Enhancing Business Innovation: A Review of the Impact of Design Methods

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Abstract
Design methods for business innovation have become popular, yet research gaps about their true potential persist. Upon reviewing the literature on design thinking for business innovation, we identify five key themes, (1) the creation of technological differentiation, (2) how design methods help in the introduction of business innovation strategies, (3) how designers can translate ideas into concepts for business innovation, (4) how the concept of design as research leads to innovative business, and (5) the contribution of designers in introducing new design methods while implementing innovative business. Complementarily, we identified six factors that determine the effectiveness of design methods: organizational culture, resources, capabilities, industry dynamics, competition, and regulations. Also, the social and situational nature of design, should be considered in the co-evolution of tech products, services, and models.
Our research provides a valuable starting-point for business innovation researchers, regardless of their expertise in design, organizational research, or business innovation management.

Keywords*:* business innovation; design methods; innovation process; design thinking

Submitted: August 7, 2023/ Approved: December 14, 2023

Introduction

The purpose of innovation is to enable organizations to adapt to evolving markets, technologies, and competitive modes by producing new products, processes, and systems procedure (Randhawa et al., 2021). Businesses are experiencing increasing turbulences due to technological advancement, business model changes, and shifts in consumer habits. Managers need innovative problem-solving and decision-making practices to respond to these dynamic changes and avoid a traditional decision-making attitude while providing creative options (Keiningham et al., 2019; Lee et al., 2019)

Using design methodology as a user-centered way to innovate has been developed as a managing approach that integrates creativity and user-centeredness (Brown, 2008). Companies are investing in innovation, training their employees, and engaging their customers in ways that have significantly changed due to the rapid shifts toward integrated products and services. For example, a board-based approach to design methods has been the most visible and strongest trend over the past decade (Roberts et al., 2016), with design methodologies matching people's requirements to technologically feasible technologies and customer values through a viable business strategy (Martin, 2009).

Increasing attention is also being observed in the business sector. Many known companies are committed to becoming design leaders, considering product and service design as an important component of their competitiveness (Razzouk & Shute, 2012). One of the most popular design-base method, *Design thinking*, has become an important management practice that many researchers believe deserves more attention (Liedtka, 2014).

Conventionally, management teaching institutions do not provide to their students the design skills and knowledge needed to apply *Business Model Innovation*. (González-pérez & Ramírez-montoya, 2022; McGrath, 2010) argued that strategies for discovering new design approaches should involve experimentation and learning, while (Osterwalder et al., 2005) and (Zott & Amit, 2010) suggest that a discovery-driven approach instead of an analytical method can provide business employees the needed design skills. Researchers have explored design's methodological value for company model innovation from several other approaches over the last decade (Zott & Amit, 2013). In these years, many technological advancements have been developed to support business design models and be used by managers and entrepreneurs (Bocken et al., 2013).

However, few studies provide a comprehensive view of applying this approach, neither design-methods challenges in their implementation (Foss & Saebi, 2017). For instance, design methodologies have weak support theories, and oversimplified the design process as a clear easy-to-follow procedure (França et al., 2017; Kimbell, 2011; Spaniol et al., 2019).

This paper will provide a comprehensive perspective on the role of design methods in business innovation to help unleash its potential and find the unique challenges faced by its utility.

Theoretical approach

Innovation in businesses and the influence of design methods.
Literature on business models often emphasizes innovative design methods and strategies. Researchers recognize the importance of business design models, which describe how a company gets and captures value.

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One of the earliest and most influential models of the design process was proposed by Herbert Simon in his book "The Sciences of the Artificial" (Simon, 1969). Simon described the design as a process of "problem-solving" that involves several stages, including understanding the problem, generating ideas, evaluating alternatives, and implementing solutions. Simon's model emphasizes the importance of iteration and feedback in the design process, as well as the need for designers to balance competing goals and constraints. More recently, the concept of innovative business design methods was developed by (Chesbrough, 2007) and later by (Gay, 2014) as a means of transitioning from traditional business models. Recent academic suggests that innovative business design models include various activities like creating an entirely new model for business, diversifying previously known designs, acquiring new designs in models, or transforming already functioning design methods (Geissdoerfer et al., 2016). Learning from a successful business model to simulate the innovative process is also valuable (Geissdoerfer et al., 2018). According to (Giesen et al., 2007), 35 best business design methods provided insights into three types of innovation: industry innovations, revenue, and enterprise model (see table 1).

Table 1: Business model concepts, models, and methods

Authors	Business model concepts	Models and methods
(Chesbrough, 2007)	Value proposition (creation and capture value)	Business model framework
(Gay, 2014)	Value proposition (creation and capture value) and network perspective	Open innovation
(Geissdoerfer et al., 2016; Geissdoerfer et al., 2018)	Value proposition (creation and capture value) and sustainable business model innovation	Value mapping process and design thinking
(Giesen et al., 2007)	New business model	Innovation in industry, revenue and enterprise

The research identified a wide range of literature, showing various subjects and presentation styles. These narratives often rely on researcher's personal experiences and ideologies derived from a long historical validation perspective. In general, previous research lacks empirical and quantitative evidence, while others present purely critical or historical arguments without any empirical support, all being relevant in this review.

The research analysis and conclusions primarily reflect the qualitative perspective of the analyzed papers. Half of the peer-reviewed articles were categorized as Literature, Experiences, Examples, and Opinions (LEEO). Within the LEEO classification, articles encompassed literature reviews, thesis development, opinion pieces, or small anecdotes (Grant & Booth, 2009). The remaining literature fell into qualitative studies, on which data was presented through interviews, case studies, observational insights, and focus groups. These methodologies collectively showed the correlation between business design methods and innovation, integrating data, figures, surveys, and economic models in the analysis.

Additionally, design methods may have various impacts beyond mere styling in businesses due to the broader understanding of 'design' that has evolved based on the concepts (Marxt & Hackling, 2005; Ooi & Husted, 2021). Business design model innovation, defined by researchers, mainly focuses on enhanced value configuration, offering customers new products and services while experimenting with new design methods' building blocks and elements using internal business resources (Geissdoerfer et al., 2018). According to (Hobday et al., 2011), the innovation studies field has neglected to conceptualize, research, and teach design (Hobday et al., 2012).

Design studies literature does not offer a clear and precise definition of the roles and impacts of design methods in the innovation or success of technologically innovative end products, nor does it outline the relevant variables necessary for their implementation and development. The design method is often conceptualized as a process involving variations from existing states to desired ones. However, "design" is a term commonly used to describe a broad spectrum of elements, such as the shape or form of an object (Simon, 1969), or the collaboration between designers and consumers to fulfill their needs.

Several relationships are observed, such as the utilization of Business design methods as a means for analyzing innovative processes and communicating data (Doganova & Eyquem-Renault, 2009; Geissdoerfer et al., 2018), and that business models and organizational design are connected to product strategy and their focus on market needs (DaSilva & Trkman, 2014). Furthermore, there is an acknowledgment of the responsibility of managers in the design and development of business models (DaSilva & Trkman, 2014).

Market segment, value creation, and the value proposition show a consistent correlation among various business models proposition (Chesbrough, 2007; Geissdoerfer et al., 2016; Zott & Amit, 2013), as well as the relationship between sustainability and business innovation models (Carayannis et al., 2014). Differences, especially conflicts, are observed between recent and previous business model design methods, being the approach of the model and the influencing factors the most relevant (Aspara et al., 2010). This ambiguity complicates the determination of whether design methods indeed have an impact on innovative business models.

A common theme identified by multiple authors pertains to the adaptability of organizations to market conditions. This refers to their capacity to recognize crucial market conditions and, consequently, create, implement, and evolve business models. Wirtz's research (Wirtz et al., 2016) emphasizes that the innovative design approach of a business should consistently be viewed through a dynamic lens, suggesting that a business should evolve and adapt its design method in response to changes in both, internal or external environments. Zott's research (Zott & Amit, 2010) provided a conceptual toolkit to help managers and design thinkers analyze and innovate current design methods while adapting them for future implementation, while (Chesbrough, 2007) provided an integrated approach to innovative business, considering the components of the business model, the process, and the competitive technique of the innovating company.

Table 2: Key elements identified in the literature review.

