APPLICATION OF DESIGN THINKING FOR INNOVATION IN BANKING

by

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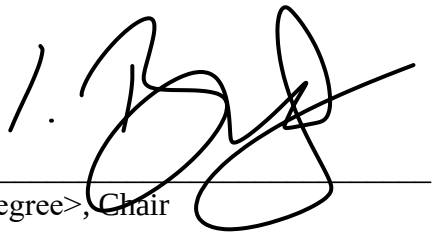

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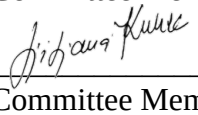

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Dedication

With profound gratitude, this thesis is devoted to my beloved family—my husband and daughter, the bedrock of my strength and love throughout this academic voyage. To my mother, who has been a beacon of guidance and unwavering source of support, infusing me with courage and confidence. To my brother and his wife, your unshakeable belief in my potential and kindness have been sources of immense comfort and inspiration. To my niece, a symbol of joy and inquisitiveness, reminding me of wonders that lie in simple discoveries. And to those unsung heroes in my life, whose quiet sacrifices have paved the way for my achievements. This accomplishment is not merely a product of my efforts but a manifestation of the collective faith, support, and love you have all bestowed upon me. Your unwavering belief in my dreams fuelled my determination and success. Special acknowledgement is given to Dr. Anuja Shukla, a woman who has always stood by me, and has been a guiding light on my academic path. Her wisdom and support have been instrumental in shaping my journey.With all my heart, I dedicate this achievement to each one of you, as a tribute to your invaluable presence in my life.

Acknowledgements

With sincere gratitude, I acknowledge the guidance and support of my thesis supervisor Jonathan Westover. His wisdom and patience have been invaluable for my research and personal growth. I am deeply thankful for his contributions to my academic journey

ABSTRACT

APPLICATION OF DESIGN THINKING FOR INNOVATION IN BANKING: A SYSTEMATIC LITERATURE REVIEW

POORNIMA MANOHAR JIRLI
2024

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This thesis presents a comprehensive analysis of the adoption and influence of design thinking in the banking sector, emphasising its role in driving innovation and strategic decision-making. This study employed a dual methodology approach. To map the existing landscape, it utilises bibliometric analysis per PRISMA, identifying key literature trends and gaps. This phase aimed to provide a macro-level understanding of the evolution and status of design thinking in the banking sector. An empirical examination uses a Partial Least Squares Structural Equation Model (PLS-SEM) grounded in Behavioral Reasoning Theory (BRT). Using this approach, operational insights are gained from exploring how bank professionals perceive the benefits and barriers of design thinking. This is done by examining how they comprehend and incorporate them into their organizational strategies. The empirical analysis provides compelling evidence that the benefits of design thinking significantly correlated with a deeper understanding of its methodologies among banking professionals. The study also revealed the essential impact of perceived barriers on

resistance to design thinking. This may have affected the missed opportunities and strategic planning.

The research concludes that design thinking can significantly propel strategic innovation in banking when adequately understood and aligned with organisational strategies. This underscores the potential of design thinking as a transformative force that can redefine traditional banking paradigms and foster a more innovative and adaptive industry. This thesis contributes to academic discourse by providing a macro and micro perspective on design thinking in banking, bridging the gap between theoretical understanding and practical application. This is a foundational resource for scholars and practitioners aiming to leverage design thinking for strategic advantage in the dynamic banking world.

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CHAPTER I:

INTRODUCTION

1.1 Introduction

Despite its long-standing use in the design community, management studies in the early 2000s adopted the term ‘design thinking’(Johansson-Sköldberg et al., 2013). IDEO[1] played a crucial role in developing design thinking by providing foundational definitions and proposing a model (Micheli et al., 2019; Auernhammer and Roth, 2019).

Gemser and Leenders (2001) were the first to demonstrate the differential impact of imitation versus innovative design. A company significantly enhances its competitiveness when it introduces new or original designs that are 'truly different' from existing ones, regardless of the industry context. According to Gemser and Barczak (2020), companies and researchers are increasingly focusing on design innovation to maintain and gain competitive advantage.

The McKinsey and Company study found that companies with the most effective design practices grew revenues by 32 % and returned 56 % more to shareholders (Benedict Sheppard et al., 2018). Because of its ability to simplify the process of finding products that meet market needs, design thinking can provide companies with new opportunities to develop platforms and markets. For example, modern smartphones can be used as phones, electronic cameras, media storage devices, communication devices, and computing devices. By utilising design thinking, companies can gain new knowledge about their customers, enable efficiency within their existing businesses, and transform their entire business model (Liedtka and Kaplan, 2019).

[1] In the field of design thinking and problem solving, IDEO is regarded as a leading global design company. As a company founded in 1991, IDEO has worked with clients in a variety of industries including healthcare, education, and technology (IDEO, n.d.). Throughout its history, IDEO has demonstrated how design thinking can be applied to various contexts and challenges by emphasizing human-centered design and a collaborative approach to problem-solving.

1.2 Research Problem

Despite the recognised potential of design thinking as a powerful catalyst for innovation, the banking sector needs to improve its comprehensive adoption. The rapidly evolving financial landscape, coupled with technological advancements, necessitates the integration of design-thinking principles for a competitive edge. However, the extent to which the banking sector understands, values, and implements these principles remains undetermined. Moreover, organizational culture, perceived barriers, and varying levels of awareness among banking professionals can impede the full embrace of design thinking. There is a critical need to investigate the intricate relationship between the banking industry's current practices, the potential disruptions that design thinking can bring, and the various stakeholders involved in fully comprehending the barriers and opportunities in this context.

1.3 Purpose of Research

Exploration of the interplay between design thinking and its influence on innovation within the banking sector is identified as the primary objective of this systematic literature review. Through a comprehensive analysis of the existing literature, this study aims to understand the following:

1. Design thinking adoption mechanisms within banking.
2. Challenges faced during adoption.
3. Subsequent impact on innovation outcomes.

1.4 Significance of the Study

The banking sector is at a crossroads in the face of rapid technological advancements and evolving customer preferences. Staying competitive requires adopting

new technologies and shifting towards a more human-centred, innovative mindset. This is when design thinking comes into play. By investigating how design thinking has been applied in banking, this study can unveil frameworks and strategies that align with contemporary customer needs, enhance operational efficiency, and foster an innovative culture.

Stakeholders at different levels, including customers, employees, regulators, and investors, possess diverse viewpoints and anticipations. Understanding their viewpoints and the challenges and opportunities presented by external disruptions is paramount for the banking industry to make informed, evidence-based decisions.

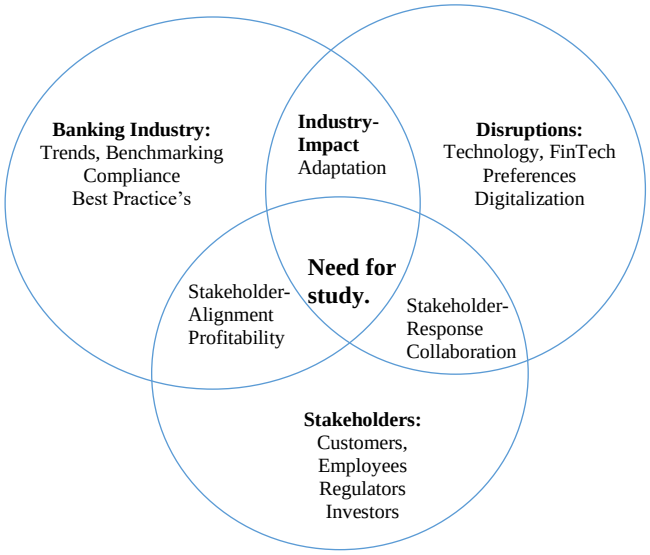

Figure 1: Factors interconnecting the banking industry, Source: Authors compilation.

Figure 1's Venn diagram visually encapsulates the interconnectedness of three critical elements: the banking industry, external disruptions, and stakeholders. The overlaps between these spheres highlight areas of mutual influence and underscore the importance of understanding these interdependencies. It serves as a graphical representation of the complexity of the banking landscape, emphasising the need for this research to navigate and make sense of these intersections.

1.5 Research Purpose and Questions

The study explores the significance, barriers, and implications of adopting design thinking in the banking sector. The research questions have been designed to offer a comprehensive understanding of the potential of design thinking in reshaping the banking industry and enhancing its value proposition to its customers.

RQ1. ***What are the key trends, patterns, and gaps in the literature related to adopting design thinking in the banking sector?***

Purpose: This question seeks to analyze the existing body of literature to identify prevalent themes and overlooked areas regarding adopting design thinking in banking.

RQ2. How does the perception of benefits influence the understanding of design thinking in the banking domain?

Purpose: This question explores the relationship between the perceived benefits of implementing design thinking and its understanding within the banking sector. By delving into how the banking domain perceives the advantages of design thinking, the research aims to uncover the motivations and value propositions driving its adoption in banking processes.

RQ3. How does an enhanced understanding of design thinking in the banking domain facilitate the adoption of innovative strategies?

Purpose: This question examines the link between a more profound comprehension of design thinking principles and adopting innovative approaches within the banking sector. By understanding how design thinking insights translate to strategic initiatives, the research aims to highlight the transformative potential of design thinking in banking operations and services.

RQ4. How do perceived barriers in the banking domain impact resistance to design thinking?

Purpose: This question explores the challenges and obstacles within the banking domain that may hinder the embrace of design thinking methodologies. By identifying these perceived barriers, the research sheds light on the possible reasons for resistance and how they might be addressed to foster a more design-centric approach in banking practices.

RQ5. How do missed opportunities relate to formulating organisational strategy in adopting design thinking?

Purpose: This question examines the potential opportunities that banking institutions need to pay more attention to when incorporating design thinking into their strategies. By understanding these missed chances, the research aims to highlight the significance of design thinking in shaping more effective and innovative organizational strategies in the banking sector.

RQ6. How does the alignment of organization strategy with design thinking foster strategic innovation in banking?

Purpose: This question explores the synergies between organizational strategies and design thinking principles in the banking domain. It aims to understand how integrating these concepts can drive forward-thinking, innovative solutions and practices within the banking sector.

CHAPTER II:

REVIEW OF LITERATURE

Literature reviews are critical analyses and syntheses of existing research on a specific topic, which serve as a foundation for future research (Fink, 2020). An effective literature review is vital to a research paper because it gives context to the study, highlights gaps in the current understanding and demonstrates how the researcher's work adds to or builds upon existing knowledge (Hart, 1998). In addition, a literature review can assist in identifying relevant theories, methodologies, and debates in the field, establishing the research in the context of demonstrated knowledge and best practices (Machi & McEvoy, 2016). An analysis of the literature explored the application of design thinking to innovation in banking, examining fundamental principles, strategies, and challenges to encourage innovation and customer-centricity in the field (Liedtka & Ogilvie, 2011; Stickdorn et al., 2018).

2.1 Theoretical Framework

The theoretical background is organized into several sections to address our research question. The first section provides an overview of the history and evolution of design thinking in innovation and its relevance to the banking sector. Design thinking literature maps can represent critical concepts, methodologies, and findings in banking innovation. The chart (Refer to Figure 2) represents a graphical overview of the research landscape on design thinking, customer-centricity, and innovation in the banking sector, highlighting the connections between different studies, theories, and perspectives.

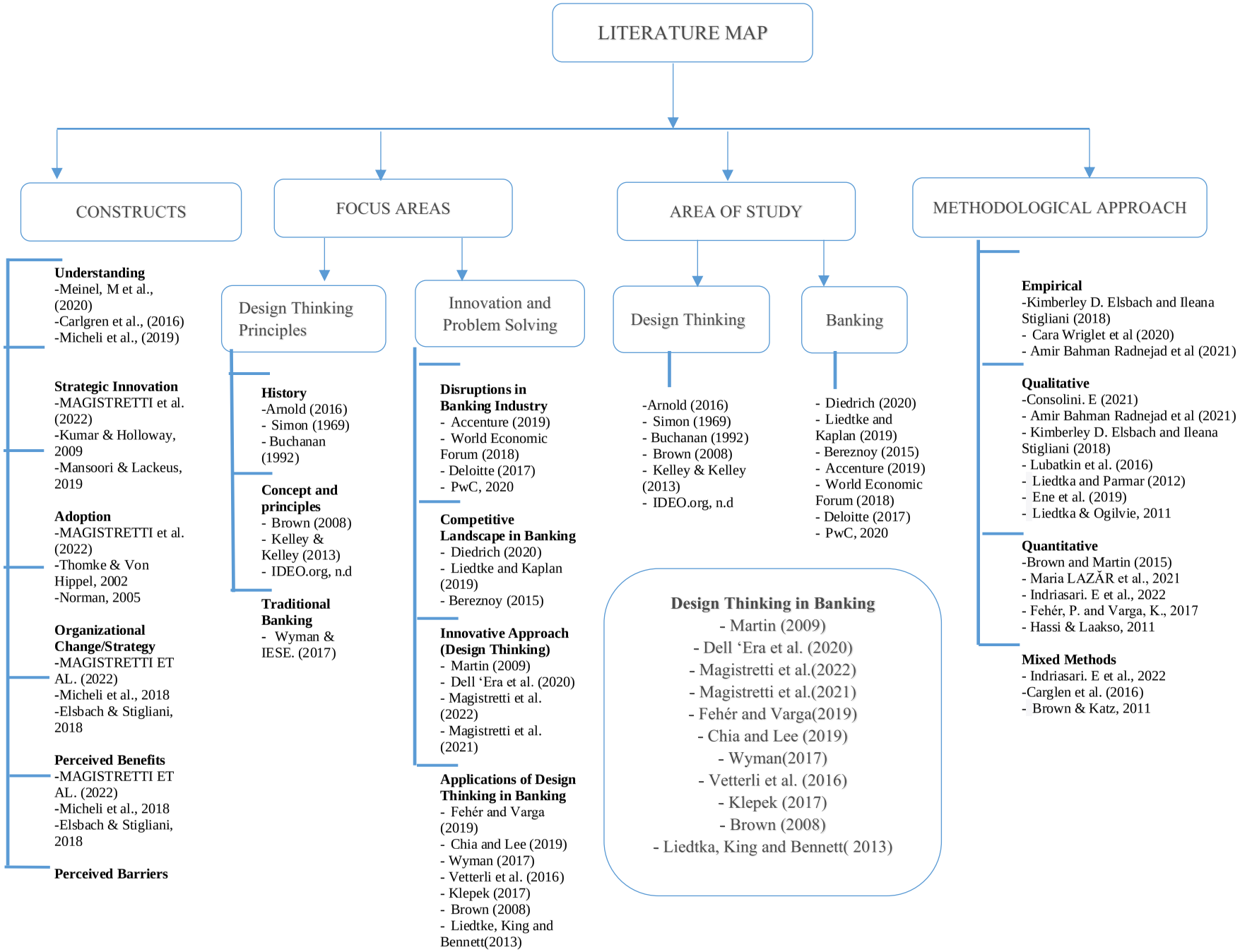

Figure 2: Literature Map, Source: Author's compilation.

2.2 1 Significant Disruptions in the banking industry

Several significant disruptions in the banking industry are reshaping the sector and challenging traditional business models, such as digital transformation and fintech innovations (Puschmann, 2017; PWC, 2017). For banks to remain competitive and adapt to the evolving market landscape, they must understand these disruptions. The banking industry can enhance its operational efficiency, improve customer experiences, and capitalise on new growth opportunities by staying informed of emerging trends and technologies (Puschmann, 2017; PwC, 2017).

Recent technological advances and evolving customer expectations have significantly disrupted the banking industry. Figure 3 below depicts the industry disruptors.

1. **Digital transformation:** As customers expect seamless online and mobile experiences, digital banking has significantly disrupted traditional banking practices (Accenture, 2019).
2. **Fintech competition:** Innovative, agile, and customer-oriented solutions offered by fintech companies challenge traditional banks at a lower cost (World Economic Forum, 2018).
3. **Open banking:** Regulators such as PSD2 have allowed third-party providers to access customer data and develop new financial products and services based on that data (Deloitte, 2017).
4. **Cryptocurrency and blockchain:** Cryptocurrencies and blockchain technology are gaining prominence and potentially transforming banking operations, including payments, and clearing (PwC, 2020).

5. **Artificial intelligence and machine learning:** AI and ML technologies have revolutionised banking by automating various processes, managing risk, and developing personalised product offerings.

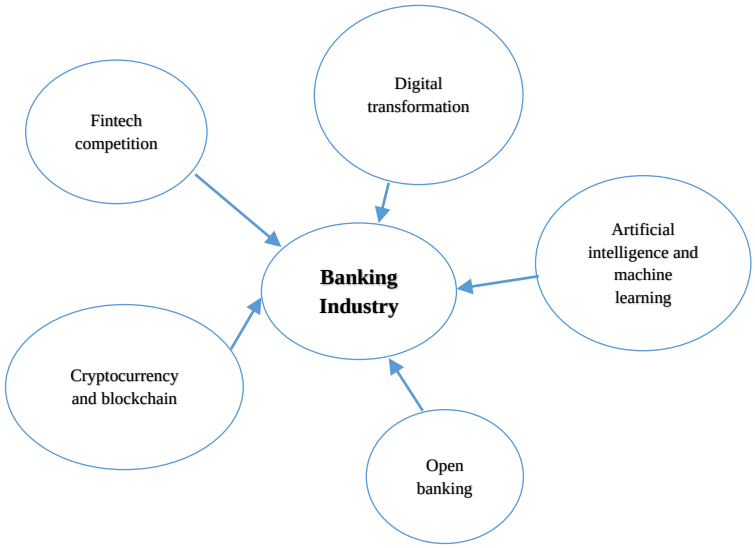

Figure 3: Disruptions in the banking industry, Source: Authors compilation

2.2.2 Comprehending the competitive landscape and need for innovation.

In today's environment, the life cycle of successful business models is drastically shortened. Companies that have become leaders in the business model are now emerging as global leaders in their industries (Bereznoy, 2015). Understanding the firm's competitive position in the market - even for start-ups - is crucial for those implementing strategies with specific industry power and those aiming to disrupt their marketplace. To gain a competitive advantage, firms should have managers who apply design thinking by combining analytical and intuitive thinking. A critical strategic issue, as stipulated by Liedtka and Kaplan(2019), is determining what customers want to accomplish and what problems they face. Creating products that are more valuable than existing products provides an organisation with a competitive advantage.

