibility, viability, and sustainability during the prototyping phase
35	Geissdoerfer et al. (2016)	Design Thinking	BMI, BMV and BMP	The study underscored the role of DT in improving companies' performance by incorporating positive economic, societal, and environmental value
36	Klenner et al. (2022)	Design Thinking	BMI and BMV	The study introduced the concepts of "entrepreneurial ways of designing" and "designerly ways of entrepreneuring," highlighting how DT facilitates entrepreneurial innovation and new venture creation
37	Liedtka (2015)	Design Thinking	BMV and BMS	The study explored the impact of DT on innovation outcomes by addressing cognitive biases in decision-making. It reviewed DT principles and their potential to reduce common cognitive flaws

N	Author (year)	MEAs involved	BMDs addressed	Main findings
38	He and Ortiz (2021)	Design Thinking	BMI	The study underscored the importance of bespoke methods and DT characteristics in developing sustainable and innovative business models
39	Coffay and Bocken (2023)	Design Thinking	BMI	The study introduced the "Sustainable By Design" tool as a practical solution for organizational transformation towards sustainable business models. It identified challenges such as differing visions and a'culture gap' and emphasized the need for deep organizational design work for sustainable innovation
40	Santa-Maria et al. (2022)	Design Thinking	BMI and BMV	The study emphasized the integration of sustainability in DT and provided a practical tool for organizations to innovate circular business models in a time-efficient manner
41	Roth et al. (2015)	Design Thinking	BMI	The study outlined the main research streams on gamification in the creativity and innovation literature, introduced contributions to a special section on gamification, and identified theoretical challenges for future research on gamification in the context of DT and BMI
42	Ghezzi and Cavallo (2020)	Agile and Lean Startup	BMI, BMV and BMP	The study focused on the relationship between Business Model Innovation, Lean Startup Approaches, and Agile Development in digital startups. It underscored the role of LS approaches as agile methods facilitating BMI in dynamic digital environments
43	Trimi and Berbegal-Mirabent (2012)	Agile and Lean Startup	BMI and BMV	The study contributed a conceptual perspective on emerging developments in business model design, particularly addressing challenges faced by technology-based firms. It emphasized the importance of flexible and customer-centered business models in dynamic environments
44	Silva et al. (2020)	Agile and Lean Startup	BMI, BMV and BMP	The study highlighted the increasing attention to startups, challenges in BMI, and the lack of practical guidance in the literature, providing a structured research agenda and a staircase roadmap for LS implementation
45	Fjeldstad and Snow (2018)	Agile	BMI	The study linked business models to organization design, emphasizing the impact of value configuration on organization design and the need for collaborative organizational forms to support open and agile business models
46	Björkdahl (2020)	Agile	BMI	The study investigated digitalization initiatives in manufacturing firms, revealing challenges and potential solutions, emphasizing the need for firms to capitalize on digitalization for growth rather than mere efficiency
47	Sanasi et al. (2022)	Agile	BMI and BMV	The study delved into the challenges faced by high-reputation firms in implementing agile BMI. It emphasized the strategic agility achieved through continuous agile experimentation, navigating reputational barriers. The study has sheds light on the mindset shift towards viewing Agile experimentation as a strategic agility enabler rather than a mere tool
48	Bouwman et al. (2018)	Agile	BMI	The study introduced the concept of Business Model Stress Testing, offering a method to assess the agility of business model during market entry situations

N	Author (year)	MEAs involved	BMDs addressed	Main findings
49	Loss and Crave (2011)	Agile	BMI	The study proposed a theoretical framework, addressing levers and barriers to innovation in Agile Business Models within collaborative networks
50	Sjödin et al. (2021)	Agile	BMI, BMV and BMS	The study explored the integration of artificial intelligence (AI) in manufacturing firms to enhance value creation. It identified critical AI capabilities and emphasized the role of business model innovation in scaling AI
51	Linde et al. (2023)	Agile	BMI, BMV and BMS	The study presented a revenue model design framework, emphasizing customer-centric, iterative, and agile processes. It highlighted the importance of close collaboration with key customers in designing revenue models for digital services