Key elements	Chesbrough, 2007	Giesen et al., 2007	Doganova & Eyquem-Renault, 2009	Zott & Amit, 2010	Aspara et al., 2010	Zott & Amit, 2013	Gay, 2014	Carayannis et al., 2014	Dasilva & Trkman, 2014	Geissdoerfer et al., 2016	Wirtz et al., 2016	Geissdoerfer et al., 2018	Keiningham et al., 2019	Randhawa et al., 2021	Ooi & Husted, 2021	Number of coincidences
Create, deliver and capture value					X	X		X	X		X					5
Adaptability	X	X	X					X			X					5
Dynamic nature			X	X		X		X	X							5
Collaboration/ partnerships/ alliances	X						X	X						X	X	5
Customer-centricity / interaction	X	X		X											X	4
Value propositions			X			X					X					3
Profit-centric/ Financial perspective					X					X		X				3
Stakeholders needs								X		X		X				3
Market dynamic / market orientation								X			X			X		3
Resource allocation				X		X							X			3
Customer experience													X		X	2
Strategy													X	X		2
Agility	X	X														2
Technology integration (drivers)		X	X													2
Sustainability								X				X				2
Value creation				X												1
Customer relationships			X													1
Diversification and expansion		X														1
Networking dynamics							X									1
Transactions costs economics						X										1
Revenue streams			X													1
Agency						X										1
Replication					X											1
Digitalization factors											X					1
Mentioned methods	-	-	-	-	-	Canvas business model blocks: customer segments, channels and revenue streams	Open innovation	-	Canvas business model	Design thinking and value mapping	Canvas business model blocks: revenue streams, customer segments and channels	-	-	-	Brainstorming, design thinking, workshops and beta testing	-

Table 2 shows that *creation*, *deliver* and *capture of value* are the higher value elements, mostly because they direct the efforts during the business model design process, pointing towards results that can be made tangible. These results can be observed as processes, organizational, product, or service innovations. At the same time, the dynamic nature of current markets requires organizations to be adaptative enough to quickly modify their business models. The relevance of knowing the clients and consumer needs, external-internal knowledge, environment, hyper-connected and collaborative vision with other organizations are recognized as factors that provide business models with value, which can be developed in different layers of the business, allowing the development of feasible and transferable value proposals.

Research gap

Although methods such as *Design Thinking*, *Brainstorming*, *Open Innovation*, *Value Mapping*, *Beta Testing*, and the *Business Model Canvas* enhance the design of business models, their impact and modes of relationship are not easily recognizable.

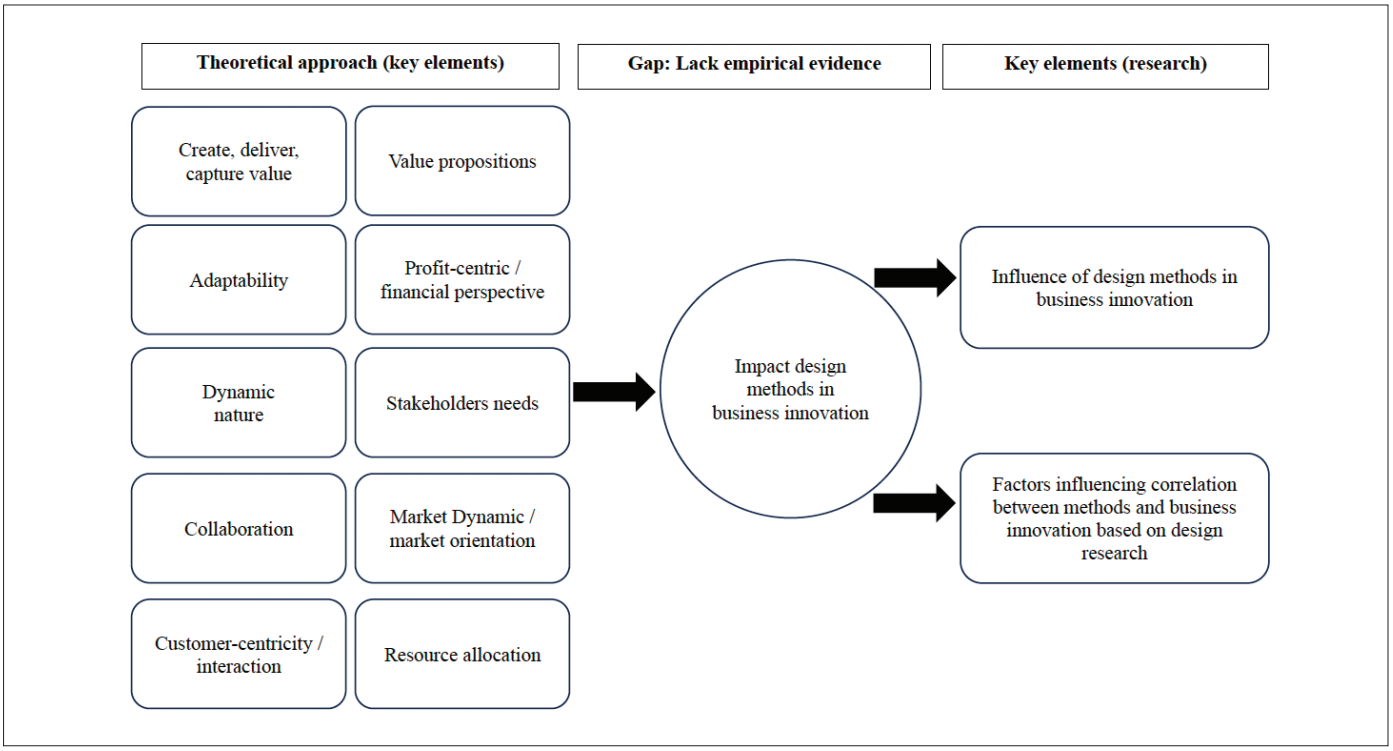
For example, their user-centered approach allows *Design Thinking* and *Beta testing* to be suitable for using them when adding value is fundamental. However, their degree of influence is not easily discernible. Similarly, we observe that *value maps* provide clear analyses of business processes, as a *Brainstorming* of solution ideas, but may not necessarily establish their influence on the business model added value. *Business model canvas* considers the market-segment-needs, value proposition, and it relates relationship modes with customers/users, communication, and distribution (channels). To a lesser extent, previous studies mention financial aspects of the business model (revenue streams and costs) and the structural layer (resources, activities). However, collaboration, understood in the canvas model as key partners, is a consistently relevant factor in the design of business models, at least from the perspective of extending beyond the "walls" of the business itself. This aligns intuitively with the idea of forming value alliances in a hyper-connected and globalized world.

There is a need for better design conceptualization, considering it a unique economic activity at companies, industry, and wider economic level within social sciences and business innovation studies. Given the lack of clear and consistent understanding of the correlation between design and business innovation in previous literature, we work with implicit theories and categorize roles based on common ideas pooled across various organizations.

In summary, our research identifies a gap in the literature characterized by the predominance of qualitative perspectives, a lack of empirical evidence, and the ambiguity surrounding the definition and impact of design methods in the context of business model innovation. Addressing these gaps could contribute to a more comprehensive understanding of the relationship between design methods and the development of innovative business models. While there may be some gray areas that require further exploration, our classification can be a useful starting point.

Based on key concepts observed repeatedly in the related literature, we propose two dimensions of analysis: the influence of design methods on business innovation, and the factors influencing the correlation between methods and business innovation based on design research (see figure 1).

Figure 1: Relation between literature review and the key research elements.



The analysis dimensions are broken down to understand the impacts of methods on business innovation; the influence of design methods in business innovation (figure 2), and the key factors correlating design methods with business innovation, categorized into internal and external dimensions (figure 3).

Figure 2: Recurrent themes in literature when studying the influence of design methods in business innovation.