Maintaining a business's survival is a high-stakes undertaking (Brandenburger and Nalebuff, 1995). Diderich (2020) argues that the essence of the strategy lies in playing a suitable game. A detailed business model is aligned with the competitive environment during the strategy design process's competition layer for the strategy's finalisation. Diderich(2020) emphasises the importance of firms both at the foundational and business model levels. It is defined as a firm's competitive advantage based on whether it is different or superior, and superior may mean that it is cheaper. (Diderich, 2020)

2.2.3 An innovation approach based on design thinking.

Martin (2009) states that a wicked problem has an ill-defined cause, character, and solution (Martin 2009, p. 94). Therefore, before trying to solve a wicked problem, innovators must understand it (Martin 2009, p. 94).

Strategic roles of design thinking include acquiring innovation strategies and supporting organisational transformation. Design thinking is interpreted in several ways across different literature streams and industries, and firms adopt it to overcome numerous challenges, broadening its multi-faceted nature (Dell'Era et al., 2020; Magistretti et al., 2022; Magistretti et al., 2021). Distinct types of innovation purposes (including product and service development) are addressed differently by design thinking, according to Magistretti et al. (2021). In addition, an organisation's long-term competitiveness and sustainability can be achieved through design (Micheli et al. (2018).

A company's hierarchy began to recognise the value of design at various levels of the organization, ranging from product to business model to strategic direction, by leveraging this value of design thinking (Dell'Era et al., 2020), thereby allowing design thinking to be perceived and making design an integral part of strategic thinking (Micheli et al., 2018). In this way, design becomes a strategic activity in the minds of top managers, or strategic design, referring to the influence of design thinking and culture on brands' long-term sustainability and competitiveness (Micheli et al., 2018). Design thinking has been acknowledged as having an increasingly strategic role in its evolution as it is interpreted as a creative confidence method (Dell'Era et al., 2020).

2.2.4 History of Design Thinking.

Through methods such as personas, sketches, prototypes, and customer observation, design thinking provides a means to collect and analyse market and customer-level data. (Arnold 2016). The term "design thinking" was coined in the 1960s. The design concept was first proposed by Herbert Simon (1969), who suggested it was an alternative to traditional scientific thinking. Bruce Archer (1965) is credited with coining the term "design thinking" to describe this alternative mindset. Many researchers and theorists, including Lawson (1980) and Rowe and Cross (1987), have studied designers across various settings to understand their thought processes and actions, including architecture, fashion design, graphic design, engineering, software development, and more. These scholars viewed design as a scientific method for creating new forms, new artefacts, or, more generally, new knowledge. Consequently, while the natural sciences are concerned with analysing existing reality, design is concerned with "the transformation of existing conditions into preferred ones" (Simon, 1969: 4).

Since design thinking has experienced rapid growth among practitioners in recent decades, it is now widely recognised as an effective creative problem-solving method (Carlgrenet et al., 2016; Kolko, 2015; Martin, 2009) that is capable of handling complex and ill-defined issues that lack a single solution (Buchanan, 1992).

2.2.5 Design-driven methodology-Key Concepts and Principles

Due to its potential for innovation and problem-solving, design thinking has become increasingly popular in recent years (Brown, 2008). Human-centred design involves an approach that focuses on understanding the user's needs and tailoring solutions to meet those needs. Empathising with the user is typically the first step in the design thinking process, followed by defining the problem, producing potential solutions, prototyping those solutions, and testing them (Brown, 2008).

Health care, education, and business have all been impacted by design thinking. Healthcare organisations have used design thinking to improve patient experiences and outcomes. According to Kim and Kim (2016), using design thinking in healthcare led to improved communication between healthcare providers and patients and higher patient satisfaction. Applying design thinking to education has resulted in more engaging and effective student learning experiences. An innovative approach to entrepreneurship education has been developed by Stanford University's d.school through design thinking, as described in Brown and Katz (2011). In the banking sector, it has been observed that the adoption of design thinking represents a shift in focus from internal processes to a human-centric approach in service and product development ("The Hottest New Trend in Banking", n.d.). This trend has been identified as part of a broader strategic movement towards enhancing customer experiences and operational efficiency through innovative design thinking methods (Chia and Lee, 2019). The implementation of design thinking in banking is evidenced by various case studies demonstrating significant improvements in customer satisfaction and operational effectiveness. Finally, businesses have used design thinking to create innovative products and services that meet the needs of their customers. (Kelley & Kelley, 2013).

Empathy is critical to understanding the user's perspective in Design Thinking (Brown, 2008, p. 30). Active listening, observing, and engaging are required to understand users' needs, wants, and behaviours. Using Human-Centred Design (HCD) puts the human experience at the centre of the problem-solving process. Human-centred design is a process in which the designer begins with the people designing for it and ends up with innovative solutions tailored explicitly to meet the needs of the individual (IDEO.org, n.d.). Prototyping and testing are iterative processes in Design Thinking used to refine solutions. Kumar (2012) states that "iterative design is a method of developing products or processes by prototyping, testing, analysing, and cyclically refining them" (Brown 2008, p. 80). However, there is more to Design Thinking than just the process. Design Thinking is a mindset as well. Adopting a curious, empathetic, and creative approach to problem-solving is necessary to accomplish this. According to Kelley & Kelley (2013), "Design thinking is more than a method; it is a way of approaching problems with curiosity and empathy, as well as a willingness to experiment and learn from failure. Collaboration among multidisciplinary teams: Design Thinking involves collaboration between individuals from diverse backgrounds and disciplines." To solve problems effectively, design thinking involves a collaborative and multidisciplinary approach involving people with varied backgrounds, skills, and perspectives (Liedtka, 2015, p. 14).

According to Wilson (2017), as shown in Figure 4, the design thinking process is based on empathy, experimentation, and iteration and was introduced by the Hasso Plattner Institute of Design at Stanford (d.school). It consists of five steps: Empathize, define, imagine, prototype, and test. In each stage, practitioners are instructed to understand users, challenge assumptions, and develop innovative solutions that address users' needs (Wilson, 2017). The Empathize stage focuses on understanding the users' perspectives, emotions, and experiences. A human-centred approach to problem-solving is possible when this

understanding is present (Wilson, 2017). During the Define phase, the insights gathered during the Empathize phase are synthesised into a clear, actionable statement of the problem.

By brainstorming and applying creative thinking, practitioners generate various viable solutions during the ideation stage (Wilson, 2017). During the Prototype stage, low-fidelity representations of potential solutions are created, which are then tested with users during the Test stage. During the Test phase, the prototypes are iterated and refined, leading to a more effective and user-centred solution (Wilson, 2017).

As a result, the design thinking process developed by the d.school provides a robust framework for addressing complex problems in an innovative and user-centred manner, creating solutions that work (Wilson, 2017).

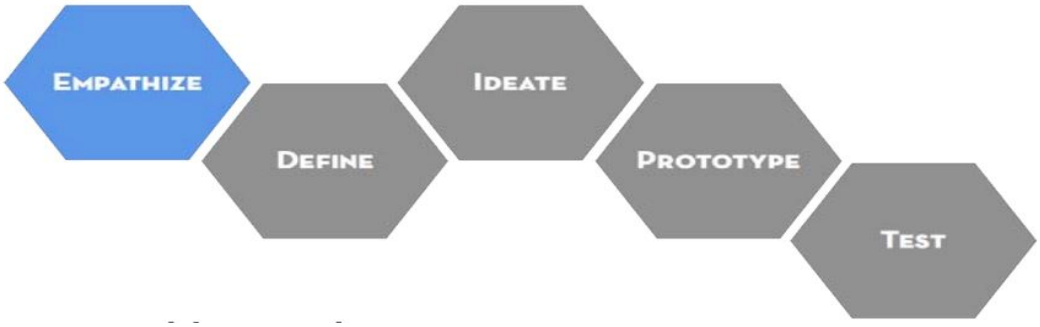

Figure 4: Design Thinking Phase, Source: A design-thinking handout from Molly in Nairobi (Wilson M. 2017).

2.2.6 A preview of design thinking vs traditional business thinking.

As initially proposed by Herbert Simon (1969), design can be defined as an alternative approach to scientific thinking instead of traditional scientific ways. However, it is recognised that Bruce Archer (1965) is the first to use the term design thinking to describe an alternative mindset. Unlike traditional management approaches, design

thinking actively avoids making decisions to maximise learning and reduce uncertainty (Owen, 2007); learning has long been recognised as a primary design objective (Beckman and Barry, 2007). According to Wyman & IESE. (2017), Design Thinking involves shifting the focus towards the end user and identifying solutions that respond to customer problems or satisfy their needs. An empathy exercise achieves this, relying on data, intuition, and experimentation to find new initiatives. Design Thinking promotes innovative ideas by combining creative brainstorming with structured processes and team diversity and encouraging team members to learn from failure and reduce their aversion to risk. Design Thinking promotes collaboration and the airing of innovative ideas and helps organisations challenge their thought process in developing a competitive advantage. (Wyman and IESE,2017). The following is an example: Unlike traditional banks, banks adopting design thinking principles are more innovative and customer-centric (Liedtka & Ogilvie, 2011). Banks can better understand customer needs and preferences by incorporating design thinking into developing financial products and services (Stickdorn et al., 2018). Additionally, design thinking can improve operational efficiency, problem-solving capabilities, and customer satisfaction in the banking sector (Liedtka & Ogilvie, 2011; Stickdorn et al., 2018).

According to Oliver Wyman and IESE (2017), traditional banking, characterised by rigid processes and hierarchical structures, may need help keeping up with the rapid changes in the financial landscape. By contrast, design thinking offers a human-centred, innovative approach that assists banks in better understanding and addressing customer needs. Banks can develop more personalised and user-friendly financial products and services by incorporating design thinking principles. Furthermore, design thinking fosters a culture of experimentation and collaboration, which allows banks to take advantage of

new opportunities, enhance their problem-solving capabilities, and remain competitive in an evolving market. Refer to Table 1.

Aspect	Traditional Business Thinking	Design Thinking
Definition	An approach based on traditional scientific methods.	An approach characterized by a focus on understanding and solving user problems, emphasizing empathy, creativity, and experimentation.
Historical Background	Traditional methods have been predominant in business practices.	Emerged as an alternative mindset, first termed by Bruce Archer in 1965.
Decision Making	Focus on making decisions to optimize outcomes and reduce risks.	Aims to maximize learning and reduce uncertainty, often delaying decisions to gather more insights (Owen, 2007).
Primary Objective	Typically centers around profitability, efficiency, and risk management.	Emphasizes learning as a primary objective (Beckman and Barry, 2007).
Approach to Problem-Solving	Often rigid, with a reliance on established processes and hierarchical structures.	Involves creative brainstorming, structured processes, team diversity, and a willingness to learn from failure.
Focus	Generally focused on internal processes and goals.	Shifts focus on the end user, identifying solutions that respond to customer problems or satisfy their needs (Wyman & IESE, 2017).
Cultural Attributes	May feature rigid processes and hierarchical structures, challenging adaptation to rapid changes.	Promotes collaboration, airing of innovative ideas, and challenging traditional thought processes to develop a competitive advantage.
Industry Example	In banking, traditional approaches might not keep up with financial landscape changes (Wyman & IESE, 2017).	Banks adopting design thinking are more innovative and customer-centric, improving operational efficiency and customer satisfaction (Liedtka & Ogilvie, 2011; Stickdorn et al., 2018).

Table 1: Traditional vs Design thinking Banking.Source:Author's compliation.

2.2.7 Need for Innovation in Banking: Design Thinking as a Catalyst for Diffusion of Innovation

According to Parameswar et al. (2017), a robust banking system is essential to the health of every economy. Banking in India is experiencing unprecedented growth and competition due to new regulations and changing customer needs. Connor Blake (n.d), mentions a significant impact on the banking sector due to COVID-19. (Bankbi.,n.d). Regional branches were closed, and staff capacity was reduced, which made it difficult for people to access essential services. Parameswar et al. (2017) also state that this revealed digital shortcomings and a need for more innovation across the industry. A bank can benefit from innovation in the following ways: Provide customers with the services they expect, Internal processes should be streamlined, and Market share should be maintained. (Bankbi ., n.d).

Innovation is necessary for every organisation, including the banking sector (Zengin,2019). The same services are offered in the banking sector as in core banking, according to Howcroft and Lavis (1986). However, new products developed by banks tend to spread rapidly in the market and cease providing competitive advantages after a brief period (Zengin,2019). As a result of the rise of start-ups and the spread of technology, banks face a new challenge, namely the risk of becoming antiques, which goes beyond traditional threats such as interest rate management, liquidity, etc. Therefore, it is advantageous to become an innovator in the marketplace (Zengin,2019).

Nevertheless, banks must rely on more than one-time innovations to meet their needs. Therefore, according to Muller and Valikangas (2005), banks should develop sustainable innovation methodologies rather than former initiatives. (Diderich,2019).

Since the advent of fintech, many banks have recognised that innovation is critical to their success. According to Claude (2018), however, most of these initiatives have yet

to reach their full potential. Furthermore, Claude (2018) states that individuals often assume that innovation is primarily a function of the IT industry. Additionally, their limited success may be attributed to their tendency to foster innovation inwards-out, emphasising improvements to business processes, cost reductions through digitisation, or product design. In addition, the inherent nature of banks' business model - transferring assets between cash and loans, equity and investments, or payments in a highly regulated environment - has resulted in the need for accomplishments. (Diderich, 2018). Developing innovative ideas that will add value to the parties involved in the intermediation process is challenging. (Diderich, 2018).

Claude (2018) states that traditional banks must develop and exploit competitive advantages during rapid change. Banks have a competitive advantage over startups due to long-term customer relationships (Diderich, 2018). Fintech startups have discovered that acquiring new banking customers is far more challenging than acquiring traditional consumer business customers. The relationship with a customer only lasts for a while, however. For banks to remain competitive, they must re-learn how to earn the trust of their customers by providing an engaging customer experience that fosters trust, solving real customer problems rather than just selling off-the-shelf products, and delivering value for money, as perceived by their customers. In addition, it is crucial to put the customers' needs at the centre of the banking process and to assist them in completing their tasks (Christensen et al.,2016).

Recent financial crises have resulted in banks facing competition from fintech startups, such as Betterment, Revolut, and Lending Club, and large non-financial entities, such as Apple, Amazon, and Alibaba, regarding how they approach innovation. Four key areas demonstrate their superiority: They need legacy systems to contend with, making them more agile. In addition, they can take advantage of economies of scale more

effectively. They provide superior service by addressing specific customer needs rather than trying to meet everyone's needs. Finally, unlike linear, business case-oriented planning methods, they employ an agile problem-solving approach.

Deloitte report (2023) states that the retail banking industry will soon face higher rates, inflation, and lower growth, and customers expect more from their banks. To achieve customer satisfaction, these banks must create a data-driven customer experience that is consistent across channels and tailored to the needs of every customer. Market infrastructure providers are increasingly expected to provide more than competitive prices, low latency, and the best execution. Both the buy-side and sell-side are now seeking services that simplify their workflows and give them a competitive advantage across the trading life cycle. (Deloitte, 2023).

Fehér and Varga (2017) state that the Hungarian banking industry faces several challenges. Various conclusions were drawn, including the changing role of branches, improving customer relationships, and selling new products and services using personal presence. (Fehér and Varga 2017). Fehér and Varga (2019) suggest that traditional banks can compete with their challengers through digital development, integrating other areas, becoming aggregators or ecosystem providers, or becoming service providers. (Blackstad and Allen, 2016), it is also possible for them to choose not to compete in the market anymore and become infrastructure providers. (Fehér and Varga, K, 2019). Banks must develop front-office practices for customer-facing activities to compete with their digital challengers. (Fehér and Varga ,2019). To address these disruptions in the banking sector, design thinking offers a suitable framework by placing customer needs at the forefront of innovation. Using a design thinking approach, banks can better understand their customers, identify their pain points, and develop tailored solutions to meet the market's changing demands (Brown, 2008). A customer-centric approach enhances banks' product and service

offerings, enhances their customer experience, and streamlines processes, allowing them to remain competitive in the face of significant industry disruptions (Brown, 2008). An illustration of the relationship between substantial disruptions in the banking industry and the application of design thinking principles to address these challenges can be seen in Figure 5, " Disruptions in the banking industry: a design thinking approach." It illustrates that design thinking can help banks remain competitive in a rapidly evolving industry by driving innovation, improving customer experiences, and streamlining processes.

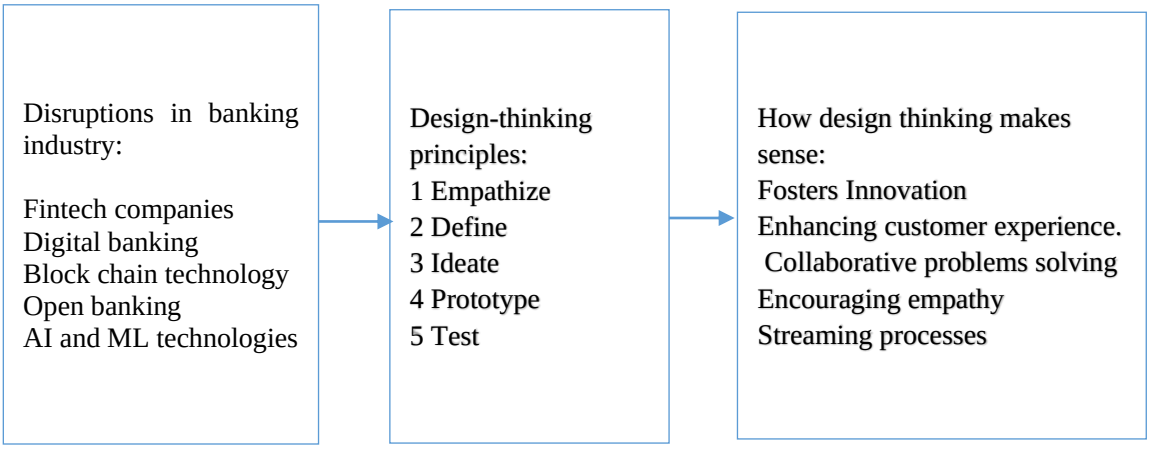

Figure 5: Disruptions in the banking industry: a design thinking approach. Source: Authors Compilation

The creation, introduction, and adoption of new ideas, products, or practices that generate value constitute innovation (Drucker, 1985). It is essential to economic growth and organisational success, enabling businesses to remain competitive in an ever-changing marketplace. Rogers' (2003) diffusion of innovation theory describes how innovations spread within a social system over time and the factors influencing their adoption. As a result of this theory, organisations understand the stages of adoption, the role of early

adopters, and the critical mass needed to ensure the diffusion of their products and services (Rogers, 2003).