Appendix C: List of articles included in the systematic literature review

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
1	2017	Baldassarre; Calabretta; Bocken; Jaskiewicz	Bridging sustainable business model innovation and user-driven innovation: A process for sustainable value proposition design	Journal of Cleaner Production	Sustainable development; Business models; Innovation; Value proposition; Product design; Iterative methods; Lean start-up; Design; Sustainable business; Sales; Climate change; Sustainable business model innovation; Service design; Business design	Empirical, qualitative	Netherlands	459

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
2	2020	Baldassarre, Brian; Konietzko, Jan; Brown, Phil; Calabretta, Giulia; Bocken, Nancy; Karpen, Ingo; Hultink, Erik Jan	Addressing the design-implementation gap of sustainable business models by prototyping: A tool for planning and executing small-scale pilots	Journal of Cleaner Production	Sustainable development; Business models; Business model innovation; Bridges; Design implementation; Prototyping; Design thinking; Iterative methods; Design; Design science; Business experimentation; Design-science researches; Environmentally acceptable	Empirical, qualitative	Netherlands	152

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
3	2019	Balocco, Raffaello; Cavallo, Angelo; Ghezzi, Antonio; Berbegal-Mirabent, Jasmina	Lean business models change process in digital entrepreneurship	Business Process Management Journal	Business models; Digital entrepreneurship; Entrepreneurship; Lean startup; Business model change; Business model experimenting; Business model validation; Lean manufacturing; Digital technology; New business enterprises; Customer retention; Deep learning	Empirical, qualitative	Italy	142
4	2023	Bargoni, Augusto; Jabeen, Fauzia; Santoro, Gabriele; Ferraris, Alberto	Growth hacking and international dynamic marketing capabilities: a conceptual framework and research propositions	International Marketing Review	Big data; Cognitive computing; Data-driven decision-making; Growth hacking; International dynamic marketing capabilities; International marketing	Conceptual	Italy	5

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
5	2023	Becker, Sebastian; Endenich, Christoph	Entrepreneurial Ecosystems as Amplifiers of the Lean Startup Philosophy: Management Control Practices in Earliest-Stage Startups	Contemporary Accounting Research	ecosystem; Lean Startup; business model innovation; entrepreneurship; incubator; management control systems; Entrepreneurship education; Business planning; Communities	Empirical, qualitative	France	7
6	2018	Beltagui, Ahmad	A design-thinking perspective on capability development: The case of new product development for a service business model	International Journal of Operations & Production Management	Business model innovation; Supply chains; Design thinking; Servitization; Design capabilities; New product development; Service design; Technological innovations; Computer software development; Industrial design;	Empirical, qualitative	UK	73

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
7	2020	Björkdahl	Strategies for Digitalization in Manufacturing Firms	California Management Review	dynamic capabilities; Business models; business model innovation; strategy; Value creation; digital transformation; ecosystems; digitalization; agility; services; value capture; value creation; Value capture; Digital technology; Profitability; Agile manufacturing	Empirical, qualitative	Sweden	404
8	2020	Bocken, Nancy; Snihur, Yuliya	Lean Startup and the business model: Experimenting for novelty and impact	Long Range Planning	Experimentation; Business models; Impact; Business model innovation; Lean startup; Experiential learning; New business enterprises; Customer feedback; Stakeholder theory; Novelty	Conceptual	Sweden	214
9	2019	Bohnsack, René; Liesner, Meike Malena	What the hack? A growth hacking taxonomy and practical applications for firms	Business Horizons	Big data; Digital marketing; Digital transformation; Growth hacking; Lean startup	Conceptual	Portugal	53