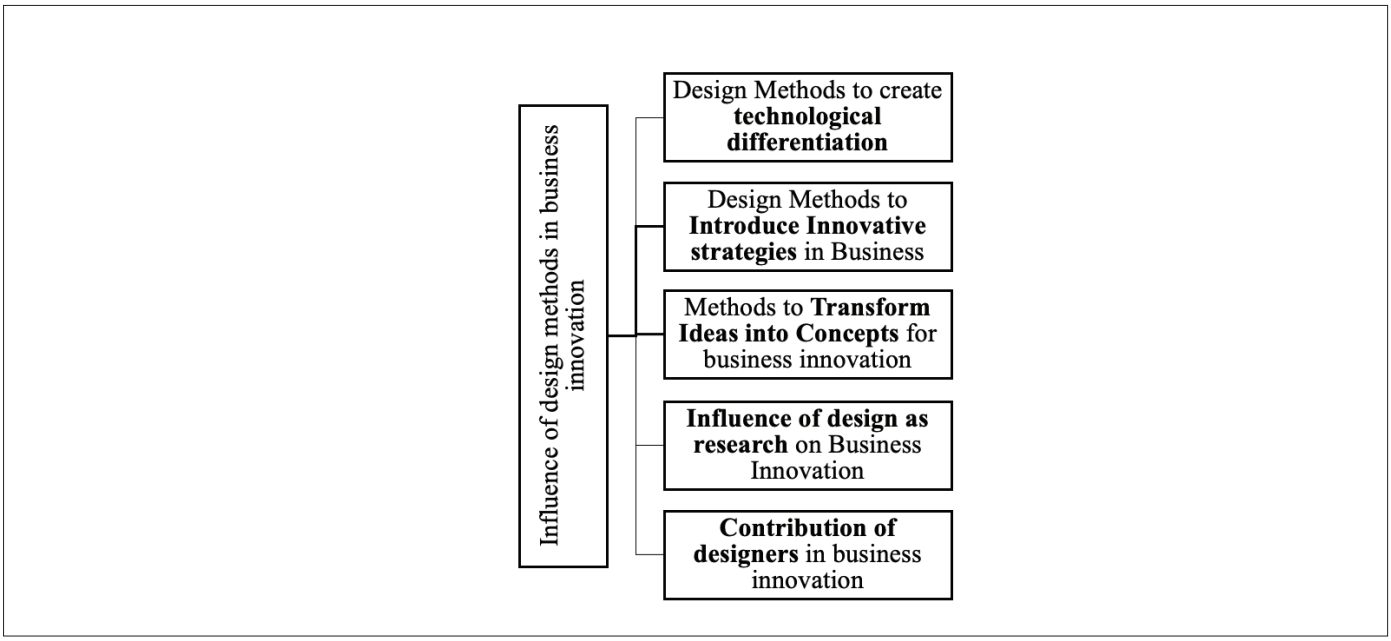
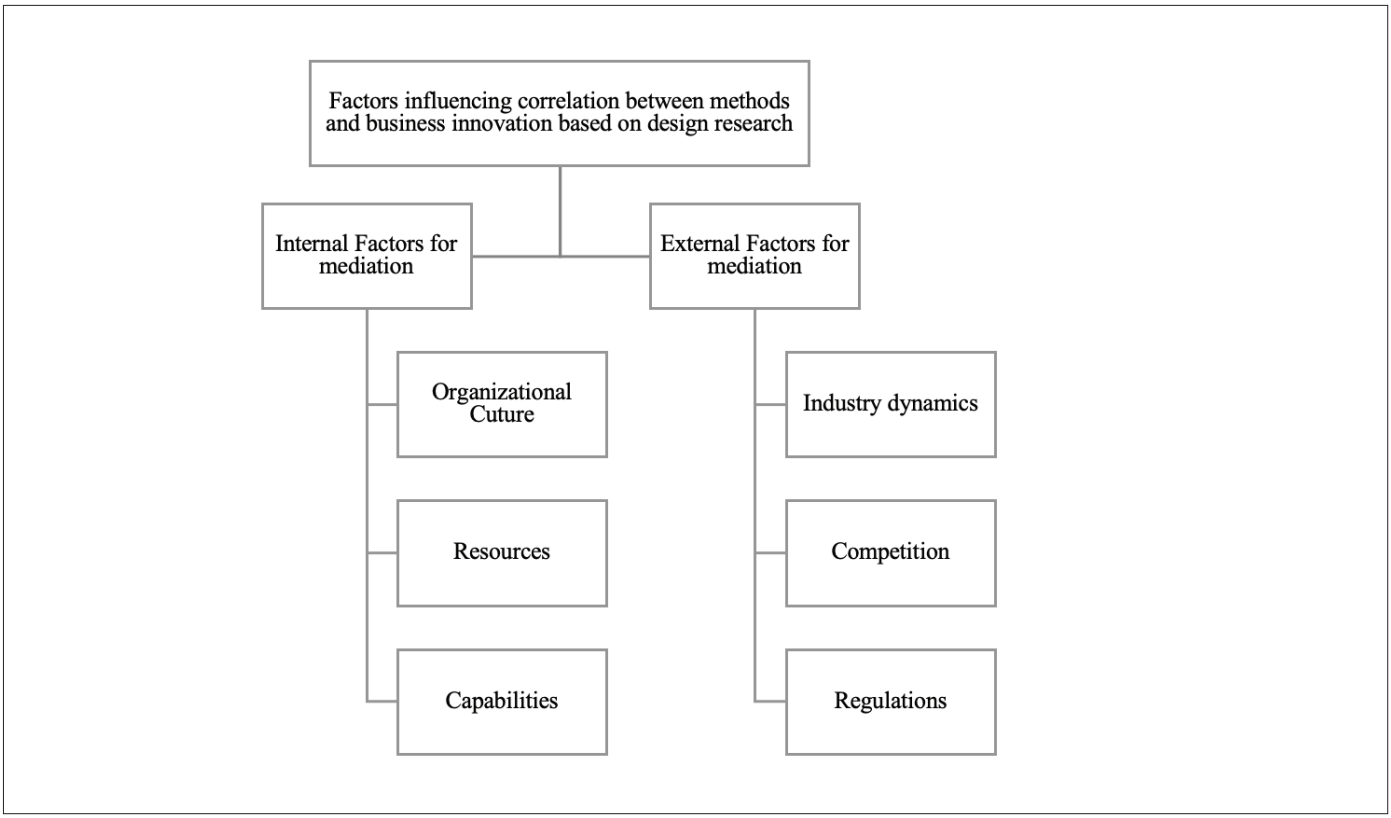


Figure 3: Factors influencing correlation between methods and business innovation based on design research.



Methodology

Our main objective is to identify and synthesize existing research on the utilization of design methods, examine the impact of these methods on business innovation, identify the key challenges and benefits associated with the use of these methods in innovation of business or firms, and propose future recommendations for businesses looking to adopt design methods in their innovation processes.

Research strategy

Given the challenge of collecting, reviewing, systematizing, and subsequently analyzing information, we have adopted the approach proposed by Tranfield (Tranfield et al., 2003), which recommends ensuring three phases in the review process: planning, review, and reporting. The review placed emphasis on the research objective, focusing on the relevance of articles concerning the influence of design methods on business innovation, using a set of keywords selected across multiple online databases to broaden the scope of the review (Hossain et al., 2019), such as Google Scholar, Semantic Scholar, and Science Direct. The basic terms in searching process will be "design methods," "design thinking," "user-centered design," "innovation process," "business innovation," "product development," "customer satisfaction," and "organizational culture". The search will be limited to articles published in english between 2010 and 2023, and it will involve four stages: applying research strings (first), followed by exclusion criteria (second), reading abstracts and titles (third) to exclude off-topic work, and finally a thorough review of the complete text (fourth), extracting valuable information for subsequent analysis, and disseminating the findings.

Criteria for consider an article.

The main inclusion/exclusion criteria were as follows:

- Different perspectives on the influence of design methods on business innovation
- We considered peer-reviewed articles and book chapters that examine this aspect, published in journals or edited volumes.
- Papers disclosing empirical research using case studies, surveys, etc., were also included.
- Articles focusing solely on design aesthetics or branding were not considered.
- All the identified "duplicated" papers from different sources were removed.

Data synthesis

Our findings will be synthesized to draw conclusions regarding the influence of design methods on business innovation, supported by evidence from the selected articles. The synthesis will also identify areas for further research and potential implications for businesses looking to adopt design methods in their innovation processes.

Quality assessment

We will use established criteria such as the Cochrane Risk of Bias tool for randomized controlled trials or the JBI Critical Appraisal Checklist for qualitative research (Barker et al., 2023) to ensure that the selected articles findings are reliable and valid. The quality assessment will involve a thorough review of the selected articles, examining the research methods, sample sizes, and potential sources of bias.