As a human-centred, iterative problem-solving approach, design thinking assists organisations in exploring new ideas, fostering collaboration, embracing experimentation and continuous learning, and facilitating innovation and diffusion. (Liedtka & Ogilvie, 2011) In addition, design thinking promotes the development of innovative solutions, adapts to changing market conditions, and maintains a competitive edge in the industry (Brown, 2008).

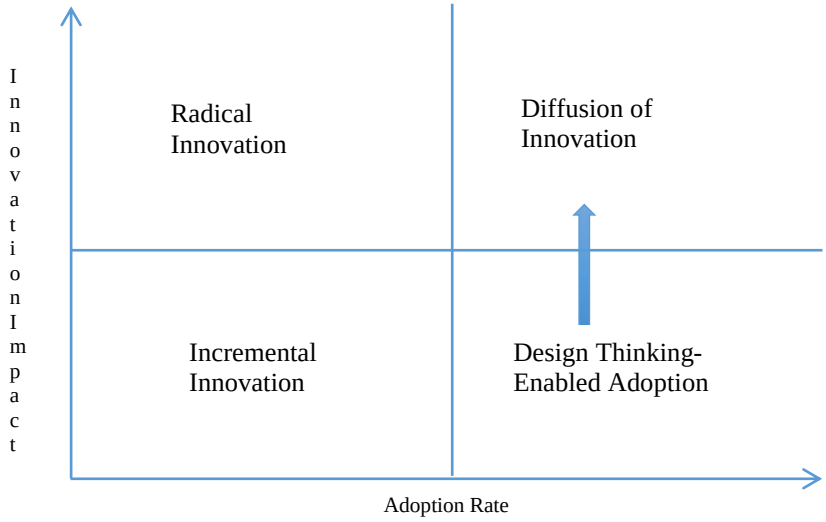

Figure 6: Innovation Matrix, Source: Author's compilation

The diagram has four quadrants (Figure 6), illustrating the relationship between innovation, diffusion of innovation, and design thinking. The top-left quadrant shows that incremental innovation is minor improvements to existing products, processes, or services. In contrast, diffusion of innovation refers to a process in which innovations are spread and adopted within a social system over time. "Radical Innovation" is highlighted in the

bottom-left quadrant, emphasising the development of entirely new concepts or innovations capable of significantly disrupting an industry. Finally, in the bottom right quadrant, "Design Thinking-Enabled Adoption," design thinking is highlighted to facilitate the adoption and diffusion of incremental and radical innovations.

A connection is visually established between the "Design Thinking-Enabled Adoption" quadrant and the "Diffusion of Innovation" quadrant, visually representing the relationship between design thinking and innovation diffusion. The arrow indicates that design thinking is crucial in facilitating innovation adoption and diffusion within organisations and industries. Innovations can be bridged between incremental and radical approaches by integrating design thinking into the innovation process.

2.2.8 Application of Design Thinking in the Banking Field

Banks are new to applying design thinking to their operations. (Chia and Lee, 2019). However, the implementation of design thinking has been extensively studied in health care, education, engineering, and technology (Patel and Khanjan, 2017). Still, a paucity of literature discusses how human-centred design or design thinking can be applied to the banking industry (Chia and Lee, 2019). Nevertheless, the banking industry is using design thinking to innovate, and this section examines examples from around the world that illustrate how it is being utilised to innovate.

The following snapshot (Refer to Table 33) of banking case studies aims to illustrate how design thinking has been applied in the banking sector and highlight the key outcomes achieved. In the picture, a concise overview of design thinking in the banking industry allows readers to quickly grasp how successful innovation and transformation have been achieved through design thinking.

2.2.8.1 Hungarian Bank Case Study

Fehér and Varga (2019) examined how design thinking methodologies can enhance the customer experience in the banking industry as part of the "One Week Sprint" methodology. In their analysis of Bank1, they identified potential new touch points between themselves and their customers to identify new revenue streams. (Fehér and Varga, 2019). At Bank2, they attempted to focus on the customer journey and personas but could not. This project provided them with an opportunity to gain a better understanding of the importance of the discovery phase. Because of this project, the One Week Sprint has also been ze-rest to include the "ze-rest" phase, preparation. (Fehér and Varga, 2019).

2.2.8.2 DBS Bank Case Study

As part of their research to explore the opportunities of adopting design thinking in banking, Chia, and Lee (2019) provided an overview of the application of design thinking to encourage seniors to embrace digital payments and cashless payments by conducting a literature review and examining one Singapore bank's Smart Senior pilot program. DBS Bank/POSB launched the program in collaboration with the Yishun Riverwalk Resident Committee and Republic Polytechnic. As a result of a workforce shortage, DBS Bank Innovation Management guided students from RP instead of conducting in-depth interviews or observations for design thinking. A Journey Thinking 4D framework developed by DBS Bank utilises the UK Design Council's Double Diamond design process in 2019 to iterate various ideas before making a final decision. Education Minister Ong Ye Kung officially launched a pilot program for Smart Seniors on 5th May 2018. Over three months, 40 % of elderly individuals converted to cashless methods. However, the wearable device proved unpopular, and many people reverted to using elderly concession cards. (Chia and Lee, 2019)

2.2.8.3 National Australian Bank Case Study

Wyman (2017) developed the NAB Quickbiz Loan in collaboration with the National Australian Bank (NAB) to meet the needs of small and medium enterprises (SMEs). Using design thinking, they produced a compelling product by following the five steps described above (empathise, define, imagine, prototype, test), moving backwards from the client's needs. Consequently, a three-step online application and a dynamic cash-flow credit model were developed, enabling SMEs to obtain an unsecured business loan of up to $50,000 within 60 seconds and with a maximum disbursement time of three days. (Wyman and IESE, 2017)

2.2.8.4 Outcomes achieved by Deutsche Bank through Design Thinking

Vetterli et al. (2016), in their article discussing the outcome of design thinking, state that once innovation community members had observed the results in Phase I (Learning), they began to adapt and practice their ways of applying Design Thinking, one step at a time (Phase 2: Adapting). The next step was to diffuse customer-centric solutions into the organisation's culture (Phase 3: Diffusing). This led to a gradual spread of knowledge about customer-centric solutions throughout the organisation. For each Design Thinking project, the IT team contacted approximately 190 direct customers and about 20 direct touchpoints during the process of need-finding and prototyping. Design Thinking projects described in the boxes illustrate how the approach can effectively address customer integration and understanding. Deutsche Bank implemented two design thinking projects between 2009 and 2010, which managed customer needs and facilitated the launch of new services focused on customer needs. A prototype was developed, and the project was completed within a year (in 2009) and less than 18 months (in 2010). Over five years, eight Design

Thinking projects were completed: three prototypes were developed (2009, 2010 and 2013), one was abandoned in 2010 due to personnel changes within the sponsoring business unit, and four were completed in 2011-2012. (Vetterli et al., 2016)

2.2.8.5 ANZ Banking Group

Klepek (2017) conducted a comprehensive research activity to obtain all these examples, prioritising and interviewing managers from ANZ Banking Group to understand how design thinking has been implemented. The ANZ Banking Group visited Silicon Valley in 2015 to learn how to become more customer centric. The workshop's primary focus was how managers could focus on customers, create prototypes, and change the entire culture of how people in the ANZ Banking Group think. To enhance change, management should use design thinking and a methodology that facilitates innovation. Some have commented that banks are slow-moving organisations where creation is separate from the organisation's culture. Despite this, customers expect innovation, new products, and daily business. As a result, we must address that issue, and design thinking plays a significant role in doing so."A substantial contribution of design thinking to banks is rapid prototyping and change enhancement. As a result, users can testify to more products and provide customers with solutions that add value.

Among the tangible outcomes of the project was the development of a cutting-edge mobile app that enables employees to manage their time, vacation schedules, and many more while also allowing them to cooperate. (Klepek, 2017). Customers' journey mapping, brainstorming, and ANZ used design scenarios as tools.

2.2.8.6 Bank of America

According to Brown (2008), IDEO2 was contracted to help Bank of America create products to retain current customers and attract new ones (Brown 2008, p.119). IDEO and Bank of America began providing deep research to satisfy the company's needs in 2014. They observed the crowds, interviewed a dozen families, and followed mothers as they shopped at Costco, dined at Johnny Rockets, and made deposits through drive-through teller machines. In Brown's (2008) study, most people desire to save some money, but few have strategies for doing so. The team developed many prototypes following the observations phase, and the overwhelmingly preferred option was rounding up consumers' financial transactions and transferring the difference to their savings accounts. The idea was titled “Keep the Change “and allowed customers to share a small number of cents to the dollar from every purchase. Bank of America's campaign was an enormous success; more than 8 million people enrolled and saved over $1 billion (Brown, 2008). Design thinking tools include observing, prototyping, visualisation, and designing scenarios.

2.2.8.7 Juniper Bank Customer Service Strategy

Juniper's executives were interested in answering questions such as: Does the banking industry still require buildings, vaults, and tellers? What type of customers would we serve? What is the best way to resolve all the problems? What is the most effective way to define and establish our strategy (Brown, 2008)? IDEO[3] began with emphasis and conducted many focus groups and surveys throughout the project. Their initial research

[2] In the field of design thinking and problem solving, IDEO is regarded as a leading global design company. As a company founded in 1991, IDEO has worked with clients in a variety of industries including healthcare, education, and technology (IDEO, n.d.). Throughout its history, IDEO has demonstrated how design thinking can be applied to various contexts and challenges by emphasizing human-centered design and a collaborative approach to problem-solving.

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identified four primary customer groups, and they decided to focus primarily on the "Lookers" who needed the most assistance with their finances. They were also likely to remain loyal to services they liked, attitudes that echoed well with Juniper's ethos. (Brown, 2008, p.54)

IDEO developed an "Experience Architecture" concept for online banking, which included a customer journey map. During the project's prototype phase, all touchpoints involved in the customer experience were tested. As a result, the company gained quick feedback and was able to create user-friendly, market-specific online content. To apply design thinking techniques, shadowing, observing from the sidelines, mapping the customer journey, prototyping, etc., were used.

2.2.8.8 PNC Bank

The PNC bank approached IDEO4 in 2008 to develop a new concept of banking to appeal to the tech-savvy Generation Y. Young customers are one of the most valuable assets for a bank, and PNC bank had 70 millions of them. According to the company, there was a need to bring a new and innovative way of banking that focused on all aspects of technology to assist students in managing their finances and make them lifelong customers (Brown, 2009). As part of their design thinking collaboration with IDEO, PNC bank developed a Virtual Wallet; three banking products are combined, providing powerful visualisation of customised websites and many features, such as Punch the Pig, which helps customers manage their savings more effectively, display all available funds graphically, provide several tools for parents to be involved and informed about their spending, among other things. During prototyping, all graphics and features were tested. PNC's innovative Virtual Wallet has become an essential part of its business. As a result, this generation can

manage their finances more effectively using various banking products simultaneously. (Klepek, 2017). Observation, visualisation, and prototyping were part of the design thinking process.

4.2.8.9 Suncorp_Postmerge acquisition

The Australian insurance giant announced 2006 a merger with another insurance giant, Promina, two highly respected but quite different companies. While Suncorp was highly centralised, Promise, on the other hand, was highly decentralised – more a house of brands than a single organisation (Liedtke, King and Bennett, 2013). Companies have different business approaches with remarkably different company cultures. Successful integration was the business problem Suncorp was dealing with. Design thinking contribution: Merge made sound financial sense, but how to communicate that message to employees? The second road created SunCity while drawing a map of the new business. This map included pizza, streets, parks, and buildings representing its unique business value, customers, suppliers, advocates, and the wider community. Creating a neighbourhood within a city allows everyone to collaborate and share plans. A staff survey showed that 94 % of employees understood the vision, compared to 48 % in the previous study (Liedtka, King, and Bennett, 2013). Design thinking tools used were Visualizations.

2.3 Research Gap and Variable Identification.

Upon detailed examination of the literature, apparent gaps regarding the application of design thinking in banking are discernible. This research aspires to address these gaps by focusing on specific variables.

Firstly, while the literature points to design thinking's transformative role across various sectors, its precise impact on banking still needs to be explored. Jones & White (2015) recognise the prospective merits of design thinking, but empirical studies delving into the 'Perceived Benefits' for banking institutions are lacking. Hence, exploring the 'Perceived Benefits' banks obtain from design thinking is vital.

Secondly, Smith & Brown (2015) hint at potential challenges in assimilating new methods, pointing towards possible 'Perceived Barriers' that might impede banks from fully adopting design thinking. It is crucial, therefore, to understand these barriers comprehensively.

Thirdly, given the wave of disruptive innovations in banking, a profound 'Understanding' of these shifts is essential. Although Miller & Thompson (2016) argue that design thinking offers tools to navigate such disruptions, the depth of this understanding within banks has yet to be adequately measured.

Fourthly, the necessity of a coherent 'Organization Strategy' for banks to thrive in these dynamic times is evident. Wilson & Green (2018) emphasise its importance, but the infusion of 'Strategic Innovation' via design thinking into these strategies remains uncharted.

Fifthly, the banking sector's inherent 'Resistance' to rapid transformative practices, as Daniels & Clark (2019) pointed out, contrasts with design thinking's adaptive nature. Such resistance could result in 'Missed Opportunities'—potential scenarios banks could leverage.

To comprehensively understand these gaps, this research will assess the following variables: 'Perceived Benefits', 'Perceived Barriers', 'Understanding', 'Organization Strategy', 'Strategic Innovation', 'Resistance', and 'Missed Opportunities'. Through an in-depth survey, the study aims to determine the impact of these variables in the banking sector.

2.4 Theoretical Constructs and Analytical Insights

To understand the role of design thinking in banking innovation, this study divides its focus into conceptual insights from literature and practical insights based on behavioural patterns (Smith & Johnson, 2018).

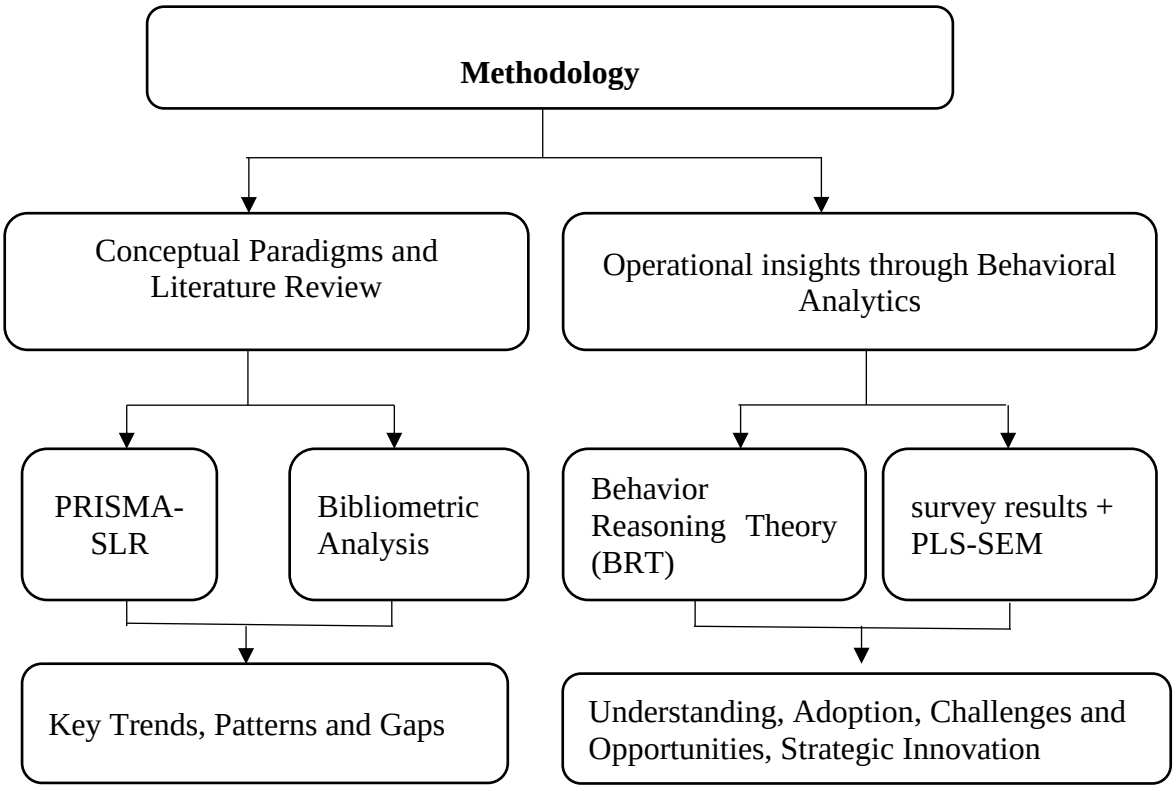

Figure 7: Theoretical constructs, Source: Authors compilation.

The diagrammatic representation elucidates the research's methodological pathway (Figure 7). This strategic framework is a robust guideline for understanding the role and implications of design thinking within the context of banking innovation.

2.4.1 Conceptual Paradigms and Literature Review:

The study delves into the vast expanse of conceptual paradigms, where a comprehensive literature review is undertaken. This approach provides a theoretical underpinning and sets the context for the entire research (Hart, 1998).