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
10	2021	Bortolini, Rafael Fazzi; Nogueira Cortimiglia, Marcelo; Danilevicz, Angela de Moura Ferreira; Ghezzi, Antonio	Lean Startup: a comprehensive historical review	Management Decision	Lean Startup; Startups; Business model validation; New business enterprises; Electronic journals; Historical literature; Historical review; Learning School; Model validation; Scholarly periodicals; Snowball sampling	Empirical, qualitative	Brazil	203
11	2018	Bouwman; Heikkilä; Heikkilä; Leopold; Haaker	Achieving agility using business model stress testing	Electronic Markets	Business model; M13; O31; Business model innovation; Agility; Business modelling; Market entry; Stress testing	Empirical, qualitative	Netherlands	77
12	2019	Carroll, Ryall; Casselman. Mitch	The Lean Discovery Process: the case of raiserve	Journal of Small Business and Enterprise Development	Business model; Lean startup; Digital business; Uncertainty; A/B testing; software-development; Business model iinnovation; A; B testing	Empirical, qualitative	USA	22

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
13	2023	Cavallo, Angelo; Cosenz, Federico; Noto, Guido	Business model scaling and growth hacking in digital entrepreneurship	Journal of Small Business Management	Business model innovation; digital entrepreneurship; Creation; Design; Ecosystems; Experimentation; Growth Hacking; Innovation; Management; Perspective; Scalability; Startup; Sustainability; System Dynamics	Empirical, qualitative	Italy	9
14	2019	Cavallo, Angelo; Ghezzi, Antonio; Ruales, Guzmán Bertha Viviana	Driving internationalization through business model innovation: Evidences from an AgTech company	Multinational Business Review	Globalization; Experimentation; Internationalization; Business model; Business models; Entrepreneurship; Business model innovation; Lean startup; Innovations in business; Evidence; Performance; Dynamic Capabilities; Firm;	Empirical, qualitative	Italy	71

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
15	2023	Coffay, Matthew; Bocken, Nancy	Sustainable by design: An organizational design tool for sustainable business model innovation	Journal of Cleaner Production	Dynamic capabilities; Sustainable development; Business models; Business model innovation; Bridges; Sustainable design; Design thinking; Iterative methods; Design; Sustainable business; Sustainable business model; Design science; Dynamics capability	Empirical, mixed	Norway	1
16	2019	Conway, Tony; Hemphill, Tanya	Growth hacking as an approach to producing growth amongst UK technology start-ups: an evaluation	Journal of Research in Marketing and Entrepreneurship	Agile marketing; Entrepreneurial marketing; Growth hacking; Small firms; Technology led strategy; Technology start-ups	Empirical, qualitative	UK	44
17	2020	De Cock, Robin; Bruneel, Johan; Bobelyn, Annelies	Making the lean start-up method work: The role of prior market knowledge	Journal of Small Business Management	growth-oriented ventures; Lean start-up; Market knowledge; Venture experimentation	Empirical, qualitative	Belgium	47

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
18	2018	Fjeldstad, Øystein; Snow, Charles	Business models and organization design	Long Range Planning	Business models; Business model innovation; innovation; business; model; Decision making; Theoretical foundations; Decision theory; Industrial management; Organization design; theoretical study; design; Management practices; Managers	Conceptual	Norway	373
19	2021	Flechas, Chaparro Ximena Alejandra; de, Vasconcelos Gomes Leonardo Augusto	Pivot decisions in startups: a systematic literature review	International Journal of Entrepreneurial Behavior & Research	Decision-making; Entrepreneurial judgment; Innovation; Pivot; Startup	Empirical, qualitative	Brazil	42
20	2018	Ganguly, Abhijit; Euchner, Jim	Conducting Business Experiments	Research-Technology Management	Business model innovation; Lean Startup; Business experiments	Conceptual	UK	44

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
21	2022	Geiss-doerfer; Savaget; Bocken; Hultink	Proto-typing, experi-menta-tion, and piloting in the business model context	Industrial Marketing Manage-ment	Business model; Business models; Innovation manage-ment; B2B; Experi-menting; Piloting; Prototyping; Innovations in business; Business literature; Business-to-business transactions; Design; Innovation; Strat-egy; Agile; Barriers	Empirical, qualitative	UK	9
22	2016	Geiss-doerfer, Martin; Bocken, Nancy; Hultink, Erik Jan	Design think-ing to enhance the sus-tainable business modelling pro-cess– A workshop based on a value mapping process	Journal of Cleaner Production	Sustainable develop-ment; Business models; Business model innova-tion; Value proposition; Design thinking; Value creation; Systems engineering; Corporate sustain-ability; Corporate-sustain-ability; Failed value exchanges; Mapping; Value ideation	Empirical, qualitative	Netherlands	608