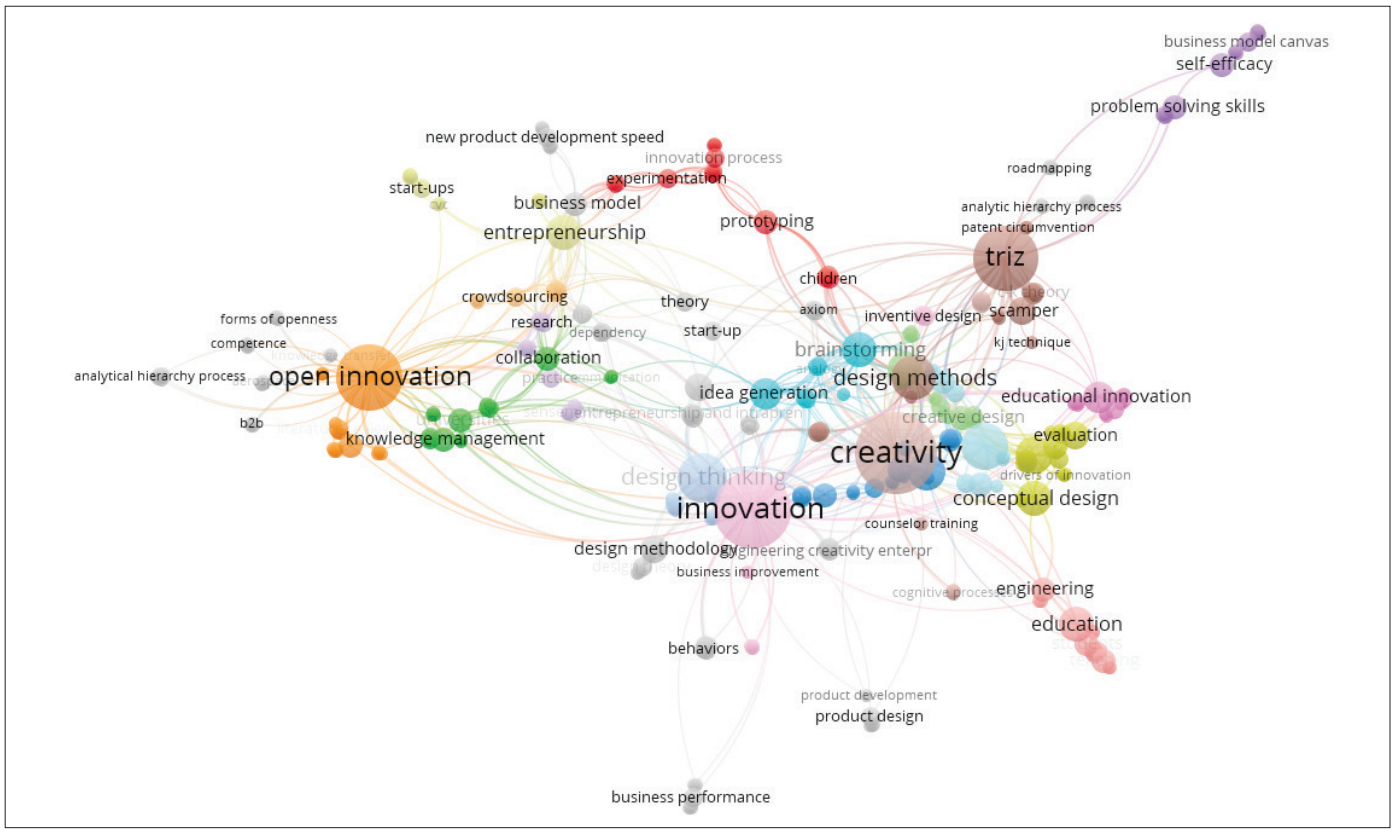
Limitations of research methodology

This study's limitations encompass the risk of publication bias and potential gaps in literature coverage, stemming from the restricted scope of search terms and inclusion criteria. To mitigate potential publication bias, we will perform a thorough search of academic literature, focusing exclusively on peer-reviewed research articles and specific book sections. The study report will transparently address and discuss the constraints imposed by the search terms and inclusion criteria.

Results

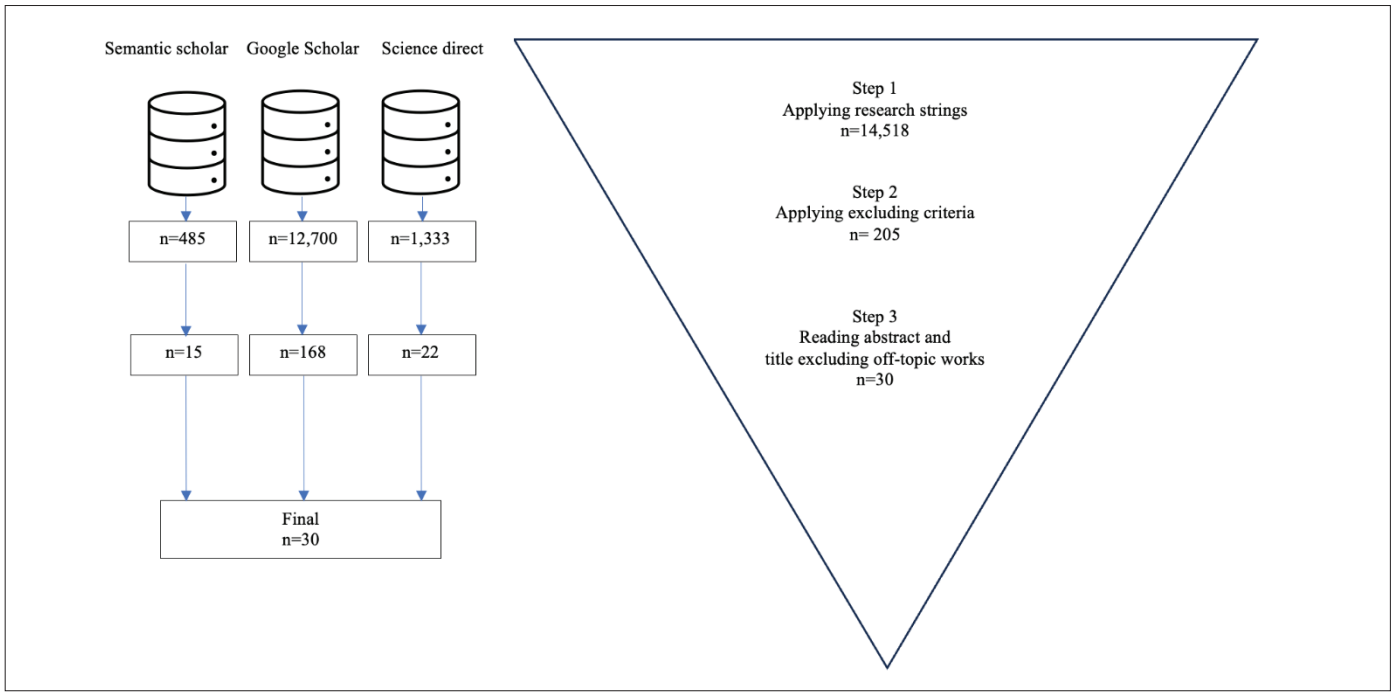
The literature review presents a diversity of concepts associated with design methods in the innovation of business models, being the most relevant concepts creativity, innovation, design methods, open innovation, and *TRIZ* (see figure 4).

Figure 4: Co-occurrence of keywords



During the initial information gathering -step one- a significant number of articles were observed. For Google Scholar (n=12,700), Semantic Scholar (n=485), and Science Direct (n=1,333). In step two (applying exclusion criteria), the number of articles was reduced to n=205. Finally, n=30 articles were selected for their relevance (see Figure 5).

Figure 5: Steps of the research process and number of selected papers

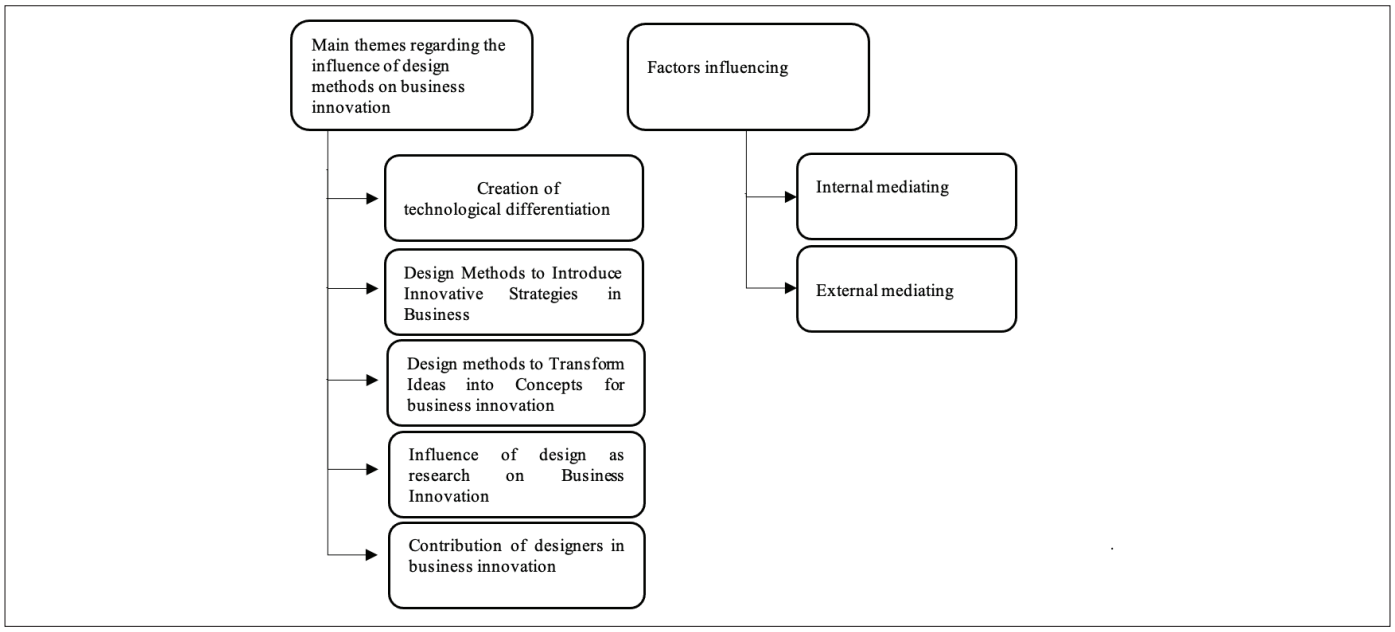


The selected articles (twenty-four articles) enable structuring an analysis regarding the primary influences of design methods (5 themes/elements) in business innovation, which include (1) the creation of technological differentiation, (2) how design methods help in the introduction of business innovation strategies, (3) how designers can translate ideas into concepts for business innovation, (4) how the concept of design as research leads to innovative business, and (5) the contribution of designers in introducing new design methods while implementing innovative business (see Figure 6).

Additionally, it allows us to delve into the factors influencing the relationship between design and business innovation (six articles). These factors can be categorized into two segments: internal mediating factors and external mediating factors (see Figure 6).