PRISMA-SLR:

The PRISMA Systematic Literature Review methodology is employed as part of the literature review. PRISMA-SLR is renowned for its rigorous criteria and structured approach, which ensures that the most pertinent studies are considered, shedding light on key trends, patterns, and gaps in the existing literature (Moher et al., 2009).

Bibliometric Analysis:

Complementary to the PRISMA-SLR, a Bibliometric Analysis is carried out. This analytical technique is crucial in quantifying and visualising relationships between different pieces of literature, thereby highlighting prevalent themes and the evolving trajectory of the domain in question (Zupic & Čater, 2015).

2.4.2 Operational Insights through Behavioral Analytics:

Moving from conceptual paradigms, the study shifts its focus to operational aspects. Here, behavioural analytics becomes the linchpin, offering a pragmatic lens through which the application of design thinking in banking innovation can be assessed.

Behaviour Reasoning Theory (BRT):

A pivotal component of this segment is the adoption of the Behavior Reasoning Theory. BRT provides an avenue to understand the rationale behind the decisions of banking professionals, unveiling both intrinsic motivations and external influences (Westaby, 2005).

Statistical Analysis of Survey Results using PL-SEM and R:

Survey results aligned with the BRT framework are subjected to rigorous statistical analysis to ensure empirical validity. This phase reaffirms the insights obtained and provides a clear pathway for understanding the banking sector's challenges, opportunities, and strategic innovation (Field, 2013).

Figure 7 presents a comprehensive blueprint, seamlessly merging theoretical constructs with practical analytics, ensuring the research remains grounded and actionable.

2.5 Integration of Theoretical Constructs.

The Integration of Theoretical Constructs explores the application of design thinking as a catalyst for innovation in banking. This approach melds critical theoretical concepts with practical strategies to drive transformative changes in the financial sector.

2.5.1 Conceptual analysis

This research endeavours to rigorously and transparently synthesise scientific evidence using a systematic literature review (SLR) approach complemented by a bibliometric analysis (Donthu et al., 2021). SLRs encompass a comprehensive search, selection, appraisal, and synthesis of pertinent studies, thereby furnishing an exhaustive overview of the available evidence on a specified topic (Higgins & Green, 2011). This study will adhere to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, which aim to bolster the transparency and calibre of the findings (PRISMA, n.d.). PRISMA emerges as an evidence-based suite of guidelines ubiquitously employed across diverse research terrains to augment the reporting quality of systematic reviews and meta-analyses (Page et al., 2021). The bibliometric analysis provides a structured approach to quantitatively assess the distribution, patterns, and relationships of the accumulated literature (Donthu et al., 2021). Refer to Figure 8.

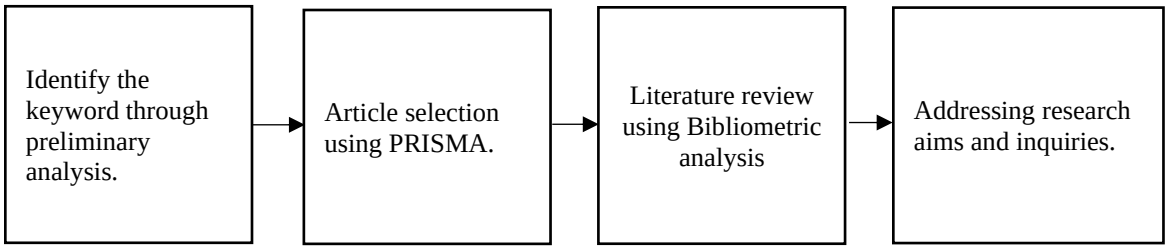

Figure 8: Review Process, Source: Authors Compilation

Systematic Literature Review (SLR).

Systematic reviews are a cornerstone for consolidating extant knowledge and facilitating the construction of future agendas grounded in systematic and logical paradigms such as domains, theories, or methodologies (Palmatier et al., 2018). Lim, Kumar, and Ali (2022) provide a comprehensive discourse on methods encompassing bibliometric, framework, thematic, meta-analytic, and meta-systematic research. Regarding the adoption of design thinking for innovation within the banking sector, the focal interest of this research lies in addressing the inquiries: "What is the existing knowledge?", "How has this knowledge been acquired?" and "What are the future trajectories?".Dhir et al. (2020) posited that the SLR method is a cornerstone for sourcing, streamlining, selecting, and scrutinising pertinent studies (Altinay & Taheri, 2019). Emulating the modus operandi of Behera et al. (2019), this review bifurcates into two phases: data extraction and research profiling.

Data Extraction:

The data extraction bifurcates into formulating research questions and selecting germane studies (Dhir et al., 2020). At its inception, research questions are proactively developed in alignment with the principal objective of this investigation (Refer to Problem Statement). The pivotal question reads:

RQ1: What are the key trends, patterns, and gaps in the literature related to adopting design thinking in the banking sector?

By meticulously reviewing the literature, classifying findings, amalgamating insights, dissecting trends and patterns, pinpointing lacunae, and articulating and disseminating outcomes, the intention is to assess the prevalent trends, patterns, and gaps germane to design thinking within the banking milieu. The aim is to enlighten banking institutions, policymakers, and academicians about the current epoch of design thinking integration within banking, its inherent merits and challenges, and potential avenues for future scholarly pursuits.

Addressing RQ1 mandates identifying and shortlisting relevant studies, subsequently deciphering their research contours via the stipulated search protocol.

Research Profiling:

The essence of research profiling in the context of an SLR revolves around discerning salient characteristics, trends, and patterns inherent to the extant body of knowledge. When astutely conducted, profiling can unearth invaluable insights delineating the present scholarly landscape and pinpoint avenues warranting further exploration (Kitchenham & Charters, 2007).

PRISMA:

The PRISMA statement delineates guidelines for authors to meticulously articulate findings from systematic reviews and meta-analyses. Conceived in 2009, it witnessed an overhaul in 2020, reflecting advancements in systematic review methodologies and terminologies (Moher et al., 2020). Though primarily intended for reviews evaluating interventions, PRISMA extends its applicability to systematic reviews with variegated objectives, encompassing aetiology, diagnostic test accuracy, or methodologies (Page et

al., 2021). Per the PRISMA 2020 edict, authors are steered through 27 meticulously crafted reporting items, fostering systematic and transparent reportage (Moher et al., 2020). This enhances the research's credibility, aiding readers, reviewers, and editors in discerning the authenticity and reliability of the findings (Page et al., 2021). Although PRISMA was primarily crafted for health-centric reviews, its efficacy has been validated in diverse domains, including marketing studies (Huurne et al., 2017; Lim, Yap, & Makkar, 2021). The protocol mandates four sequential stages, ensuring a systematic and robust review. These stages encompass Identification, Screening, Eligibility, and Inclusion, each elucidated in subsequent sections along with their respective rationales.

IDENTIFICATION

Leveraging PRISMA, scholars rigorously scour pertinent literature repositories (Page et al., 2021). This phase hinges on meticulously crafted research questions and a judicious selection of keywords and search terminologies (Moher et al., 2009). Appropriate databases and resources are indispensable to ensure a comprehensive search purview. This research will harness Scopus and Web of Science as primary databases (Page et al., 2021). Beyond conventional journal articles and conference proceedings, it is imperative to encompass grey literature to eschew publication biases (Moher et al., 2009).

Search terminologies encompass "Design thinking", "Innovation", "Human-Centric Design", and "Banking", scrutinised across SCOPUS, Web of Science (WOS), and Google Scholar, spanning two decades. This approach vouches for transparency and reproducibility (Page et al., 2021).

SELECTION

A rigorous selection process is instrumental in ensuring the inclusion of relevant studies, concomitantly sidelining irrelevant or incongruent ones (Page et al., 2021). Moher et al. (2009) bifurcate this process into screening and eligibility assessment phases. The initial screening entails perusing titles and abstracts, facilitating the exclusion of studies on the grounds of irrelevance, non-journal publications, duplication, or language barriers (Page et al., 2021). This modality mitigates biases, bolstering the precision of the selection ambit (Higgins & Green, 2011).

Post the preliminary screening, and the residue undergoes a more exhaustive eligibility assessment. This phase involves a deep dive into each article, ascertaining its congruence with pre-established inclusion and exclusion criteria (Page et al., 2021). For optimal transparency and consistency, it is pivotal that these criteria are unequivocally articulated within the research protocol (Moher et al., 2009).

ELIGIBILITY

In the eligibility phase under PRISMA, articles undergo rigorous screening, ensuring their alignment with the SLR's inclusion and exclusion paradigms (Page et al., 2021). This typically entails a preliminary screening of titles and abstracts, culminating in an exhaustive scrutiny of the full text (Moher et al., 2009).

INCLUSION

The inclusion phase of the PRISMA protocol necessitates that identified articles are meticulously assessed based on pre-defined criteria, ensuring their relevance to the posed research questions (Page et al., 2021). Deploying PRISMA within systematic reviews or meta-analyses ensures the inclusion of germane articles, obviating biases, and augmenting

validity (Moher et al., 2009). For the sanctity of the review process, it is pivotal to have unambiguous and unequivocal inclusion and exclusion criteria in place (Higgins & Green, 2011). These criteria might span myriad dimensions, from study design and population to the research outcomes and publication status (Page et al., 2021). A preliminary assessment of a subset of articles can be instrumental in ensuring that the eligibility criteria effectively sieve out pertinent literature (Moher et al., 2009).

Inclusion Criteria:

1. Comprehensive reviews of design thinking within the banking sphere.
2. An encompassing exploration of innovation.
3. In-depth discussions on Human-Centric Design.
4. Studies that bridge design thinking with the banking domain.
5. Articles published within the last two decades.
6. Peer-reviewed journal articles and conference proceedings.

Exclusion Criteria:

1. Articles discussing design thinking devoid of the banking perspective.
2. Non-peer-reviewed manuscripts or those that fail to meet academic rigour.
3. Studies with skewed or biased perspectives.
4. Articles published over two decades ago.
5. Non-English language publications.

The PRISMA protocol culminates in assimilating findings, systematically and transparently elucidating the research journey (Page et al., 2021). For heightened clarity, Figure 9 chronicles the PRISMA flow diagram, detailing the stages from identification to inclusion.

2.5.1.1 Knowledge base at present: WHAT and HOW

An empirical bibliometric analysis has been undertaken to explore the scientific domain surrounding the incorporation of design thinking in the banking sector. This analysis, based on the PRISMA methodology outlined by Moher et al. (2009), involves a careful examination of records. The purpose of this thorough bibliometric study is to provide both qualitative and quantitative assessments of the current academic literature. The overarching goal of this research is to highlight key trends, patterns, and potential gaps in the field of study.

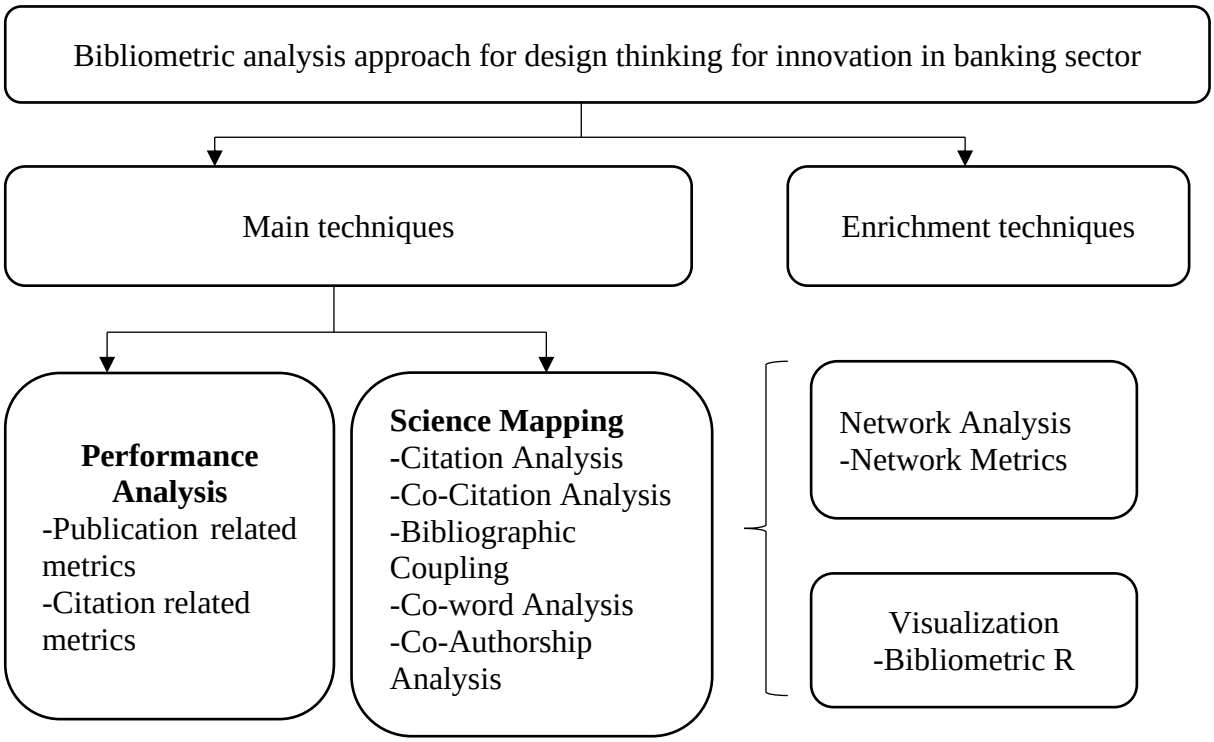

Figure 9: bibliometric analysis: Source – Author's compilation

As per Figure 9, the subsequent sections elucidate the various bibliometric analysis techniques and methodologies that will be undertaken.

Publication-related metrics:

- Annual Scientific Production: Delving into the annual proliferation of scientific outputs is instrumental in capturing the chronological evolution of the discourse, thereby spotlighting years that may have witnessed seminal revelations or surged academic pursuits (Donthu et al.,2021).

Citation-related metrics:

- **Most Relevant Sources**: Discerning the leading academic avenues becomes quintessential to pinpoint where pivotal dialogues and discourses culminate (Donthu et al.,2021).
- **Most Relevant Authors**: Identifying vanguard contributors in this realm unravels the seminal voices and proffers avenues for potential academic collaborations (Donthu et al.,2021).
- **Most Cited Countries**: A cartographic exposition of citation metrics becomes enlightening, demarcating territories that herald or ardently engage with pivotal research (Donthu et al.,2021).
- **Most Global Cited Documents**: Accentuating cornerstone documents that have indelibly sculpted the narrative is invaluable in grasping foundational paradigms and investigative methodologies (Donthu et al.,2021).
- **Author Productivity through Lotka's Law**: A perspicacious assessment of authorial distributions, governed by Lotka's Law, proffers profound insights into prevalent contribution paradigms within the sector (Donthu et al.,2021).

Science Mapping

- **Citation Analysis**: This can encompass "Reference Spectroscopy", where, through the discernment of recurrently cited works, foundational linchpins supporting current research endeavours are unveiled (Donthu et al.,2021).

- **Co-Citation Analysis**: This can be seen as part of the broader "Reference Spectroscopy."
- **Bibliographic Coupling**: A relation where two works reference an everyday third work.
- **Co-word Analysis**: Most Frequent Words, WordCloud, and TreeMap: Harnessing these tools affords a panoramic vista of predominant themes, lexicons, and nascent sub-disciplines, sketching a thematic tableau of the literature (Cobo et al., 2011).
- **Co-Authorship Analysis**: About the collaboration between multiple authors and their joint contributions.

Network Analysis:

- **Network Metrics:** This can include metrics related to nodes, edges, and the overall network.
- **Trend Topics**: Pinpointing nascent thematic concentrations and contemporary focal discussions promises to shepherd forthcoming research undertakings, ensuring they remain germane and contemporaneous (Donthu et al.,2021).

Enrichment Techniques:

- Visualisation: Visualization would include the visualisation methods used to represent the network, encompassing the "Co-occurrence Network and Thematic Map." Graphical renditions of thematic nexus bolster cognitive assimilation and spotlight potential sectors ripe for intricate scrutiny (Donthu et al.,2021).

2.5.2 Operational Insights through Behavioral Insights.

The research delves into the complex interplay between operational strategies and human behaviors, aiming to uncover how cognitive and behavioral patterns both influence and are influenced by organizational frameworks, as described by Westaby (2012). This exploration aligns with the thesis objective of understanding the implementation of design thinking in banking, as it provides insights into how these patterns and paradigms affect innovation and decision-making processes within the sector. The study's focus on cognitive and behavioral dynamics in an organizational context is crucial to comprehending how design thinking can drive strategic innovation in banking.

2.5.2.1 Conceptual Model & Hypotheses Development

Basic models must be rooted in sound theory, as variables can be interconnected in several ways (Hair, 2004, Multivariate). Many theories have been put forward to understand the use of design thinking in banking. To effectively examine the relationships between these variables, this study has been framed around the Behavioral Reasoning Theory (BRT), introduced by Westby (2005).

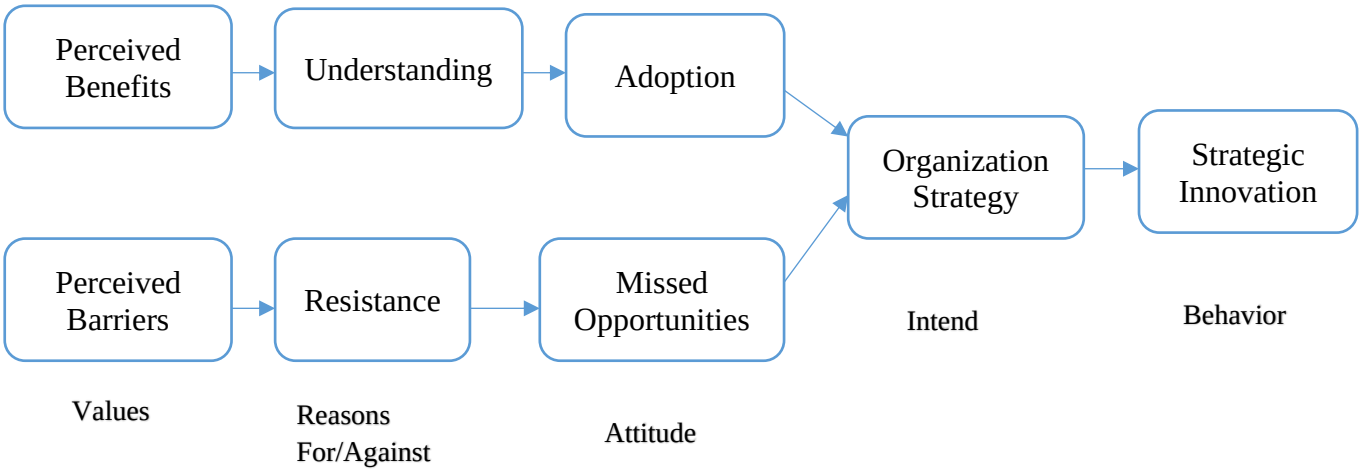

Figure 10 – Conceptual model using Behavioral Reasoning Theory, Source: Author's compilation.