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
23	2020	Ghezzi; Cavallo	Agile Business Model Innovation in Digital Entrepreneurship: Lean Startup Approaches	Journal of Business Research	Business models; Entrepreneurship; Customer development; Agile development; Strategic agility; Business Model Innovation; Digital start-ups; Lean Startup Approaches; Multisided platform; New business enterprises; Innovations in business	Empirical, qualitative	Italy	664
24	2020	Hampel, Christian; Tracey, Paul; Weber, Klaus	The Art of the Pivot: How New Ventures Manage Identification Relationships with Stakeholders as They Change Direction	Academy of Management Journal	Lean startup; Organization and management theory; Pivot; Qualitative orientation; Research Methods	Conceptual	UK	167
25	2020	Hampel, Christian; Perkmann, Markus; Phillips, Nelson	Beyond the lean start-up: experimentation in corporate entrepreneurship and innovation	Innovation: Organization & Management	Innovation; experimentation; lean start-up; corporate entrepreneurship	Conceptual	UK	72

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
26	2021	He, Jiantong; Ortiz, Jaime	Sustainable business modeling: The need for innovative design thinking	Journal of Cleaner Production	Sustainable development; Business models; Business model innovation; Value proposition; Sustainable design; Design thinking; Iterative methods; Design; Sustainable business; Sustainable business model; Climate models; Case-studies; Failure analysis	Empirical, qualitative	China	65
27	2014	Kerr, William; Nanda, Ramana; Rhodes-Kropf, Matthew	Entrepreneurship as Experimentation	Journal of Economic Perspectives	Entrepreneurship; Experimentation; Innovation; new firms	Conceptual	USA	792
28	2022	Klenner, Nico Florian; Gemser, Gerda; Karpen, Ingo Oswald	Entrepreneurial ways of designing and designerly ways of entrepreneuring: Exploring the relationship between design thinking and effectuation theory	Journal of Product Innovation Management	innovation; entrepreneurship; design thinking; effectuation theory; new venture creation	Empirical, qualitative	Australia	55

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
29	2020	Konietzko, Jan; Baldassarre, Brian; Brown, Phil; Bocken, Nancy; Hultink, Erik Jan	Circular business model experimentation: Demystifying assumptions	Journal of Cleaner Production	Experimentation; Sustainability; Business model; Business models; Circular economy; Business model innovation; Lean startup; Business modeling; Design science; Effectuation; Health technology; Industrial engineering; Innovation manager; Production engineer	Empirical, qualitative	Netherlands	71
30	2023	Lamperti, Sofia; Cavallo, Angelo; Sassanelli, Claudio	Digital Servitization and Business Model Innovation in SMEs: A Model to Escape From Market Disruption	IEEE Transactions on Engineering Management	Business; Technological innovation; Manufacturing; lean start-up; Companies; Analytical models; Bibliographies; Firms; Business Model Innovation (Bmi); Co-Creation; Digital Servitization (Ds); Digital Transition; Digitization; Infusion; Of-The-Art; Product	Empirical, qualitative	Italy	19

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
31	2015	Liedtka, Jeanne	Perspective: Linking Design Thinking with Innovation Outcomes through Cognitive Bias Reduction	Journal of Product Innovation Management	Design Thinking; growth; Innovation	Empirical, qualitative	USA	1017
32	2023	Linde, Lina; Frishammar, Johan; Parida, Vinit	Revenue Models for Digital Servitization: A Value Capture Framework for Designing, Developing, and Scaling Digital Services	IEEE Transactions on Engineering Management	Pricing; Digitalization; Business models; Economics; business models; Business; Manufacture; Technological innovation; Digital servitization; Servitization; Digital services; Sales; Advanced service; Advanced services; Context models; digital services; dig	Empirical, qualitative	Sweden	64