Details regarding themes, factors, and their impact on the relationship between design methods and innovative business management are provided in the following section.

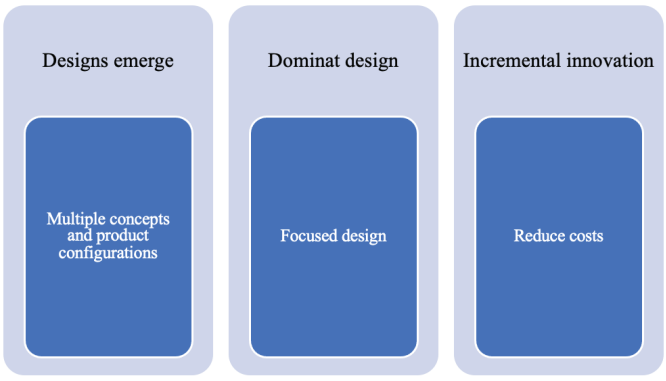
Figure 6: Key research elements



Main themes regarding the influence of design methods on business innovation

(1) Design Method to create technological differentiation.
Several scholars have put forth the notion that the nature of innovation changes depending on the lifecycle of a product or industry (Benitez et al., 2020). In general, the initial phase of a product or industry lifecycle is marked by a flexible environment where multiple product configurations or design concepts can emerge. In this phase, firms may either compete to establish a dominant design or remain adaptable to replicate a competitor's approach. Once a dominant design emerges, the lifecycle moves into a more focused stage where companies typically prioritize incremental product innovations and invest heavily in process innovation to reduce costs. Although these stages mainly relate to product development, they also apply to service and industry development. Design methods can contribute to innovations in both stages (see figure 7).

Figure 7: Nature of innovation changes



(Bürdek & Basel, 2016) argues that design methods can be used to create technological differentiations in product design. By using a user-centered design approach, designers can create products that meet the needs of specific user groups, which can give their products a competitive advantage in the market.

Businesses have found that design methods such as empathy, ideation, and prototyping are instrumental in making their products different from their competitors. In (Wright et al., 2010) study, students at a College of Technology and Engineering participated in an intensive design thinking workshop called "The Innovation Boot Camp" to increase student innovation. Utilizing *Design thinking* as its primary instructional technique and curriculum, this workshop was developed through research and collaboration. First, the authors define innovation as centered around the user, involves prototyping, and is rooted in finding inspiration through looking, doing, and asking.

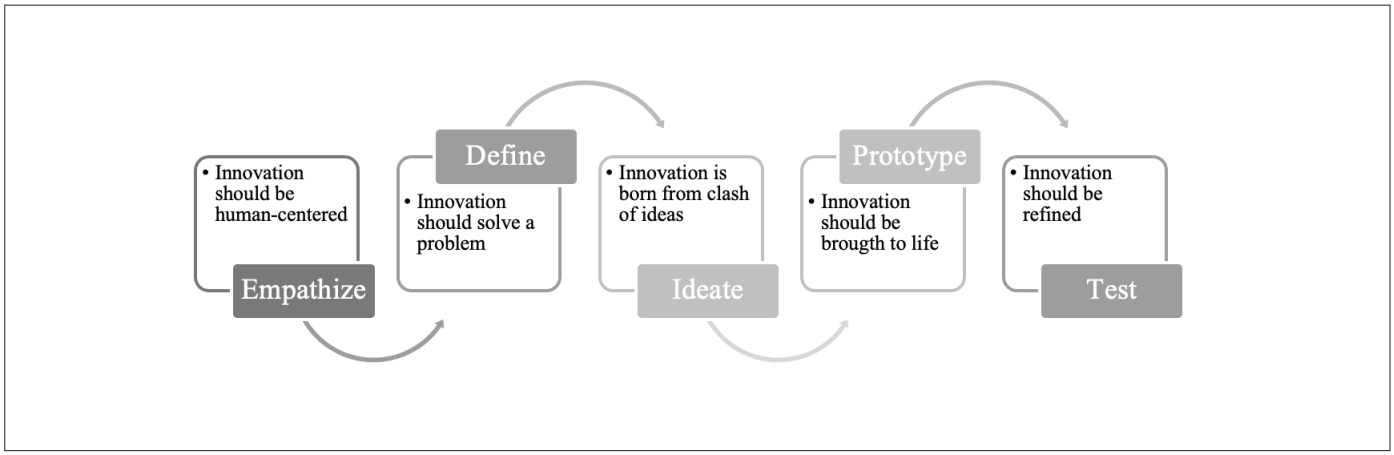
The Innovation Boot Camp effectively imparted innovation principles to students, through real-world problems to solve. This program facilitated hands-on, collaborative learning by presenting students with real-world challenges, bringing together participants from various technology programs, fostering a dynamic and interdisciplinary environment. It spanned two days and united students, faculty, and staff from seven different schools and departments, all dedicated to cultivating innovative thinking through design thinking as instructional method.

Related research found that students who engaged in collaborative cross-discipline innovation training were more inclined to be innovative, had a higher aptitude for innovation, and had better creative skills (Wright et al., 2010). This makes necessary to explicitly teach and provide innovation training to the student, in order to overcome these challenges. It also provides insight into the needs and benefits of such a venture for unique technology and engineering schools and programs, thereby contributing to the theoretical underpinnings of innovation and creativity pedagogy.

We found that creating technological differentiation and incubating innovation can be accomplished by using design methods such as empathy, ideation, and prototyping. Integrating these design methods into their product development processes, companies can develop innovative and differentiated products.

According to (Aliandrina et al., 2018), humans need to adapt their skills, particularly creativity, to avoid being replaced by machines during the 4th Industrial Revolution. They argue that creativity encourages collaboration with machines rather than creating a threat. Empathy, ideation, and prototyping serve as methods for stimulating creativity in design ethnography and design thinking. During semi-structured interviews with 32 young people, they found that they had various requirements for a tabletop game designed to stimulate creativity, including being "fast-paced," "interesting in content and visuals," "ergonomics packaging and components," "improved quality of material," "fun," "educative," and "interactive." To meet these needs, they generated, enhanced, and examined tabletop game ideas through ideation, prototyping, and testing stages. Empathic understanding of the problem and a desire for continuous development are the key factors that enable the problem to be solved and a successful solution produced. Again, empathy, ideation, and prototyping are key to creating technological differentiation in the business sector. Creativity flourishes through these methods, and understanding and defining problems accurately produces new and differentiated products (see figure 8).

Figure 8: Design thinking framework for business innovation. Adapted from (Clune & Lockrey, 2014)



In conclusion, literature suggest that design methods can have a significant impact on technological differentiations in product design. By using a user-centered design approach, focusing on user needs, and incorporating unique design features, companies can create products that stand out in a crowded market and gain a competitive advantage.

(2) Design Methods to Introduce Innovative Strategies in Business

A User-Centered Design (UCD) approach has long been recognized as an effective way to create products that meet user needs and drive business success. Using UCD, designers design products with the end user's needs, wants, and limitations in mind to ensure products fit the needs, wants, and limitations of the end-users (Norman, 2013). For example, *Design thinking* has been used to introduce and facilitate the adoption of innovations in the business market. According to (Brown, 2008), it helps businesses create innovations that are more user-centric, which increases the likelihood of adoption.

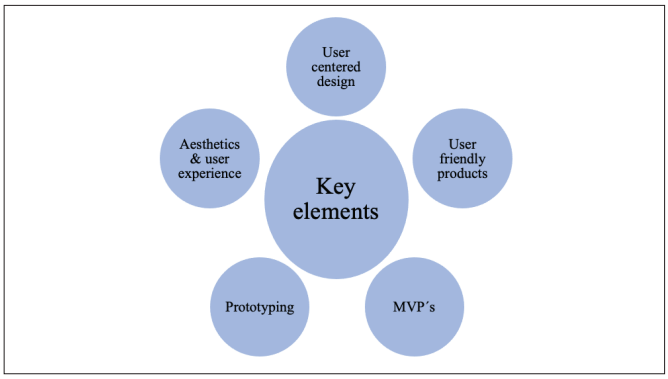
According to (Kujala et al., 2011), a UCD approach can result in innovative products that differentiate from their competitors. When companies focus on their clients' needs and wants, they can create products that meet these needs and provide unique features or functionality that set them apart from their competitors. Ultimately, this can lead to business success and a significant competitive advantage.

Participatory design, which involves users in the design process, ensures the creation of user-friendly products that are more likely to be adopted (Sanders & Stappers, 2008). This participatory approach, emphasize user input, enhances functionality, aligns with target audience preferences, and boosts user satisfaction, ultimately driving product adoption through a more personalized experience.

The *Lean Startup* approach is another design method that has been used to introduce and facilitate the adoption of innovations. The *Lean Startup* involves creating a minimum viable product (MVP) and testing it with users to gather feedback. The feedback is then used to improve the product, which increases its adoption rates (Ries, 2011). The Lean Startup approach is especially useful for introducing new products in highly competitive markets, where adoption rates are critical to success.