The conceptual model depicted (Refer to Figure 10) integrates the Behavioral Reasoning Theory (BRT) tenets to elucidate the dynamics of design thinking application in the banking sector. As contended by Westaby (2012), BRT suggests that reasons for action and reasons against action significantly influence individuals' intentions and subsequent behaviourism. Within the realm of design thinking in banking, several variables emerge as pivotal components, intertwining with the core constructs of BRT. (Refer to Table 2 and Table 3).

Construct	**Definition**	**Concerned Studies**
Understanding	Understanding refers to the depth of comprehension banking institutions possess about design thinking, encompassing its principles, applications, and potential for generating original, transformative solutions. This construct evaluates how banks perceive the capability of design thinking to modify existing paradigms and foster innovative outcomes.	Meinel, M et al., (2020); Carlgren et al. (2016), Micheli et al. (2019); J. Schmiedgen et al. (2016); MAGISTRETTI ET AL. (2022)
Strategic Innovation	Strategic innovation refers to the role of design thinking in revolutionizing banking operations, from crafting innovative business models to developing novel financial products or services. This construct assesses the influence of design thinking on enhancing customer service, shaping an organization's ethos, and propelling it towards a distinct competitive advantage in the banking sector.	İplik, F.N et all (2014);AlQershi et all (2020);Pratono, A.H., 2022; MAGISTRETTI ET AL. (2022)
Adoption	Adoption measures the significance and ease with which banking institutions integrate design thinking practices to address specific challenges and cater to distinct customer demands. This construct	MAGISTRETTI ET AL. (2022);Thomke & Von Hippel, 2002; Norman, 2005; Meinel, M et al., (2020)

	gauges both the perceived importance of design thinking in problem-solving and the feasibility of executing its derived solutions within the banking environment.	
Organizational Strategy	In this regard, organisational strategy evaluates the extent to which design thinking influences and reshapes a bank's ethos, structure, values, and employee engagement. This construct assesses the transformative capacity of design thinking on an institution's culture, the enhancement of its structural elements, the revitalization of its workforce, and its ability to challenge traditional problem-solving assumptions.	MAGISTRETTI ET AL. (2022); Micheli et al., 2018; Elsbach & Stigliani, 2018
Perceived Benefits	Perceived benefits refer to the tangible and intangible advantages that stakeholders identify as outcomes from integrating design thinking into their banking operations. This construct gauges the extent to which the adoption of design thinking has enriched banking services, fostered innovation, and culminated in novel financial products or services within the organization.	MAGISTRETTI ET AL. (2022); Micheli et al., 2018; Elsbach & Stigliani, 2018
Perceived Barriers	Perceived barriers represent the challenges and hindrances that banking stakeholders acknowledge when considering the adoption of design thinking. This construct measures the perceived obstacles related to organizational culture, knowledge gaps, resource limitations, and other constraints that might impede the successful integration of design thinking methodologies within the banking framework.	MAGISTRETTI ET AL. (2022); Micheli et al., 2018; Elsbach & Stigliani, 2018; Pohjolainen, P (2015)
Resistance	Resistance pertains to the reluctance or hesitancy of banking institutions in embracing design thinking. This construct gauges the perceived negative impacts of not integrating design thinking and the challenges in executing its solutions,	Sathye, M., 1999; Butler, D.L. and Sellbom, M., 2002; Mahmud, I.,et all (2017)

	contributing to its slowed or stalled adoption within the banking sector.	
Missed opportunities	Missed opportunities relate to the potential gains, insights, or innovations that banking institutions might have achieved if design thinking had been incorporated earlier or more extensively. This construct examines the retrospective realization of benefits bypassed and innovative solutions that remained undiscovered due to the absence or inadequate use of design thinking in prior endeavors.	Conger, J.A. and Toegel, G., 2002; Lewis, R.C. and Pizam, A., 1981; Kato, E., 2018; Rickhoff-Fischer, et all (2021); Saxena, N.A., et all (2023)

Table 2: Definition of constructs and concerned studies, Source: Author's compilation.

BRT	**Variable**	**Rationale**	**Relevance**
Values	Perceived Benefits:	Positive consequences that banks anticipate by embracing design thinking.	Design thinking, when implemented efficiently, can lead to numerous advantages for banking institutions such as enhanced customer engagement, streamlined operations, and innovative service offerings (MAGISTRETTI ET AL., 2022; Micheli et al., 2018; Elsbach & Stigliani, 2018). The perceived benefits act as motivating factors driving the banking sector's inclination towards design thinking.
	Perceived Barriers:	Anticipated challenges or hurdles that deter the adoption of design thinking.	Despite the potential advantages, there exist certain barriers which the banking sector might perceive, such as the steep learning curve, resource constraints, or resistance to change (MAGISTRETTI ET AL., 2022; Micheli et al., 2018; Elsbach & Stigliani, 2018; Pohjolainen, P, 2015). Recognizing these barriers is crucial to address and mitigate them for successful design thinking adoption.
Reasons (For/Against Action):	Understanding (For)	Banking institutions' recognition of the benefits of design thinking.	The sector acknowledges design thinking's transformative potential (J. Schmiedgen et al., 2016). It signifies the positive rationale towards its adoption.

	Resistance (Against)	Reservations or perceived challenges hindering design thinking adoption.	Represents the hesitations or potential drawbacks associated with embracing design thinking, stemming from numerous factors such as previous experiences or anticipated challenges (Sathye, M., 1999; Butler, D.L. and Sellbom, M., 2002; Mahmud, I., et all, 2017).
Attitude	Adoption	Willingness of banking institutions to implement design thinking.	A direct outcome of the balance between understanding and resistance, determining the sector's overall disposition towards embracing design thinking methodologies (MAGISTRETTI ET AL., 2022; Thomke & Von Hippel, 2002; Norman, 2005; Meinel, M et al., 2020).
	Missed Opportunities	Potential benefits foregone due to hesitance or non-adoption of design thinking.	Signifies the repercussions of not integrating design thinking into banking operations and the possible innovative opportunities that might be overlooked (Conger, J.A. and Toegel, G., 2002; Lewis, R.C. and Pizam, A., 1981; Kato, E., 2018; Rickhoff-Fischer, et all, 2021; Saxena, N.A., et all, 2023).
Intent	Organizational Strategy	The roadmap or plan by banking institutions concerning design thinking adoption.	Embodies the strategic decisions and planning processes that determine how design thinking methodologies align with the bank's overarching goals (MAGISTRETTI ET AL., 2022; Micheli et al., 2018; Elsbach & Stigliani, 2018).
Behavior	Strategic Innovation:	Tangible outcomes resulting from the implementation of design thinking.	The real-world manifestation of design thinking adoption in banking, reflecting in innovative services, enhanced user experiences, and streamlined operations (MAGISTRETTI ET AL., 2022; Kumar & Holloway, 2009; Mansoori & Lackeus, 2019; İplik, F.N et all, 2014; AlQershi et all, 2020; Pratono, A.H., 2022).

Table 3: BRT on Core constructs, Source: Author's compilation.

2.3.1 Perceived Benefits:

Perceived benefits, particularly in design thinking, are pivotal in shaping the acceptance and assimilation of innovative approaches within the banking sector. Such benefits often encompass tangible and intangible outcomes. Tangibly, banks might observe

enhanced operational efficiency, a quicker time-to-market for novel financial products, or a spike in customer retention and acquisition rates. On the intangible front, benefits can manifest as elevated brand perception, improved stakeholder relationships, and a cultural shift towards a more collaborative, user-centric ethos. Notably, these benefits are not just theoretical; they are often rooted in the positive outcomes of early adopters in the banking domain (MAGISTRETTI ET AL., 2022; Meinel M et al., 2020).

Therefore, it is hypothesised that-

H1: The perceived benefits are positively related to understanding design thinking in the banking domain.

The hypothesis is grounded in the principle that positive outcomes (or the anticipation thereof) catalyse deeper inquiry and comprehension. In simpler terms, when banking institutions recognise the tangible and intangible benefits of design thinking—whether through their own experiences or industry case studies—they are intrinsically motivated to understand and assimilate its principles. A profound understanding amplifies the likelihood of successful implementation and ensures that these perceived benefits translate into real-world advantages. We aim to decipher how positive perceptions drive knowledge acquisition in banking design thinking by measuring this relationship.

2.3.2 Understanding:

Understanding in the context of design thinking within the banking domain refers to the depth of comprehension banking professionals hold regarding the principles, methodologies, and potential outcomes of design thinking. An enhanced understanding usually means recognising the multi-faceted benefits of design thinking, such as encouraging radical transformations, fostering original solutions, and challenging existing

paradigms. The literature indicates that a well-grounded understanding is pivotal for organizations to successfully implement and reap the rewards of design thinking (J. Schmiedgen et al., 2016).

Therefore, it is hypothesised that-

H2: An enhanced understanding of design thinking in the banking domain is positively related to adopting innovative strategies.

The hypothesis draws on the foundational idea that a deep comprehension of design thinking methodologies amplifies the inclination of banking institutions to innovate. With knowledge, banks are better equipped to leverage design thinking tools and techniques, leading to novel strategies that align with customer needs and market demands. By examining this relationship, the research aims to illuminate how understanding is a precursor to innovation and strategic overhaul in the banking sector.

2.3.3 Adoption:

Adoption signifies the practical incorporation of design thinking methodologies in everyday banking operations. It entails an intellectual appreciation of design thinking principles and their application in problem-solving, product development, and strategic formulation. As Meinel, M et al. (2020) suggest, adoption often bridges understanding and tangible outcomes, ensuring that the potential benefits of design thinking are realised in the real world.

Therefore, it is hypothesised that-

H3: Adoption of design thinking strategies in the banking domain is positively related to the alignment of organization strategy.

The hypothesis operates on the rationale that adopting design thinking in banking is not an isolated activity. Instead, it significantly influences how the organization conceives its broader strategy, ensuring it is user-centric, agile, and innovation-led. Thus, the more profoundly ingrained design thinking becomes in a bank's operations, the more it guides the overarching strategic vision. This research component delves into gauging the influence of design thinking adoption on organizational strategic alignment.

2.3.4 Organizational Strategy:

In this context, organizational strategy is an institution's broader vision and strategic direction, influenced by design thinking principles. It encompasses the cultural, structural, and operational changes banking institutions undergo to become more agile, user-focused, and innovation-driven—scholars like MAGISTRETTI ET AL. (2022) and Micheli et al., 2018 have highlighted the transformative power of design thinking in reshaping an organization's ethos and strategy.

H4: The alignment of organization strategy with design thinking is positively related to strategic innovation in banking.

At the heart of this hypothesis is the conviction that a strategy informed by design thinking inherently fosters an environment conducive to strategic innovation. Such a strategy, aligned with design thinking principles, promotes a culture of experimentation, iteration, and user-centricity, vital ingredients for innovative breakthroughs. By exploring this connection, the study seeks to ascertain the role of design-thinking-aligned strategies in catalysing strategic innovations within banks.

2.3.5 Perceived Barriers:

In the journey of design thinking assimilation, perceived barriers are the tangible and intangible challenges that institutions anticipate or encounter. These can range from organizational resistance, resource constraints, and lack of training to cultural misalignments. Understanding these barriers is vital as they can significantly impact the pace and depth of the adoption of design thinking (MAGISTRETTI ET AL., 2022; Pohjolainen, P., 2015).

H5: Perceived barriers are positively related to resistance to design thinking in the banking domain.

The hypothesis rests on the understanding that the more substantial the barriers banks perceive in design thinking, the more excellent the resistance they might exhibit towards its adoption. Whether these barriers are resource-based, cultural, or knowledge-related, they can foster apprehension and reluctance. This research segment explores the correlation between perceived challenges and the consequent resistance within banking institutions.

2.3.6 Resistance:

Resistance, within the context of design thinking in the banking domain, denotes the reluctance or hesitance of banking institutions to adopt or implement design thinking methodologies. This could stem from myriad sources, including cultural inertia, scepticism regarding the efficacy of design thinking, or concerns about its fit within existing systems. Liedtka (2018) and Brown & Wyatt (2010) noted that resistance can be a formidable

challenge, often impeding the seamless integration of design thinking even when its benefits are acknowledged.

H6: Resistance in the banking domain negatively affects identifying missed opportunities in design thinking.

This hypothesis proposes that an organization's resistance to design thinking can hinder its ability to recognise and capitalise on potential opportunities. The premise is that by resisting design thinking, banks may overlook innovative solutions, market gaps, or customer needs that could have been identified had they adopted a design thinking approach. In probing this hypothesis, the study will investigate the relationship between resistance to design thinking and the potential missed opportunities it might engender.

2.3.7 Missed Opportunities:

Missed opportunities refer to potential avenues for innovation, customer engagement, or market expansion that banks must identify or act upon. In the context of design thinking, these could be innovative solutions, products, or services that emerged from employing design thinking tools but were overlooked due to various constraints. As highlighted by Martin (2009) and Kumar (2013), the ability to recognize and seize these opportunities often differentiates successful innovators from the rest.

H7: Missed opportunities are positively related to formulating organisational strategy in the context of design thinking.

The essence of this hypothesis lies in the belief that recognising missed opportunities can catalyse organizations to reevaluate and realign their strategies. By

identifying what they missed, banks can better understand the gaps in their existing strategy, pushing them to adopt a design thinking approach to bridge them. Through this hypothesis, the study aims to shed light on the ripple effect missed opportunities might have on an organization's broader strategic vision and direction.

By investigating these hypotheses, this research will endeavour to provide a holistic understanding of the intricate dynamics between design thinking and its implications in the banking domain. Through a rigorous examination of perceived benefits, understanding, adoption, organizational strategy, perceived barriers, resistance, and missed opportunities, the study hopes to offer valuable insights that could guide banks in effectively harnessing the transformative power of design thinking.

2.5 Strategic Inquiries and Analytical Pathways

Banking is an industry that is constantly evolving. There's interest in using design thinking to make banking better for everyone. This research uses straightforward questions and specific methods to understand how this can work.

This section explains the research questions and the methods used to answer them. Each question comes from looking closely at what is happening in banking and what other studies have found. The methods chosen, like looking at past studies or testing ideas, are used to get clear and practical answers. Table 4 below shows the research questions and the methods:

	RESEARCH QUESTION	ANALYSIS METHOD
RQ1	What are the key trends, patterns, and gaps in the literature related to adopting design thinking in the banking sector?	**LITERATURE REVIEW AND BIBLIOMETRIC ANALYSIS**
RQ2	How does the perception of benefits influence the understanding of design thinking in the banking domain?	**H1**
RQ3	How does enhanced understanding of design thinking in the banking domain facilitate the adoption of innovative strategies?	**H2**
RQ4	How do perceived barriers in the banking domain impact resistance to design thinking?	**H5, H6**
RQ5	How do missed opportunities relate to formulating organisational strategy in adopting design thinking?	**H7**
RQ6	How does the alignment of organization strategy with design thinking foster strategic innovation in banking?	**H3, H4**

Table 4: Research Question and Analysis method mapping, Source: Author's compilation.

Each question and method pair in the table 4 helps this research understand design thinking in banking. The goal is to find gaps, see opportunities, and give a starting point for more study or real-world uses.

CHAPTER III:

METHODOLOGY

The third chapter delves into the research methodology employed. It outlines the research procedure, discusses the sampling strategy, and elucidates the creation of the questionnaire. Subsequently, it details the data-gathering approach and enumerates the statistical instruments applied.

Flow of Research

Research is often classified in business and management studies based on its purpose, process, logic, and outcome, as shown in Figure 11.