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
33	2011	Loss, Leandro; Crave, Servane	Agile Business Models: an approach to support collaborative networks	Production Planning & Control	Business networks; Globalization; Business models; innovation; Agile Business Models; collaborative networks; customer experience; Information economy; Marketing models	Conceptual	Brazil	54
34	2021	Magistretti, Stefano; Allo, Luis; Verganti, Roberto; Dell'Era, Claudio; Reutter, Felix	The microfoundations of design sprint: how Johnson & Johnson cultivates innovation in a highly regulated market	Journal of Knowledge Management	Design sprint; Design thinking; Experimentation; Knowledge transfer; Microfoundations; Open innovation	Conceptual	Italy	17

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
35	2023	Magistretti, Stefano; Sanasi, Silvia; Dell'Era, Claudio; Ghezzi, Antonio	Entrepreneurship as design: A design process for the emergence and development of entrepreneurial opportunities	Creativity and Innovation Management	Business models; Entrepreneurship; entrepreneurship; Design science; design thinking; New product development; design science; design sprint; entrepreneurial endeavours; entrepreneurial opportunity; lean startup	Empirical, qualitative	Italy	6
36	2020	Mansoori, Yashar; Lackéus, Martin	Comparing effectuation to discovery-driven planning, prescriptive entrepreneurship, business planning, lean startup, and design thinking	Small Business Economics	Effectuation; And relevance; Comparison; Entrepreneurial methods; Prescriptive theories	Conceptual	Sweden	170

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
37	2023	Rittershaus, Philipp; Renner, Manfred; Aryan, Venkat	A conceptual methodology to screen and adopt circular business models in small and medium scale enterprises (SMEs): A case study on child safety seats as a product service system	Journal of Cleaner Production	Circular business model innovation; Circular economy; Circular transitions; Circular value creation; Circularity score; SMEs	Conceptual	Germany	2
38	2015	Roth, Steffen; Schneckenberg, Dirk; Tsai, Chia-Wen	The Ludic Drive as Innovation Driver: Introduction to the Gamification of Innovation	Creativity and Innovation Management	Video games; Technological innovations; Creative ability in technology; Electronic games; Gamification; Design; Organizations; Creativity; Directions	Conceptual	France	158

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
39	2023	Sanasi	Entrepreneurial experimentation in business model dynamics: Current understanding and future opportunities	International Entrepreneurship and Management Journal	Business model innovation; Lean startup; Pivots; Business model dynamics; Entrepreneurial experimentation; Scaling; Validation; Innovation; Capabilities; Strategy; Firms; Art; Effectuation; Lean Startup; Methodology; Microfoundations	Conceptual	Italy	1
40	2022	Sanasi, Silvia; Ghezzi, Antonio	Pivots as strategic responses to crises: Evidence from Italian companies navigating Covid-19	Strategic Organization	business model; experimentation; pivot; Covid-19; lean startup; strategic responses to crises	Empirical, qualitative	Italy	13
41	2023	Sanasi, Silvia; Ghezzi, Antonio; Cavallo, Angelo	What happens after market validation? Experimentation for scaling in technology-based startups	Technological Forecasting and Social Change	Technology-based scaling; Digital startups; Entrepreneurial experimentation; Lean startup; Growth hacking; Scientific method; Entrepreneurship	Empirical, qualitative	Italy	0

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
42	2022	Sanasi, Silvia; Manotti, Jacopo; Ghezzi, Antonio	Achieving Agility in High-Reputation Firms: Agile Experimentation Revisited	IEEE Transactions on Engineering Management	Experimentation; Business models; Business; Business model innovation; Value proposition; experimentation; Commerce; Iterative methods; Lean startup approach; business model innovation (BMI); Technological innovation; Agile methods; Interview; lean startup	Empirical, qualitative	Italy	14

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
43	2022	Santa-Maria, Tomas; Vermeulen, Walter; Baumgartner, Rupert	The Circular Sprint: Circular business model innovation through design thinking	Journal of Cleaner Production	Sustainable development; Sustainability; Business models; Circular economy; Business model innovation; Design thinking; Action design research; Design; Design research; Innovations process; Problem-solving; Sustainable business; Sustainable business model	Empirical, mixed	Austria	32
44	2021	Shepherd; Gruber	The Lean Startup Framework: Closing the Academic–Practitioner Divide	Entrepreneurship: Theory and Practice	Business models; business models; Entrepreneurship; cognition/knowledge/learning; opportunity search/discovery; start-up; cognition; learning; knowledge; New business enterprises; discovery; opportunity search	Conceptual	USA	272