The *Design Sprint* approach is a time-constrained, collaborative, and highly focused problem-solving method that has been used to facilitate the introduction and adoption of innovations. It involves a team working together to create a prototype of a solution and test it with users in a short period. The *Design Sprint* approach helps businesses quickly identify potential user needs and address them to improve adoption rates (Knapp, 2016), being especially useful for introducing new products that are highly innovative and require rapid adoption (see figure 9).

Figure 9: Primary drivers shaping design methods in innovative business strategies.



Literature also supports that the use of design methods and distinctive aesthetics in products can not only differentiate a business, but also contribute to the adoption of embedded technological innovations. This approach, often referred to as *Design-led innovation*, emphasizes the importance of aesthetics and user experience in the development of new products and services. One study by (Kim & Mauborgne, 2015) found that the adoption of *Design-led innovation* can lead to greater customer satisfaction and increased market share. The authors argue that design-led innovation allows firms to create products that better meet the needs and preferences of their customers, leading to greater customer loyalty and repeat business. suggests that *Design-led innovation* can also contribute to the adoption of new technologies. The authors (Shi et al., 2021) argue that when products are designed with a strong aesthetic appeal, customers are more likely to adopt and use new technologies that are embedded within those products, mostly because aesthetics can help to make the technology less intimidating.

Furthermore, research by (Luchs & Swan, 2011) suggests that the use of design-led innovation can also have positive effects on a firm's bottom line. The authors argue that by investing in design, firms can create products that are not only more attractive to customers but also more profitable due to higher price points and lower costs associated with product development.

Overall, the literature suggests that the use of *design-led innovation* can have a positive impact on a firm's competitiveness and profitability. By focusing on aesthetics and user experience, firms can differentiate themselves from competitors and increase customer satisfaction while also driving the adoption of new technologies and improving their bottom line.

(3) Design methods to Transform Ideas into Concepts for business innovation

Design methods focus on understanding user needs, identifying opportunities for innovation, and creating solutions that are both desirable and feasible. (Chasanidou et al., 2015) investigated the role of *design thinking* in fostering business innovation. The authors argue that *design thinking*, can help firms to generate new ideas and develop more innovative solutions, stimulate creativity, and generate new business opportunities.

Another study by (Brown, 2008) emphasizes the importance of prototyping in the design process. The author argues that it allows designers to quickly test and iterate their ideas, refine them, and create more user-friendly and feasible products, leading to more effective solutions.

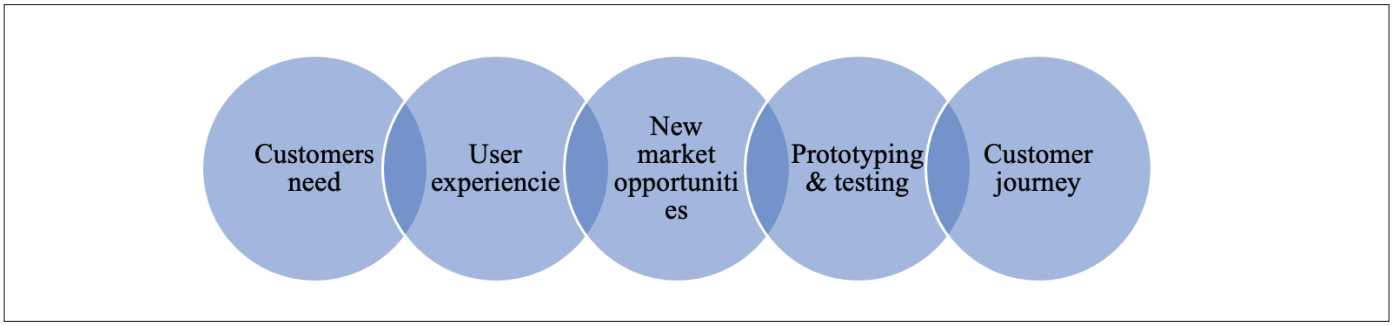
Research by (Spieth et al., 2014) suggests that design methods can be particularly effective in developing new business models. The authors argue that design methods can help firms to identify new market opportunities and develop more effective strategies for growth. The study found that design methods can help firms to develop more innovative business models that are better aligned with customer needs and preferences.

More recent models of the design process have built on Simon's framework, incorporating new insights from cognitive science, human-centered design, and other fields. For example, the "*Double Diamond*" model developed by the (Kochanowska & Gagliardi, 2022) emphasizes the importance of divergent and convergent thinking in the design process. The model suggests that designers should begin by exploring a broad range of ideas and possibilities (divergent thinking) and then gradually narrow down to the most promising solutions (convergent thinking).

Another influential perspective on design as a process of transformation comes from the field of service design. *Service design* is concerned with creating and improving the delivery of services, such as healthcare, transportation, or banking. Service designers often describe their work as transforming "user experiences" or "customer journeys." This involves understanding the needs and expectations of users, identifying pain points and opportunities for improvement, and then designing solutions that address these issues. Service design is often collaborative, involving stakeholders from across the organization, and may involve prototyping and testing new service concepts. While there is no one "right" way to describe the design process, most models emphasize the importance of creativity, iteration, and collaboration. Designers must be able to generate and evaluate multiple ideas, often in a short amount of time, and then communicate these ideas effectively to stakeholders. They must also be able to balance the competing demands of aesthetics, functionality, and sustainability, among other factors.

Overall, the literature suggests that the use of design methods in transforming ideas into concepts for business innovation can have a positive impact on a firm's competitiveness and profitability. By focusing on understanding user needs, generating new ideas, and prototyping and testing solutions, firms can create more innovative and effective products and services. Design methods can also help firms to develop new business models that are better aligned with market opportunities and customer preferences (see figure 10).

Figure 10: Key elements of design methods in transforming ideas into business innovation concepts.



(4) Influence of design as research on Business Innovation

Several studies have highlighted the importance of design research in driving innovation. For example, Kim and Mauborgne found that companies that used design thinking as a problem-solving tool were more likely to achieve breakthrough innovations (Kim & Mauborgne, 2015). It also plays a crucial role in facilitating innovation by offering insights into the needs, preferences, and behaviors of users. Design research can also serve as a risk assessment and management tool by identifying potential problems or limitations in a proposed innovation. This approach is made possible by direct user observation and involvement, which provides a more nuanced understanding of user needs and preferences.

(Abildgaard & Christensen, 2017) emphasizes the importance of a collaborative and user-centered design process in facilitating innovation. Also, argues that design research should involve both internal and external actors in knowledge creation, enabling firms to leverage their innovations strategically. By engaging with users and stakeholders throughout the design process, firms can gain valuable insights into how their innovations might be received and identify potential risks or challenges that need to be addressed.

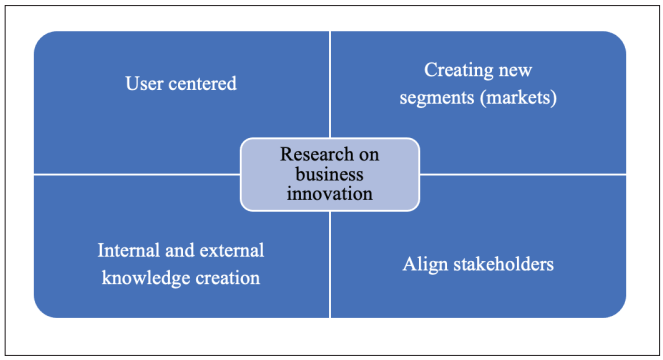
A study by (Brown & Katz, 2011) found that companies that prioritized design research were more likely to achieve breakthrough innovations that had a significant impact on their industries. Similarly, a study by (Liedtka & Ogilvie, 2011) found that user-centered design and iterative prototyping, was an effective tool for promoting innovation.

Other researchers have highlighted the role of design research in mitigating risks and uncertainties associated with innovation. Design research could help firms identify potential usability issues and design flaws early in the development process, reducing the risk of costly redesigns or product recalls. The study done by (Liu & de Bont, 2017), found that design research could help firms identify potential barriers to adoption and develop strategies for addressing them.

(Verganti, 2009) emphasizes the importance of design research in identifying emerging behaviors and patterns, which can serve as a source of inspiration for innovation. By studying how users interact with products and services, design researchers can gain insights into their underlying needs and preferences, which can inform the development of new products and services. Similarly, (Hernández et al., 2018) argues that design can contribute to innovation by creating new segments of the market where existing technologies can be exploited. This approach is based on the idea that design can help identify emerging behaviors or patterns, which can be leveraged to develop new products and services that meet unmet needs or preferences.

The complex and multifaceted nature of innovation can also be addressed through Design research; it can help innovators to eliminate inappropriate alternatives and integrate the multiple components of complex systems. By providing a common language and methodology for innovation, design research can help align stakeholders and ensure that innovations meet the needs of users and the broader market. In conclusion, design-driven innovation is a promising approach to creating new markets and driving growth through design, providing insights into user needs and preferences, identifying potential risks and limitations, and promoting a collaborative and user-centered design process. By leveraging design research to identify emerging behaviors and patterns, innovators can develop new products and services that meet hidden needs and preferences, reducing the likelihood of costly failures (see figure 11).