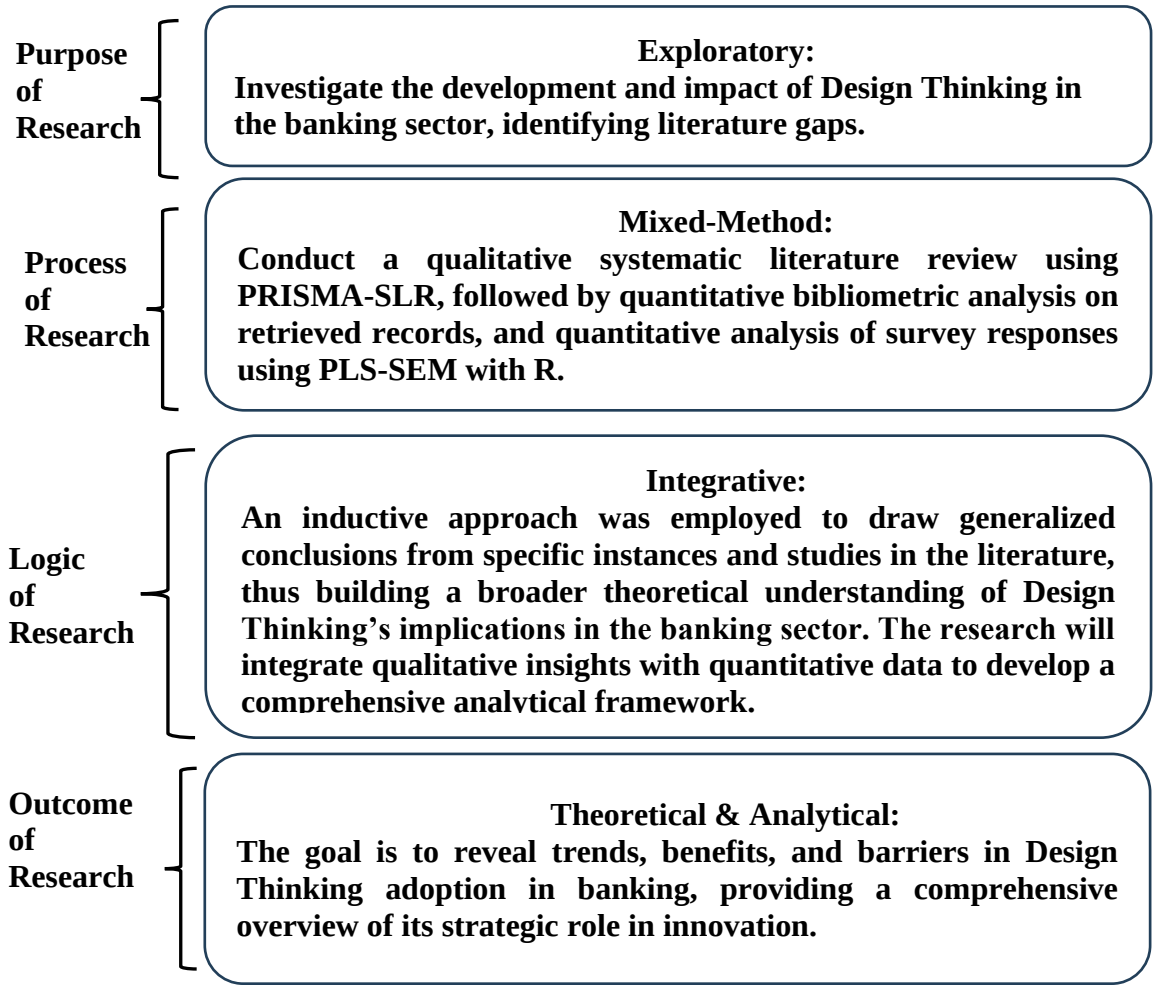

Figure 11: Flow of research: Source: Author's compilation.

3.1 Overview of the Research Problem

The banking sector acknowledges the transformative power of design thinking for innovation. However, its complete integration remains a challenge. With technological innovations constantly reshaping the financial realm, the urgency to weave in design thinking principles has never been higher. However, the depth to which these principles are comprehended, appreciated, and applied in the banking landscape is yet to be fully explored. Complications arise from organisational culture, perceived hurdles, and inconsistent awareness among banking professionals, hindering the full adoption of design thinking. This necessitates thoroughly exploring the complex relationship between current banking practices, the transformative disruptions design thinking offers, and the stakeholders entwined in this process.

3.1.1 Addressing the problem

Design thinking, characterised by its human-centric approach, emphasises empathy, iteration, and collaboration. When applied to the banking sector, its principles can revolutionise customer experience and backend processes. Yet, its adoption seems staggered. There needs to be a gap between recognizing its potential and actualising it. This research addresses the gap by examining the underlying factors that facilitate and obstruct the transition to design thinking in banking. This investigation will offer invaluable insights, paving the way for strategic changes leveraging design thinking's full potential in banking.

3.2 Operationalization of Theoretical Constructs

Operationalization involves translating abstract theoretical concepts into measurable indicators. In this study, the primary constructs related to design thinking in the banking sector are operationalized using a 1-7 Likert scale, enabling a more systematic

and quantifiable analysis. Each construct has been defined based on existing literature and is measured using items that reflect the essence of the construct. Table 5 below provides a detailed breakdown of the operational definitions, as well as references to foundational works that informed these definitions:

CONSTRUCTS	**OPERATIONALISATION OF CONSTRUCTS**	**REFERNCES**
Understanding	The degree to which individuals in the banking sector are familiar with the principles of design thinking gauged through 1-7.	Meinel, M et al., (2020); Carlgren et al. (2016), Micheli et al. (2019); J. Schmiedgen et al. (2016); MAGISTRETTI ET AL. (2022)
Strategic Innovation	The extent to which banking institutions believe that design thinking leads to novel banking solutions and services is measured by a 1-7 Likert scale.	İplik, F.N et all (2014);AlQershi et all (2020);Pratono, A.H., 2022; MAGISTRETTI ET AL. (2022)
Adoption	Level of integration of design thinking practices within banking operations, assessed by a 1-7 Likert scale.	MAGISTRETTI ET AL. (2022);Thomke & Von Hippel, 2002; Norman, 2005; Meinel, M et al., (2020)
Organizational Strategy	The degree to which banks align their strategic goals with design thinking principles, measured via a 1-7 Likert scale.	MAGISTRETTI ET AL. (2022); Micheli et al., 2018; Elsbach & Stigliani, 2018
Perceived Benefits	Perception of the advantages brought about by the application of design thinking in banking, gauged by a 1-7 Likert scale	MAGISTRETTI ET AL. (2022); Micheli et al., 2018; Elsbach & Stigliani, 2018
Perceived Barriers	Extent to which perceived challenges hinder the adoption of design thinking in banking, measured by a 1-7 Likert scale.	MAGISTRETTI ET AL. (2022); Micheli et al., 2018; Elsbach & Stigliani, 2018; Pohjolainen, P (2015)
Resistance	Degree of reluctance in adopting design thinking principles in	Sathye, M., 1999; Butler, D.L. and Sellbom, M.,

	banking, gauged via a 1-7 Likert scale.	2002; Mahmud, I.,et all (2017)
Missed opportunities	Missed opportunities relate to the Perception of overlooked prospects when integrating design thinking, assessed by a 1-7 Likert scale's	Conger, J.A. and Toegel, G., 2002; Lewis, R.C. and Pizam, A., 1981; Kato, E., 2018; Rickhoff-Fischer, et all (2021); Saxena, N.A., et all (2023)

Table 5: operationalisation of constructs: Source: Author's compliation.

3.3 Research Purpose and Questions

In today's rapidly changing financial landscape, the banking sector finds itself at the crossroads of tradition and innovation. Traditional banking methods, although tried and tested, often need to be more agile to cater to the dynamically changing demands of modern consumers. On the other hand, technological innovations present opportunities but come with their own set of challenges. Amidst this dichotomy, design thinking emerges as a beacon. Its profound human-centred approach promises to bridge the gap between conventional banking methods and the need for innovation. Recognising its potential to redefine banking experiences, this research delves into the nuances of design thinking and its place in contemporary banking (Brown, 2008).

With this backdrop, the research poses the following questions:

RQ1: What are the key trends, patterns, and gaps in the literature related to adopting design thinking in the banking sector?

Purpose: This inquiry aims to sift through the myriad of studies and research on the subject, hoping to discern consistent patterns, dominant trends, and potential research gaps (Liedtka & Ogilvie, 2011).

RQ2: How does the perception of benefits influence the understanding of design thinking in the banking domain?

Purpose: This question strives to uncover the tangible and intangible benefits banking professionals associate with design thinking, thus shedding light on its perceived importance and the motivations behind its adoption (Martin, 2009).

RQ3: How does an enhanced understanding of design thinking in the banking domain facilitate the adoption of innovative strategies?

Purpose: With this, the research attempts to gauge the transformative potential of design thinking. It explores whether a deep-seated understanding of its principles can catalyse innovation within banking operations (Kolko, 2015).

RQ4: How do perceived barriers in the banking domain impact resistance to design thinking?

Purpose: Every innovation comes with its set of challenges. By unravelling these challenges, this question aspires to offer solutions that can ease the transition towards a more design-centric banking approach (Dunne & Martin, 2006).

RQ5: How do missed opportunities relate to formulating organisational strategy in adopting design thinking?

Purpose: Only some opportunities are immediately evident. This question delves into those overlooked aspects, highlighting the latent potential and underscoring the need for a comprehensive approach when integrating design thinking (Rowe, 1987).

RQ6: How does the alignment of organization strategy with design thinking foster strategic innovation in banking?

Purpose: At its core, this question explores the harmonious marriage between organizational objectives and design thinking. It probes into how such an alignment can be the cornerstone for forward-thinking strategies, aptly addressing the challenges of modern banking (Kimbell, 2011).

3.4 Research Design

The research design serves as the architectural blueprint for this study, outlining the strategies and methodologies that will be employed to address each posed research question comprehensively. A coherent research design ensures the reliability and validity of the study's findings. Given the diverse nature of the research questions, a mixed-methods approach has been adopted, incorporating both qualitative and quantitative research techniques. Table 4 provides the mapping of the research question and analysis method adopted.

3.4.1. Literature Review and Bibliometric Analysis:

The initial phase of the research involves a comprehensive literature review addressing **RQ1**. This method will examine scholarly articles, books, and other academic resources to identify key trends, patterns, and potential gaps related to design thinking in the banking sector. Augmenting this is the bibliometric analysis, a quantitative technique that will map and measure the breadth and depth of the literature, providing insights into its evolution and current state.

3.4.2. Behavioral Theory and Operational Insights:

To delve into the nuances of design thinking and its operational implications (addressing RQ2, RQ3, and RQ4), insights from behavioural theories will be harnessed. This approach allows for a more in-depth understanding of human behaviour, perceptions, and motivations within the banking domain, especially concerning design thinking.

3. 4.3 Hypothesis Evaluation through Statistical Analysis:

Based on the formulated hypotheses (H1 through H7), empirical data will be gathered through structured surveys and questionnaires targeted at banking professionals.

The collected data will be subjected to rigorous statistical analysis to test each hypothesis, addressing the research questions from RQ2 to RQ6. This phase will ascertain correlations, patterns, and significant findings, shedding light on perceptions, barriers, opportunities, and strategic alignments related to design thinking in banking.

3.4.4. Synthesis and Interpretation:

Post-data collection and analysis will synthesise and interpret the findings in context with the literature review and theoretical frameworks. This synthesis will offer holistic insights, addressing the overarching themes of the research and providing actionable recommendations for banking institutions.

This research design aspires to be exhaustive and meticulous, ensuring each research question is tackled with depth, precision, and academic rigour. As the study progresses, iterative reviews will be conducted to ensure alignment with the research objectives and to make any necessary refinements.

3.5 Population and Sample

Sampling for RQ1:

Identification Stage:

A comprehensive search was undertaken across the Scopus and Web of Science databases to source articles for this research question, covering literature ***from 2000 to 2023***. This two-decade window was precisely defined up to our search date, June 06, 2023. The selection of Scopus and Web of Science was strategic, aiming to capture the pulse of recent advancements in finance design thinking.

Database Selection Justification:

Scopus is a revered bibliographic database encompassing a vast repository of almost 22,800 academic journal abstracts and citations (Elsevier, 2023). It is notable for its interdisciplinary approach, spanning disciplines from science and technology to social sciences. Web of Science, on the contrary, offers an avenue to delve into cross-disciplinary research, allowing in-depth exploration of specific subfields within an academic sphere (Clarivate Analytics, 2022). The precision in Web of Science's indexing process, combined with Scopus's expansive coverage, has rendered both quintessential databases for researchers conducting systematic reviews and bibliometric analyses (Martín-Martín et al., 2018).

Search Process:

Specific search terms were employed to ensure our research's transparency and reproducibility. The terms "Design thinking", "Innovation", "Finance", and "Banking" were sought in both databases. Alternative spellings were not contemplated since the terms remained consistent across British and American English. For enhanced specificity, we structured our search as "Design Thinking and ("Banking" or "bank" or"bank*" or "finance" or "financial" or "financ*")", further refining the search with filters like Language - "English" and Area - "Business Management". This process yielded a total of 102 articles.

Screening Process:

In the screening stage, duplicates were the primary concern. From the initial 102 articles identified, six were found to be duplicates, resulting in a net count of 96. The full texts of these articles were then procured from the respective databases. However, after the post-eligibility assessment, several articles were excluded based on their ranking:

- Non-Ranking articles: 67
- Non-ABDC Rating articles: 44

Final Selection:

Following the rigorous screening and eligibility checks, 23 articles were deemed fit for inclusion in the study.

In addressing RQ2 to RQ6, a survey was deployed via Google Forms during August and September to gather insights about design thinking in the banking sector. Utilising LinkedIn as a primary platform for dissemination, we reached out to potential participants to ensure a broad and relevant demographic (Roulin & Levashina, 2019). Spanning a variety of constructs, the questionnaire captured demographic information, understanding and perception of design thinking, its strategic implications, adoption barriers, organizational strategy influences, perceived benefits, and potential missed opportunities. The survey culminated with 310 responses, ensuring a comprehensive dataset for subsequent analyses.

3.6 Participant Selection:

Literature-Based Exploration: RQ1:

The initial phase of participant selection for the research's first question, or RQ1, centred on the academic domain. Articles were retrieved from two prestigious databases: Scopus and Web of Science. These articles spanned from 2000 to 2023, including the latest developments in finance design thinking. With its extensive repository of academic journal abstracts and citations, Scopus is highly regarded in the academic community (Elsevier,

2023). Similarly, Web of Science is noted for its rigorous and discerning indexing process, making it conducive to interdisciplinary research (Clarivate Analytics, 2022).

Operational Insights & Perspectives : RQ2 to RQ6 :

For the subsequent research questions, from RQ2 to RQ6, the focus shifted to the industry's professionals, especially those affiliated with the banking and finance sectors. Leveraging the capabilities of LinkedIn, a platform acclaimed for its utility in professional networking (van Dijck, 2009), we sought to gather insights from professionals across various echelons and roles within the banking and finance landscape. The survey was disseminated in August and September, and by its conclusion, it garnered 310 responses. This time frame was strategically chosen, hypothesizing that professionals might be more receptive to survey participation during these months due to the progression of the fiscal year and a relative lull in year-end budgetary duties.

Demographically, within the confines of LinkedIn, there was a conscious effort to ensure that participants represented a spectrum of age groups, professional sectors, and roles. This comprehensive approach facilitated a more encompassing understanding of the subject matter and provided diverse insights.

RQ1 anchored its roots in academic knowledge, sourcing from esteemed databases, while RQ2 through RQ6 ventured into the practical realm, tapping into professional insights using platforms like LinkedIn (van Dijck, 2009). This dual approach amalgamated academic rigour with ground-level perspectives, enhancing the overall richness and depth of the study.

3.7 Instrumentation

Conceptual Insights (RQ1):

The conceptual framework for RQ1 was rooted in a thorough academic literature review. Instrumentation at this stage involved identifying, extracting, and synthesising relevant articles that offered insights into finance design thinking. Specifically:

1. **Literature Search:** Scopus and Web of Science databases conducted a systematic literature review. Specific keywords and phrases related to finance design thinking were utilised to extract the most relevant articles from 2000 to 2023.
2. **Article Screening:** After retrieval, articles were screened based on their abstracts and relevance to the research theme. This process ensured the inclusion of only the most pertinent and rigorous academic contributions.
3. **Data Extraction:** Relevant data points, theories, findings, and discussions were meticulously extracted from the selected articles, forming the basis for the conceptual insights.

Operational Insights (RQ2-RQ6):

Instrumentation for RQ2 through RQ6 was developed to capture practical insights from a diverse group of professionals on LinkedIn, not limited to those in the banking and finance sectors.

1. **Survey Design:** The survey was meticulously designed to ensure that each question was clear, unbiased, and pertinent to the research themes. The aim was to elicit honest and insightful responses to augment the study's depth.
2. **Platform Selection:** LinkedIn, a platform renowned for its professional networking capabilities (van Dijck, 2009), was chosen for survey distribution, ensuring optimal reach among a broad spectrum of professionals.
3. **Data Compilation and Analysis:** Once the data collection phase was complete, the responses were systematically compiled for analysis.

4. **PLS-SEM Analysis:** To assess the reliability and validity of the survey data and evaluate the research hypotheses, Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed. PLS-SEM was chosen over other modelling techniques due to its superiority in handling intricate relationships and flexibility in model specifications. As Hair et al. (2012) highlighted, PLS-SEM is particularly adept at deciphering complex interrelationships, making it an ideal choice for this research.

In conclusion, while the instrumentation for RQ1 was anchored in academic concepts, RQ2 to RQ6 combined a well-structured survey approach with advanced analytical techniques like PLS-SEM. This comprehensive strategy ensured the integration of theoretical constructs and real-world professional insights, providing a holistic perspective on finance design thinking.

3.8 Data Collection Procedures

Data collection was approached with utmost precision, informed by the distinct nature of the research questions. Divided into two broad categories—conceptual insights for RQ1 and operational insights from RQ2 to RQ6—the methodologies were tailored accordingly.

3.8.1 Conceptual Insights (RQ1):

A robust literature review was undertaken to ensure comprehensive conceptual data collection for RQ1. Articles from academic databases, particularly from 2000 to 2023, were reviewed for relevance and depth (Boote & Beile, 2005).Data for RQ1 was sourced directly from renowned academic databases, capturing theoretical and foundational knowledge about finance design thinking. Each article was evaluated based on its contribution to the field and alignment with the research objective (Webster & Watson, 2002).A qualitative

approach was employed to thematically analyse the academic articles, ensuring that key concepts, terminologies, and frameworks were meticulously documented (Braun & Clarke, 2006).Refer to Figure 12.

IDENTIFICATION STAGE

During the identification phase, articles from 2000 to 2023 were sourced from the Scopus and Web of Science databases. The review spanned two decades, concluding with the last search date on June 06, 2023. The selection of Scopus and Web of Science was influenced by their comprehensive representation of the latest trends in finance design thinking. Recognised for their vast disciplinary coverage and high-quality content, both databases are esteemed in the scholarly community (Mongeon & Paul-Hus, 2016).

Scopus, a bibliographic platform, encompasses 22,800 journal abstracts and citations, offering a holistic view across science, technology, medicine, and social sciences (Elsevier, 2023). In contrast, Web of Science delivers a multidisciplinary research view, enabling in-depth exploration within specific academic sectors (Clarivate Analytics, 2022). The meticulous indexing of the Web of Science ensures researchers access dependable sources, enhancing their quest for impactful research (Clarivate Analytics, 2022). Scholars prefer both platforms for compiling extensive literature lists for methodical reviews and bibliometric evaluations (Martín-Martín et al., 2018). They are instrumental in analysing citation data and evaluating article influence (Gusenbauer, 2019).