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
45	2021	Silva, Diego Souza; Ghezzi, Antonio; Aguiar, Rafael Barbosa de; Cortimiglia, Marcelo Nogueira; ten, Caten Carla Schwengber	Lean startup for opportunity exploitation: adoption constraints and strategies in technology new ventures	International Journal of Entrepreneurial Behavior & Research	Emerging economy; Business model innovation; Lean startup; Technology entrepreneurship; Entrepreneurial experimental capability; Minimum viable product; Innovation; Entrepreneurship; Knowledge Spillovers; Risk	Empirical, qualitative	Brazil	24
46	2020	Silva, Diego Souza; Ghezzi, Antonio; Aguiar, Rafael Barbosa de; Cortimiglia, Marcelo Nogueira; ten, Caten Carla Schwengber	Lean Startup, Agile Methodologies and Customer Development for business model innovation: A systematic review and research agenda	International Journal of Entrepreneurial Behavior & Research	Business model innovation; Experimentation; Lean Startup approaches; Minimum viable product; New venture creation; Technology entrepreneurship	Empirical, qualitative	Brazil	136

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
47	2021	Sjödin, David; Parida, Vinit; Palmié, Maximilian; Wincent, Joakim	How AI capabilities enable business model innovation: Scaling AI through co-evolutionary processes and feedback loops	Journal of Business Research	Digitalization; Business models; Platform; Digital transformation; Artificial intelligence; Business model innovation; Digital servitization; Value capture; Innovations in business; Customer cocreation; Coevolution; Creation; Ecosystems; Opportunities; Art	Empirical, qualitative	Sweden	137
48	2012	Trimi; Berbegal-Mirabent	Business model innovation in entrepreneurship	International Entrepreneurship and Management Journal	Business model; Entrepreneurship; Lean start-up; Business innovation; Customer development model; New technology-based firms; Perspective; Context; E-Commerce; Exploitation; Exploration; Firm Performance; Knowledge; Spin-Off; Value Creation; Ventures	Conceptual	USA	709

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
49	2020	Troisi, Orlando; Maione, Gennaro; Grimaldi, Mara; Loia, Francesca	Growth hacking: Insights on data-driven decision-making from three firms	Industrial Marketing Management	Action research; Big data analytics; Business-to-business (B2B); Cognitive computing; Growth hacking marketing; Growth hacking marketing Action research; High-tech companies; Marketing decisions	Empirical, qualitative	Italy	140
50	2023	Wang, Chengbin; Chen, Minju; Wang, Qingyang; Fang, Yongyan	The study of value network reconstruction and business model innovation driven by entrepreneurial orientation	International Entrepreneurship and Management Journal	Business logic; Business model iterative canvas; Entrepreneurial orientation; Lean start-up approach; Value network reconstruction	Empirical, qualitative	China	2

N°	Year	Author	Title	Journal	Keywords	Typology	First Author's country	Number of citations
51	2017	Weissbrod, Ilka; Bocken, Nancy	Developing sustainable business experimentation capability—A case study	Journal of Cleaner Production	Sustainable development; Experimentation; Circular economy; Economics; Business model innovation; Value creation; Sustainable business; Sustainable business model; Triple bottom line value creation	Empirical, qualitative	UK	253

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Authors and Affiliations

Luca Simone Macca[1] [iD] **· Gabriele Santoro[1,2] · Michael Christofi[3]**

✉ Luca Simone Macca
lucasimone.macca@unito.it

Gabriele Santoro
gabriele.santoro@unito.it

Michael Christofi
michail.christofi@evaf.vu.lt

[1]   Department of Management "Valter Cantino", University of Turin, Turin, Italy

[2]   School of Business, Gnosis: Mediterranean Institute for Management Science, University of Nicosia, Nicosia, Cyprus

[3]   Faculty of Economics and Business Administration, Vilnius University, Vilnius, Lithuania