Figure 11: Key elements of design research on business innovation



(5) Contribution of designers to business innovation

Many articles regarded design as a field of study. However, some authors emphasized designers as a group of experts and their significant role in fostering innovation through their design activities. These authors also shed light on the specific skills that designers employ in their practice.

Designers play a critical role in the innovation process by generating and managing knowledge. They act as gatekeepers, controlling the flow of information and knowledge between different stakeholders ensuring that all parties are well-informed (Auernhammer & Roth, 2021; Gasparin, 2018). Designers have a deep understanding of the technical and aesthetic aspects of the innovation process, and as a result, they are uniquely positioned to provide valuable insights that can drive innovation forward (Holtzblatt & Beyer, 2014).

In addition to generating and sharing knowledge, designers also play a crucial role in validating and verifying information during the innovation process. They are responsible for ensuring that information is accurate, complete, and relevant (Liedtka, 2018). Tools and techniques, such as prototypes and visual aids, facilitate the exchange of information and help stakeholders to understand better the innovation process (Holtzblatt & Beyer, 2014). This role reduce risk error, misunderstandings, and miscommunications during the innovation process.

One of designers keyways to act as information brokers are by translating technical information into more accessible formats. They use their design skills to create visual aids and other communication tools that can help non-technical stakeholders better understand the innovation process (Liedtka, 2018). By doing so, designers can help to bridge the gap between technical and non-technical stakeholders and ensure that everyone has a common understanding of the innovation process.

Designers also act as intermediaries between different stakeholders, helping to facilitate communication and collaboration between different teams and departments (Auernhammer & Roth, 2021). By acting as information brokers, designers can help to ensure that the innovation process is well-coordinated and that all stakeholders are working towards a common goal.

Designers have a unique skill set that includes their ability to work closely with users and understand their needs. This skill is closely related to the design research process and is crucial for creating successful designs.

Designers are trained to work collaboratively with users and interpret their requirements in an iterative process to find an optimal solution. This process involves cycles of prototyping and testing to ensure that the final product meets user needs. This ability to co-create with users is what differentiates designers from other professionals and allows for innovations to be more user-friendly and easier to adopt.

Innovations that are more user-friendly and easier to use are more likely to be adopted when designers assist in making them easier to use. In order to drive relationships, citizen participation, cooperation between companies and institutions, and organizational transformation, designers must collaborate with their users to translate their needs into products and services.

Design is often viewed as a critical link between creativity and innovation, as it is through design that creative ideas are translated into practical solutions that address users' needs and desires. This link between design, creativity, and innovation has been explored in various studies.

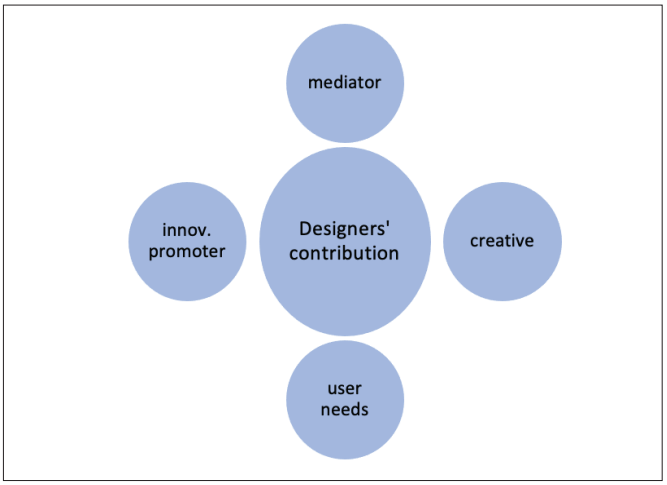
For instance, in a study by (Amabile & Pratt, 2016), it was found that design plays a crucial role in promoting innovation in organizations. The authors argued that design facilitates innovation by providing a structured approach to problem-solving and encouraging collaboration among team members.

Similarly, in a study by (Kim & Mauborgne, 2015), it was observed that design-led innovation is associated with higher levels of creativity and better business performance. The authors found that companies that emphasized design in their innovation processes were more likely to create breakthrough products and services that met customers' evolving needs and expectations.

Furthermore, in a review on the correlation between creativity, design research, and business innovation, (Zahedi, 2008) suggested that design is a critical mediator of innovation, arguing that designers are uniquely positioned to cope up with the challenges between creative ideas and their practical implementation and that their skills and expertise are essential for the successful execution of innovative projects.

In conclusion, while the relationship between creativity, design, and innovation is a complex and multifaceted topic, the literature suggests that design plays a critical role in translating creative ideas into innovative solutions. Through their skills, expertise, and collaborative approach to problem-solving, designers can make significant contributions to the success of innovative projects (see figure 12).

Figure 12: Key elements of the designer's contribution to business innovation



Overview of primary concepts and authors concerning the five key themes influencing business innovation (see table 3).

Table 3: Summary of the five key themes that influence business innovation.

N°	Authors	Key concepts
1	(Bürdek & Busel, 2016)	• End user focus • Concept sketches, CAD, testing and iterative design process • Integration of technology advantage (3D printer, virtual reality • Global collaboration
1	(Wright et al., 2010)	• User-centered • Interdisciplinary collaboration • Hands on learning through prototyping
1	(Aliandrina et al., 2018)	• Prototyping and iteration • Games and design ethnography (understanding the user) • Integrating technology
1	(Benitez et al., 2020)	• Integrating technology
2	Norman 2013	• User-centered design • Visibility and feedback in design • Cognitive psychology in design
2	(Shi et al., 2021	• Aesthetics on perceived product • Emotional response and product value • Brand perception • Aesthetics fit with funcionality
2	(Kujala et al., 2011	• Convergence of user-centered • Agile methods
2	(Knapp, 2016)	• Design sprint • Fostering creativity and innovation • Design thinking principles
2	(Ries, 2011)	• MVP´s
2	(Luchs & Swan, 2011)	• Visual communication and brand identity • User experience design • Emotional design and consumer behavior • Packaging design and consumer perception • Design thinking in marketing strategy
2	(Kim & Mauborgne, 2015)	• Design led innovation
3	(Chasanidou et al., 2015)	• Design thinking

3	(Spieth et al., 2014)	• Prototyping • New market opportunities • Customer needs preferences
4	(Kim & Mauborgne, 2015)	• Mental models for business competitive strategies • Competitive benchmarking • Blue ocean opportunities
4	(Abildgard & Christensen, 2017)	• Integration of user centered design thinking • Collaboration • User research strategies • Cultural values and preferences of specific user groups
4	(Brown & Katz, 2011)	• Design thinking • Human-centered innovation • Prototyping and iteration • Cultivating a design-led culture • Reflection on leadership
4	(Liedtka & Ogilvie, 2011)	• Design thinking • Journey mapping • Brainstorming • Prototyping • Visual collaboration • Integration with business strategy • Building a design-centric culture
4	(Liu & de Bont, 2017)	• Design research help strategies
4	(Hernandez et al., 2018)	• Human-centered design • Design thinking • Interdisciplinary collaboration
5	(Gasparin, 2018)	• Designers as a catalysts for innovation • User-centric design thinking • Cross-disciplinary collaboration • Integration of technology
5	(Holtzablatt & Beyer, 2014)	• Holistic understanding of users • Work models • User narratives • Contextual inquiry • Affinity diagramming
5	(Liedtka, 2018)	• Human-centered focus • Iterative and collaborative process • Mindset shift • User-centric innovation • Scalability and applicability
5	(Amabile & Pratt, 2016)	• Dynamic interaction and reciprocal causation • Progress and meaning-making • Implications for organizational practices
5	(Kim & Mauborgne, 2015)	• Design led innovation

(The six) factors influencing correlation between methods and business innovation based on design research

Numerous researches have shown that design methods can contribute to innovation by facilitating the identification of unmet needs, the exploration of alternative solutions, and the refinement of ideas (Martin, 2009; Plattner et al., 2009). This effect is usually related to six *mediating factors* that affect the strength of the design-business relationship. These factors can be grouped in internal and external.

Internal mediating factors

Internal mediating factors refer to the elements within an organization that influence the relation between design methods and business innovation. Most of the key internal factors discussed in the literature can be represented by organizational culture, resources, and capabilities.

Organizational culture

The organizational culture plays an important role in shaping the success of design methods in driving innovation (Schein, 2010). A supportive culture that encourages risk-taking, collaboration, and experimentation is more likely to ease the adoption of design methods and their impact on innovation (Dul & Ceylan, 2014). In contrast, a risk-averse and hierarchical culture may hinder the effective use of design methods and limit their potential to foster innovation (Eisenhardt & Martin, 2000).