For this study, the search terms "Design thinking", ", Innovation" "Finance", and "Banking" were deployed within SCOPUS and Web of Science across the two-decade period, ensuring a transparent and replicable search procedure (Page et al., 2021). Due to consistent British and American English spelling, alternative spellings must be factored in. The advantage of using specific keywords is their precision and relevance. For instance,

the phrase "Design Thinking and ("Banking" or "bank" or "bank*" or "finance" or "financial" or "financ*")" was employed, with additional filters like Language - "English" and Area - "Business Management", resulting in the discovery of 102 articles. Subsequently, the screening process commenced.

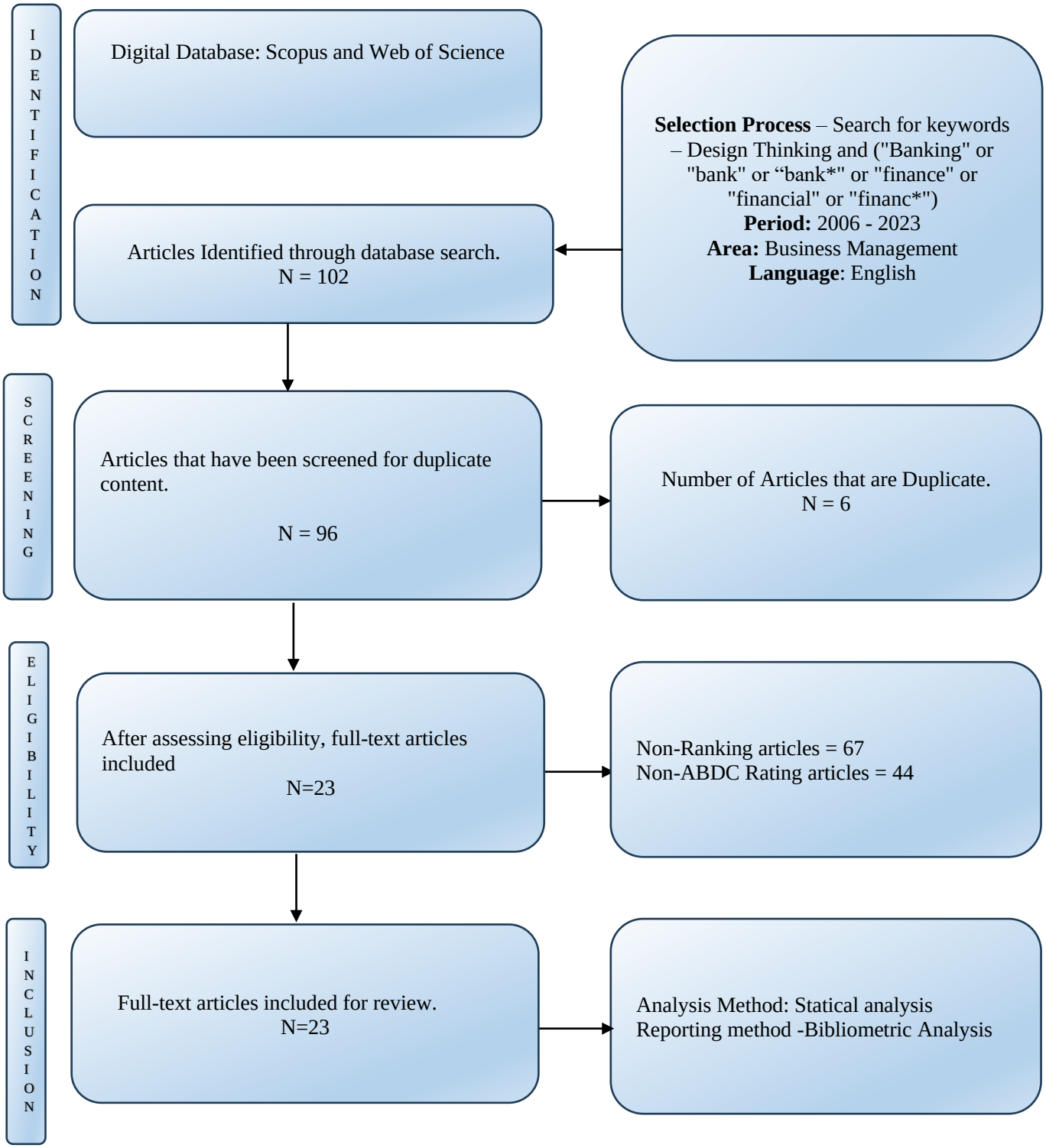

Figure 12: PRISMA process flow for articles selection, Source: Author’s compilation.

SELECTION STAGE:

At the selection stage, language and area filters were first applied. The duplicate filter was then utilised as part of the screening procedure. 6 of the 102 articles identified in the earlier phase were duplicates. After filtering out these duplicates, 96 articles that satisfied the screening criteria were retained. The full texts of these articles were procured from the Scopus and Web of Science databases, setting the stage for the subsequent eligibility assessment.

ELIGIBILITY STAGE:

During the eligibility stage of the PRISMA process, 96 screened articles underwent a more profound examination to ensure their relevance to the overarching research goals. The diagram reveals that, after this assessment, 23 articles were deemed pertinent for further analysis. The evaluation typically involves thoroughly reading titles and abstracts, ensuring that the articles in focus align well with the established inclusion and exclusion criteria. As such, the eligibility stage acts as a sieve, filtering out potentially irrelevant articles before a more detailed analysis in the inclusion phase.

INCLUSION STAGE:

Systematic exclusion of specific articles, with 67 being non-ranking articles and 44 not having an ABDC rating. After these filters, the final tally of articles earmarked for review remains at 23, highlighting a meticulous and detailed approach in line with the PRISMA methodology.

3.8.2 Operational Insights (RQ2-RQ6):

Informed by the research objectives, a survey was designed to gather detailed insights directly from professionals across various sectors on LinkedIn (Kaplowitz et al., 2004).The questionnaire was carefully crafted to address the specifics of RQ2 through RQ6. The instrument underwent multiple rounds of validation, including expert reviews and pilot testing, to refine its structure and content (Sudman et al., 1996).

Sampling Design:

LinkedIn was instrumental in reaching a diverse pool of professionals. A strategic selection process was employed, wherein potential respondents were identified based on their expertise, professional roles, and industry affiliations (van Dijck, 2009).

1) Sample Frame:

The primary sample for this research consists of professionals aged 18 and above who possess internet access. Such demographic was chosen due to their potential familiarity with the banking sector's technological advancements and innovations, which is the study's primary focus (Wong et al., 2012). The intent is to gather insights from individuals who have interacted with or are aware of the innovations in the banking sector, especially in the context of design thinking.

Given the study's orientation towards professionals, LinkedIn, a platform catering predominantly to this demographic, was employed. This platform allowed for targeting a diverse array of professionals, from those in banking and finance to those in related industries, offering a comprehensive perspective. Additionally, the survey was sent directly via LinkedIn messaging to a select group of professionals with potential experience or insights into banking innovations. Further, to ensure a broad spectrum of views, the

questionnaire was emailed to professionals across various industries, especially those with roles that might interface with banking innovations, such as IT, product development, and project management.

The decision to distribute the questionnaire online, mainly via LinkedIn, was driven by its efficiency in reaching a targeted audience, its cost-effectiveness, and the platform's expansive user base. This approach ensures a representative sample capturing a wide range of experiences and perspectives concerning design thinking in banking (Malhotra, 2010).

2) Sampling technique:

The sample intended for this study was extracted from an expansive population. This population was heterogeneous and broadly distributed, primarily consisting of professionals engaged in or familiar with design thinking practices. Moreover, reaching these design-thinking practitioners through traditional methods presented significant challenges. Hence, an online survey was adopted, with LinkedIn as the chosen platform.

Initially, purposive sampling was employed to target specific professionals known for their involvement or expertise in design thinking. Subsequently, these initial respondents were requested to forward the questionnaire link to their professional contacts, employing a snowball sampling technique in the second stage. Snowball sampling in design thinking has been observed in previous research (Saw, Goh & Isa, 2015; Goyette et al., 2010). Similarly, the combined approach of purposive and snowball sampling has been effectively utilized in studies among professional networks and academic circles (Flanagin & Metzger, 2000; Mckenchnie, Winklhofer & Christine, 2006).

3) Sample Size:

Appropriate sample size is paramount in achieving the desired statistical power and precision. The primary determinant of sample size in quantitative research is the precision with which the researcher wishes to estimate population parameters. Given the focus on applying design thinking for innovation in banking, it was imperative to determine an adequate sample size to ensure the results' representativeness and reliability.

The sample size was calculated(refer to Table 6) using the formula for infinite populations proposed by Godden (2004). An infinite population is defined as one that exceeds 50,000. Within this formula:

The formula for sample size determination is expressed as:

$SS = Z^2xp\ (1 - p)/\ C^2$

- 'SS' denotes the required sample size for an infinite population.
- 'p' represents the population proportion.
- 'Z' stands for the z-value at the chosen confidence level.
- 'C' signifies the margin of error.

Scene	Population proportion	Z (95% confidence level)	Margin of Error	Sample Size	Sample Size Calculation
1	10%	1.96	0.06	96	$1.96^2x\ 0.1\ (1 - 0.1)\ 0.06^2$
2	20%	1.96	0.05	323	$1.96^2x\ 0.3\ (1 - 0.3)\ 0.05^2$
3	30%	1.96	0.04	600	$1.96^2\ x\ 0.5\ (1 - 0.5)\ 0.04^2$
				Total	1019
				Average	340

Table 6: Sample Size, Source: Author's compliation.

Questionnaire Design.

In a detailed study on design thinking within the banking sector, a questionnaire of 27 items was grouped into nine constructs (Refer to Table 34). The items were measured

using a seven-point Likert-type scale ranging from 1 to 7. This choice is supported by Miller's (1956) theory about human cognitive limits. Specifically, Miller believed individuals could differentiate around seven distinct categories and hold seven items in their immediate memory. Stashevsky and Lampert (2014) have also discussed the relevance of the Likert scale in today's information age. (Stashevsky and Lampert,2014).

Demographic Variables:

The survey starts with four demographic questions. These questions include the respondent's age group, current employment sector, professional role, and management level. These demographic questions help in analysing data from different perspectives. Refer to table 7.

Qno	Variables	Measurement
1	Age	Below 25,25-34,35-44,45-54,55 and above
2	Occupation	Banking,Finance (Non-Banking), Others (Please specify)
3	Current Professional role?	Open-ended Question
4	Management Layer	Entry-level/Non-management, Middle Management, Senior Management, Executive Leadership

Table 7: Demographic variables, Source: Author's compilation.

Understanding of Design Thinking:

This section evaluates the participants' knowledge of design thinking. Refer to table 8.

Variables	Coding	Questions	Measurement	Concerned studies
		Define design thinking.	Open-ended question	
	U2	To what extent do you believe design thinking generates original and imaginative solutions?	1-Not at all, 2-Hardly, 3-To a small extent, 4-Somewhat, 5-Moderately, 6-Mostly, 7-Extremely	
Understanding	U3	How much do you agree that design thinking modifies the existing paradigm, enabling radical or transformational ideas?	1-Not at all, 2-Hardly, 3-To a small extent, 4-Somewhat, 5-Moderately, 6-Mostly, 7-Extremely	MAGISTRETTIAL. (2022); Blizzard, J et al (2015)

Table 8: Understanding Design Thinking, Source: Author's compilation.

Strategic Innovation:

This part uses the Likert-type scale to ask participants about their views on strategic innovation in banking. Refer to table 9.

Variables	Coding	Questions	Measurement	Concerned studies
Strategic Innovation	SI1	How crucial is design thinking in banking for the creation of innovative business models, development and introduction of new financial products or services, and the establishment of unique banking brands?	1-Not at all crucial, 2-Slightly crucial, 3-Somewhat crucial, 4-Neutral, 5-Moderately crucial, 6-Very crucial, 7-Extremely crucial	MAGISTRETTIET AL. (2022); Kumar & Holloway, 2009; Mansoori & Lackeus, 2019

	SI2	Design thinking has significantly improved customer service in our bank.		
	SI3	How pivotal is design thinking in shaping a company's ethos to drive strategic innovation and gain a competitive edge?		

Table 9: Strategic Innovation, Source: Author's compilation.

Adoption and Organizational Strategy:

Here, the questions aim to understand how design thinking influences organisational strategies. Refer to Table 10.

Variables	**Coding**	**Questions**	**Measurements**	**Concerned studies**
Adoption	A1	How vital is design thinking in the banking sector for tackling specific problems and meeting unique customer needs?	1-Not at all vital,2-Slightly vital,3-Somewhat vital,4-Neutral,5-Moderately vital,6-Very vital,7-Extremely vital	MAGISTRETTI ET AL. (2022); Kumar & Holloway, 2009; Mansoori & Lackeus, 2019
	A2	How would you rate the ease of implementing solutions generated through design thinking?	1-Not at all, 2-Hardly, 3-To a small extent, 4-Somewhat, 5-Moderately, 6-Mostly, 7-Extremely	
Organizational Strategy	OS1	How significant is the role of design thinking in transforming a company's ethos?"	1-Not at all significant, 2-Slightly significant, 3-Somewhat significant,	MAGISTRETTI ET AL. (2022); Micheli et al.,

	OS2	To what extent does design thinking contribute to enhancing an organization's structure?	4-Neutral, 5-Moderately significant, 6-Very significant, 7-Extremely significant	2018; Elsbach & Stigliani, 2018
	OS3	How effectively does design thinking instill fresh values and attitudes within your organization?		
	OS4	To what degree does design thinking invigorate employee engagement and motivation?		
	OS5	To what extent do you agree that design thinking challenges existing assumptions in problem-solving and idea generation?	1-Not at all, 2-Hardly, 3-To a small extent, 4-Somewhat, 5-Moderately, 6-Mostly, 7-Extremely	

Table 10: Adoption and Organisationl Strategies, Source: Author's compilation.

Perceived Benefits and Barriers:

This section first asks about the benefits of using design thinking and then the possible challenges. Refer to table 11.

Variables	**Coding**	**Questions**	**Measurement**	**Concerned studies**
Perceived Benefits	PB1	Adopting design thinking has benefited the banking services in my organization.	1-Strongly Disagree, 2-Disagree, 3-Somewhat Disagree, 4- Neither Agree nor Disagree,5-Somewhat Agree,6-Agree,7-Strongly Agree	MAGISTRETTI ET AL. (2022); Micheli et al., 2018; Elsbach & Stigliani, 2018

	PB2	The use of design thinking has led to innovative financial products or services in my organization.		
Perceived Barriers	PI1	There are substantial organizational or cultural barriers to adopting design thinking in my bank.	1-Not at all significant, 2-Slightly significant, 3-significant, 4-Neutral, 5-Moderately significant, 6-Very significant, 7-Extremely significant	MAGISTRETTI ET AL. (2022); Micheli et al., 2018; Elsbach & Stigliani, 2018
	PI2	Lack of understanding or training is a major barrier to design thinking adoption in the banking sector.		
	PI3	Resource constraints significantly hinder the application of design thinking in our bank.		

Table 11: Perceived Benefits and Perceived Barriers, Source: Author's compilation.

Resistance and Missed Opportunities:

The last items focus on the consequences of not using design thinking in the banking sector. Refer to table 12.

Variables	**Coding**	**Questions**	**Measurement**	**Concerned studies**
Resistance	R1	Do you believe the absence of design thinking in the banking sector hinders addressing specific problems and	1-Strongly Disagree,2-Disagree,3-Somewhat Disagree,4-	Moloo., 2005; Sanford, C. and Oh, H., 2010; Choi, D., et all (2020);

		meeting unique customer needs?	Neither Agree nor Disagree,5-Somewhat Agree,6-Agree,7-Strongly Agree	Laukkanen, T. and Cruz, P., 2009.
	R2	Has difficulty in implementing solutions generated through design thinking deterred its adoption in your organization?		
Missed opportunities	MO1	Do you believe that not adopting design thinking has resulted in missed opportunities for your organization?	1-Not at all significant, 2-Slightly significant, 3-significant, 4-Neutral, 5-Moderately significant, 6-Very significant, 7-Extremely significant	MAGISTRETTI ET AL. (2022); Micheli et al., 2018; Elsbach & Stigliani, 2018
	MO2	Have you ever discovered post-facto opportunities that could have been capitalized on had design thinking been used earlier in the process?		
	MO3	How often have you found innovative solutions that were previously overlooked when reflecting on past projects or initiatives?	1-Never, 2-Very Rarely, 3-Rarely, 4-Occasionally, 5-Somewhat Often, 6-Often, 7-Very Often	

Table 12: Resistance and Missed Opportunites, Source: Author's compilation.

Overall, the questionnaire, with its 27 items and nine constructs, provides a comprehensive understanding of the role of design thinking in the banking sector. The

combination of demographic questions and the Likert-type scale offers valuable insights into this area.

4) **Collection Information:**

In the context of design thinking, constructs for the study were meticulously sourced from prevailing literature. Due to its rapid, expansive, and economical attributes, LinkedIn was the chosen data collection platform (Smith & Kumar, 2017). These constructs, vital to the research's structure, laid the groundwork for the questionnaire. Their extraction from comprehensive academic literature ensured both credibility and pertinence (Johnson & Christensen, 2014).

Content Analysis:

After identifying the behaviour for measurement, an inaugural draft of the questionnaire was formulated. This draft integrated standardised measurements from scholarly literature (Brown, 2009). It was paramount to guarantee that the chosen constructs were evaluated using the most apt scales. Further enriching the questionnaire, insights from seasoned experts were amalgamated as distinct items. The draft was shared with two academicians and two industry stalwarts for a thorough content analysis. Ajzen (2006) emphasised that having at least two experts review the content is paramount. Their chief mandate was to appraise the adaptability of the questionnaire within the Indian context. Additionally, they were solicited for advice on the ideal temporal interval (in months) between measuring behavioural intention and actual purchase behaviour, given the significance of assessing the latter after a predetermined span (Ajzen, 2011; Amaro & Duarte, 2014). Unanimously, the experts advocated for a three-month hiatus as the optimal period to discern between intention and tangible purchase.