Resources

Resources, such as time, budget, and human capital, are essential for the successful implementation of design methods and the achievement of innovation (Cooper, 2008). Adequate funding, skilled

employees, and sufficient time are necessary for organizations to effectively adopt design methods and translate them into innovative outcomes (Amabile & Pratt, 2016). Resource constraints, on the other hand, can limit the ability of organizations to leverage design methods for innovation.

Capabilities

Organizational capabilities include the ability to manage diverse teams, absorb new knowledge, and adapt to change, which is critical in mediating the relationship between design methods and innovation. Firms that possess strong dynamic capabilities are better equipped to adopt and benefit from design methods, as they can effectively integrate new approaches and adapt to evolving market conditions (Eisenhardt & Martin, 2000).

External mediating factors

External mediating factors are elements outside the organization that influence the relationship between design methods and business innovation. The most common external factors discussed in the literature include industry dynamics, competition, and regulations (see figure 13).

Industry dynamics

The dynamics of an industry, such as its growth rate, technological change, and competitive intensity, can influence the relationship between design methods and innovation. In rapidly changing industries, the adoption of design methods may be crucial for fostering innovation and maintaining a competitive advantage (Tidd et al., 2005). Conversely, in stable industries with low levels of competition, the adoption of design methods may have a limited impact on innovation.

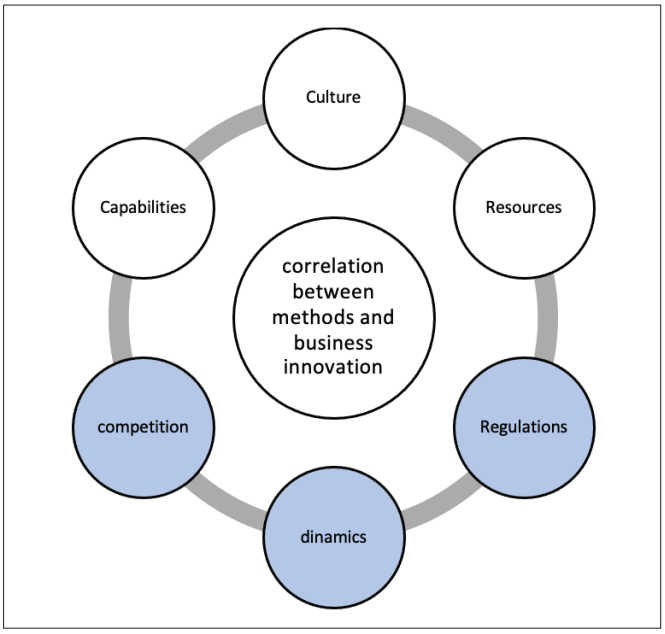
Competition

Competition can serve as a catalyst for the adoption of design methods and innovation. Firms facing intense competition are more likely to adopt design methods to differentiate themselves and stay ahead of their rivals (Christensen, 2013). However, excessive competition can also lead to imitation and incremental innovation, reducing the potential for breakthrough innovations that can be achieved through design methods.

Regulations

Regulations can both, enable or hinder the relationship between design methods and innovation (Blind, 2012). On the one hand, regulations can promote innovation by setting standards and encouraging firms to adopt design methods to comply with these standards. On the other hand, excessive regulation can stifle innovation by creating barriers to entry and limiting the scope for experimentation and risk-taking (Acs & Audretsch, 1990).

Figure 13: Correlation between methods and business innovation



Discussion

The past thirty years have seen a flurry of research exploring the link between design activity and business innovation. Within it, our aim is to delve into this domain and identify key issues and trends. However, the task proved to be a challenging one, starting by a lack of clarity and precision when defining the terms *design* and *innovation*.

While many articles offered valuable insights into the value of design in driving innovation, they often did so superficially, without in-depth analysis or empirical evidence. As a result, the literature tends to rely heavily on anecdotal evidence, case studies, and expert opinions, making it difficult to establish clear and reliable findings. Even highly regarded organizations like the Design Council, which advocates for the benefits of design in innovation, offer little in the way of detailed evaluation or analysis.

Despite these challenges, the review successfully revealed an emerging narrative; while much of it relies on qualitative data and case studies, it offers a valuable framework for comprehending the relationship between design and innovation. By clustering the most common characteristics of this relationship, the review shows when design is most used and in which roles during the innovation process. While these clusters do not constitute a formal taxonomy, they offer valuable insights into the complex interplay between design and innovation.
There is a lack of consistency in how companies understand and apply the concept of design, which can make it challenging to differentiate one type of design from another and clarify the characteristics of different applications. To address this challenge, researchers have called for a more systematic approach to defining and measuring the role of

design in the innovation process, developing dedicated measurement tools that can accurately capture the contributions of design to innovation, both in terms of economic value and social and environmental impact. A popular approach is through *design thinking*; by adopting it, companies have generated novel solutions that meet the needs of their target customers. Another approach is via *technological differentiation*. By incorporating the latest technologies and materials into their products and services, companies create offerings that stand out, providing a competitive advantage.

To fully leverage the potential of design in driving innovation, it is essential to recognize the unique language of design. Design language, which includes visual tools, development techniques, and research methods, has effectively become the language of innovation. By using design language as a common ground for communication, companies can foster collaboration and creativity in the innovation process.

About the limitations, many studies rely on qualitative data, leaving a gap in quantitative evidence that could provide a more robust understanding of the contributions of design to innovation. Additionally, the search terms used in many studies may not capture all relevant literature, highlighting the need for a more comprehensive approach to exploring the design/innovation connection. A more systematic and nuanced approach to understanding the role of design in the innovation process can help companies differentiate themselves in the marketplace, generate more novel and effective solutions, and create products and services that better meet the needs and preferences of their target customers. By recognizing the unique language of design and developing dedicated measurement tools, companies can fully leverage the potential of design to drive business innovation.

Conclusion

The purpose of our study is to explore the idea that design method research is crucial for the development of innovative business. This paper discusses the multifaceted application of design methods, their strategic value, and the challenges associated with integrating them within the development of new business models. We conduct a thorough review of the literature to provide a well-rounded understanding of how design methods contribute to business innovation. We examine how researchers define design methods, explain them, and why they believe this is valuable for business innovation. Five key research themes were identified as relating to the application of design methods to business innovation: (1) the creation of technological differentiation, (2) how design methods help in the introduction of business innovation strategies, (3) how designers can translate ideas into concepts for business innovation, (4) how the concept of design as research leads to innovative business, and (5) the contribution of designers in introducing new design methods while implementing innovative business.

Finally, our study provides valuable insight for researchers and practitioners interested in applying design methodologies to business innovation, regardless of their background in design, organizational research, or business innovation management.

Future development

Most relevant factors. During our research, five key themes were identified. Future research should consider their relation with the six most relevant factors (both, internal and external) that affect the relationship between design methods and innovation, namely organizational culture, resources, capabilities, industry dynamics, competitions, and regulations; they cannot be avoided when developing a business model, since they determine the effectiveness of design methodologies for promoting innovation. It is necessary to understand how these six factors interact and how organizations can handle them effectively to maximize the effectiveness of design methods for innovation. Additionally, the application of design methods to the evolution of products, services, and business models must consider the social, situational, contextual, and contingent nature of the design process.

Adequate framework. Currently, there is a lack of consistency in how the role of design methods is measured when innovative strategies are involved. Develop a standardized framework for measuring the influence of design methods in innovative business strategies could help improve research accuracy and reliability in this area. Our research opens a vast range of future recommendations which could be based on the following criteria.

Investigate the effectiveness of different design methods in different contexts: While design methods have been shown to be effective in driving business innovation, the relation between context and methos is unclear. Further research could help to identify the most effective design methods for different types of businesses, industries, and innovation challenges.

Explore the relationship between design methods and other factors that influence business innovation. While design methods can be a powerful tool for driving business innovation, many other factors can influence the success of innovation efforts. Future research could explore the relationship between design methods and other factors, to provide a more holistic understanding of the innovation process.

Investigate role of design methods in promoting sustainability and social responsibility: Design methods have the potential to drive innovation based on economic value and sustainability and social responsibility. Future research could explore the role of design methods in enhancing sustainability and social responsibility and the potential for design-led innovation to address global challenges such as climate change and social inequality.

Evaluate the effectiveness of government policies and initiatives to promote the selection of design research in business innovation. There interest from governments worldwide in promoting the adoption of design methods as part of their initiatives to stimulate business innovation is increasing. Through providing funding, training, education, encouraging collaboration, advocating for design-led innovation, and introducing policies and regulations that support their adoption, governments can assist businesses in harnessing the power

of design to drive innovation and remain competitive in today's rapidly changing marketplace. It is possible to evaluate the effectiveness of these policies and initiatives in the future and identify what can be done at the national and regional levels to promote the adoption of design methods.

The goal of future research on design methods and business innovation should be to develop a standardized methodology for measuring the impact of design methods. A study of design methods should also examine their effectiveness in a variety of contexts, examine the relationship between design methods and other factors that influence innovation, and evaluate how design methods contribute to sustainability and social responsibility, as well as the effectiveness of government policies and initiatives to promote their adoption.

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