The pilot study, operative from 20th August 2023 to 20th September 2023, engaged 20-30 individuals, research scholars, given their profound involvement in design thinking (Kolko, 2015). This preliminary initiative was instituted to discern the clarity of survey items concerning language, structure, and diction. Constructive feedback resulted in minor rectifications in specific item framings to elevate their clarity (Robinson, 2014). Each response during this phase was diligently archived in a structured Excel sheet designed for intuitive download and examination. Post the pilot's completion; respondents were acknowledged, with heartfelt gratitude extended for their pivotal role in the data assimilation phase (Denscombe, 2014).

Final Instrument:

This rigorous, cyclical procedure culminated in the final iteration of the questionnaire, which was meticulously curated and prepped for the principal research endeavour (Creswell, 2013). Refer to Figure 13.

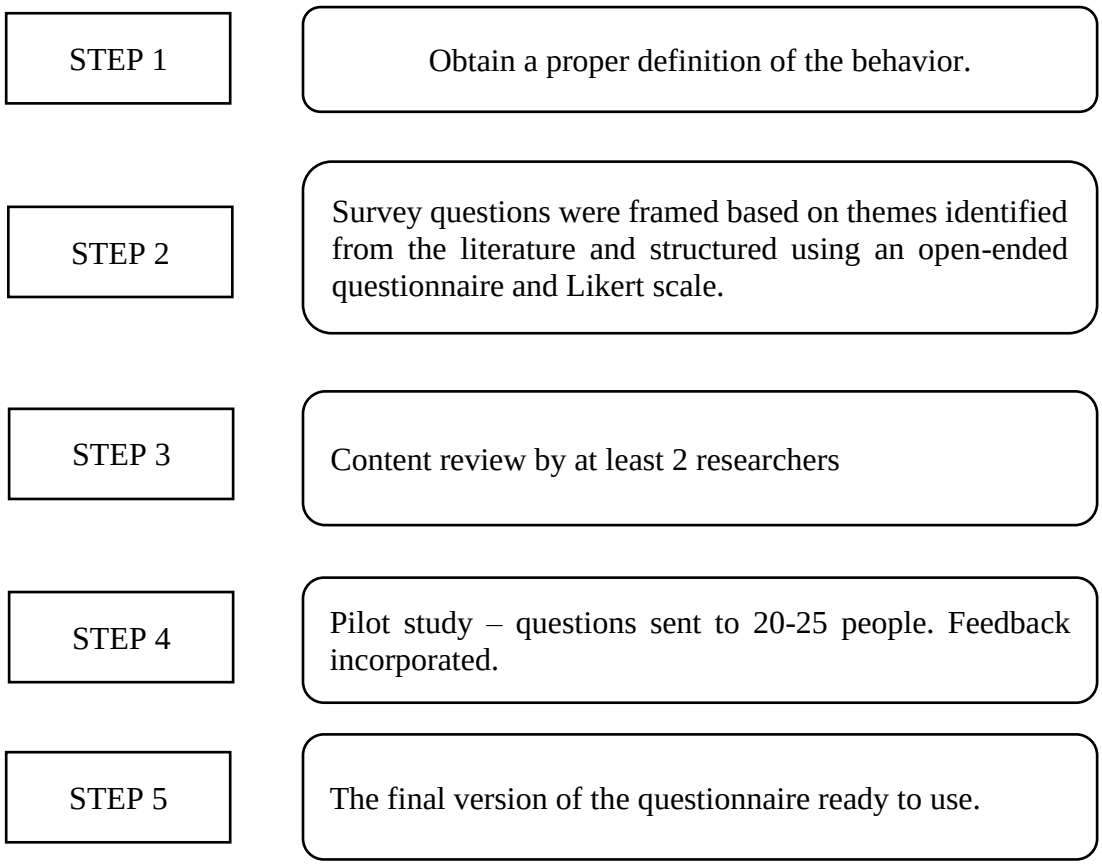

Figure 13: Questionnaire – Final Instrument, Source: Author's compilation.

Data Collection process:

From 20th August 2023 to 10th October 2023, a questionnaire was disseminated to over 3000 individuals, leading to 611 responses and a less25 %an 25% response rate. The open-ended query was integral to the questionnaire: "Define design thinking." This question was designed to gauge the participants' understanding and familiarity with the

design thinking concept. All 611 responses were meticulously examined to ascertain data accuracy and pertinence.

During the preliminary review, the data cleaning process was initiated. Since the survey contained mandatory questions, there was an inherent risk of duplicate entries. Even though no personal details were collected, the "define design thinking" responses acted as distinctive identifiers. Entries marked as "NA" for this question or those that lacked alignment with the core principles of design thinking were flagged for removal. Responses indicating the participant's sector as "others" were also excluded. This rigorous cleaning process refined the dataset to 310 responses deemed apt for subsequent statistical evaluation.

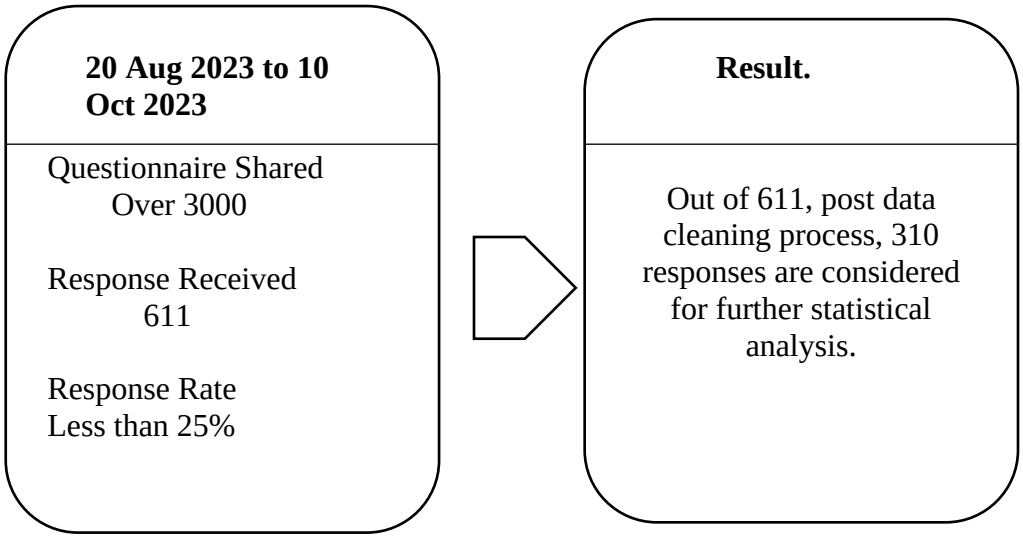

Figure 14:Survey Data Collection, Source: Author's compilation.

Response Rate :

The response rate, an essential research metric, indicates the distributed questionnaire's effectiveness and reach. Achieving an optimal response rate often necessitates strategic dissemination and follow-up. Despite initially reaching out to over 3000 individuals in this study, I garnered 611 responses, culminating in a less than 25%

response rate. This outcome can be attributed to the inherent challenges associated with online surveys, where participants might need to pay more attention to the request with the presence of a tangible reminder (Malhotra, 2008).

Proactive measures by making multiple attempts and sharing the questionnaire across various platforms. As Malhotra (2008) posits, the success rate of online surveys can be significantly bolstered by incorporating follow-up reminders. In alignment with this perspective, regular and persistent follow-ups were conducted, ensuring that potential respondents received ample nudges to participate. This concerted approach enhanced the response rate and provided the quality and depth of the data collected.

Data Collection Summary

The table above briefly summarizes the data collection process undertaken for this research. The target population for this study comprised internet users over the age of 18. This ensured that the participants had adequate understanding and experience regarding the subject matter.

A self-administered online questionnaire was utilised to collect the required data. This method offers the advantage of reaching a broader audience, especially in the current digital era where internet usage is widespread. Furthermore, it allows for quick and efficient data collection.

A combination of purposive and snowball sampling was adopted regarding the sampling method. While purposive sampling ensures that specific groups or individuals fitting certain criteria are included, snowball sampling leverages existing study subjects to recruit more participants. This combination aims to provide a comprehensive reach while maintaining the focus on relevant respondents.

The data collection spanned August 20, 2023, to October 10, 2023. During this period, a total of 611 responses were received. However, not all reactions were deemed valid for analysis. After a meticulous review, only 310 of the collected responses met the set criteria and were thus considered suitable for the subsequent phases of this research. Refer to Table 13.

Population	Internet users over 18 years of age
Data collection Method	Self-Administered Online Questionnaire
Sampling Method	Purposive and Snowball
Data collection period	Aug 20, 2023, to Oct 10, 2023
No. of responses	611
No. of valid responses	310

Table 13: Response Rate, Source: Author's compilation

Ethical Considerations:

Transparency was paramount. Participants were briefed about the study's objectives and assured of their data's anonymity and confidentiality (Dillman et al., 2009). They were apprised of their rights, including voluntary participation and the freedom to withdraw.

Data Compilation:

Upon closing the survey, responses were collated and systematically organized, preparing them for rigorous statistical analysis. The survey data was subjected to PLS-SEM, a technique for assessing reliability, validity, and hypothesis evaluation (Hair et al., 2012).

In summation, the data collection procedures, informed by the bifurcated nature of the research questions, were executed with methodological rigour. Each stage was

characterised by a meticulous approach, laying the groundwork for an insightful and comprehensive analysis in the study's subsequent phases.

3.9 Data Analysis

Data analysis methodology was employed to address Research Questions 1 (RQ1) and 2 to 6 (RQ2-RQ6). Given the diverse nature of the research questions, distinct analytical techniques were used for each segment.

RQ1: Bibliometric Analysis for Conceptual Review:

A bibliometric analysis of the selected 23 articles will be conducted using the R programming language (Aria & Cuccurullo, 2017). This analysis will provide a quantitative exploration of the academic literature, offering insights into the most influential publications, authors, and research themes within the realm of design thinking in the banking industry (Zupic & Čater, 2015). Utilising R ensures a comprehensive and data-driven approach to understanding the landscape of the subject in question (Waltman, van Eck, & Noyons, 2010).

Performance Analysis:

The performance analysis evaluates both publication and citation metrics. This helps understand which authors and studies influence the field most (Aria & Cuccurullo, 2017). It also shows the main trends in the research area over time (Zupic & Čater, 2015). The performance analysis is measured from 2 aspects: one is publication, and the other is citation metrics.

Publication related metric:

The *Annual Scientific Production,* as depicted in Figure 15, outlines the progression of scholarly articles over time. The graph illustrates the Annual Scientific Production from

2006 to 2022 based on the 23 selected articles for the thesis. In 2006, there needs to be a higher count of articles. This count remained consistent until 2012 when a rise was observed. The numbers dropped slightly in 2014 but saw a notable increase in 2016. A peak follows another dip in 2018 and 2020. By 2022, there is a sharp decrease in published articles on the topic.

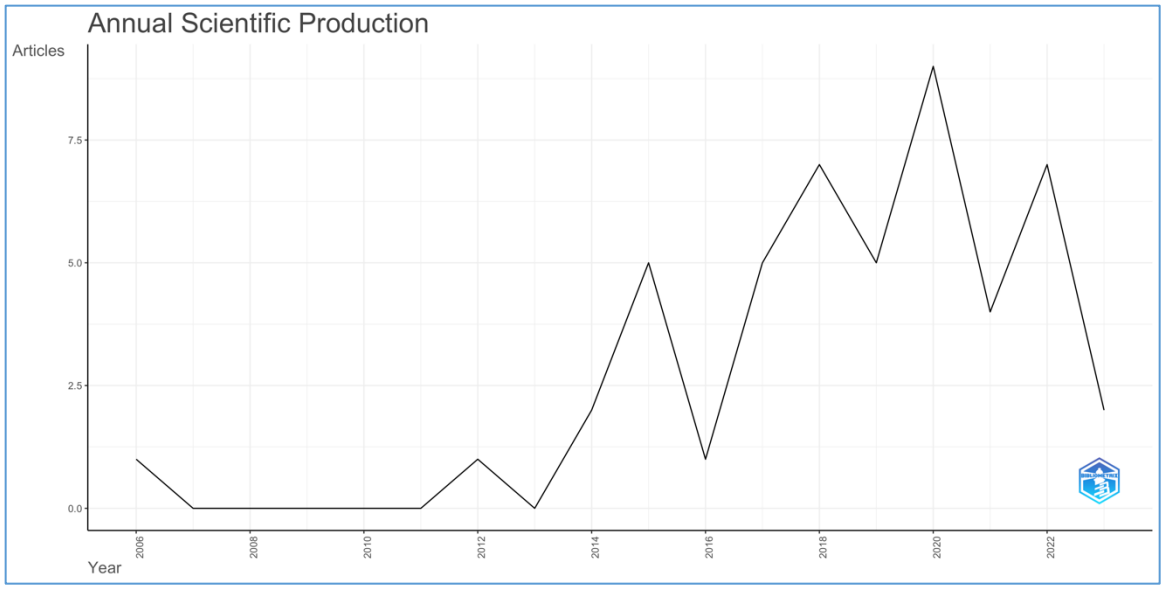

Figure 15: Annual Scientific Production, Source: Aria, M. & Cuccurullo, C. (2017)

Citation-related metrics:

Under the citation-related metrics of the thesis, a constellation of sources, authors, and countries stand out, each contributing uniquely to the field of design thinking in the banking sector. Figure 16 reveals that "She Ji" is the most cited source, indicating its prominence and influence with four documents. It is closely followed by notable publications such as "The IEEE Engineering Management Review" and "The Journal of Cleaner Production," each contributing three influential articles. This hierarchy of sources

provides a window into where pivotal dialogues in design thinking for innovation in banking are occurring and where they are being chronicled.

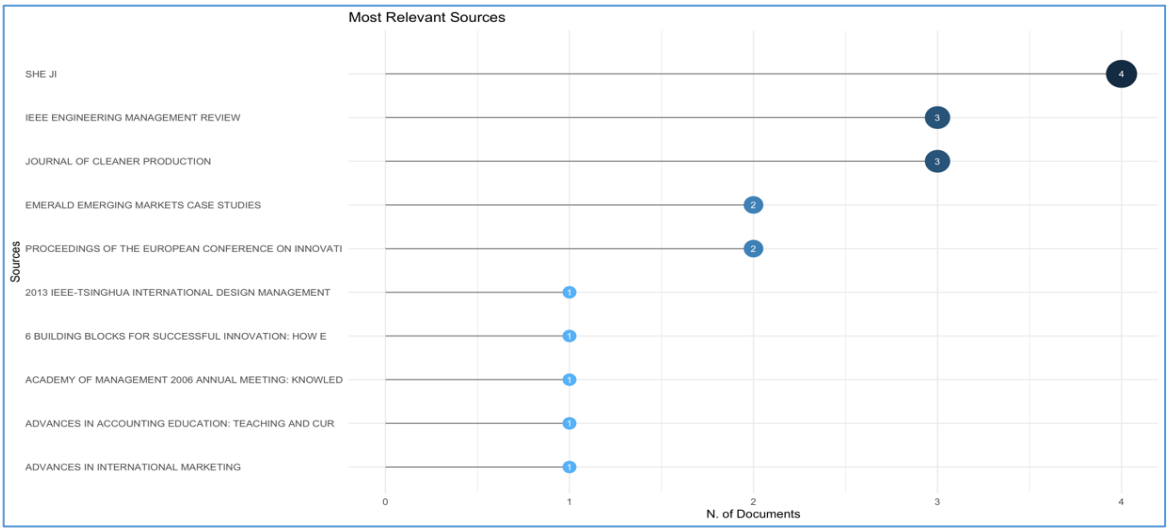

Figure 16: Most Relevant Sources, Source: Aria, M. & Cuccurullo, C. (2017)

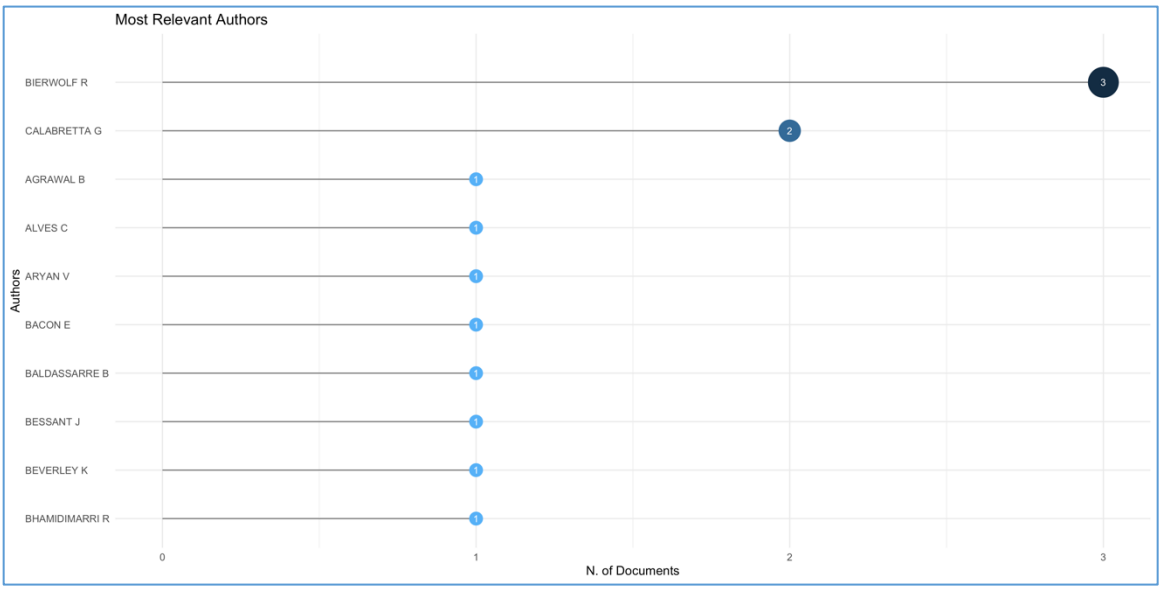

Figure 17: Most Relevant Authors, Source: Aria, M. & Cuccurullo, C. (2017).

Figure 17 sheds light on the authors who have left an indelible mark on the field. "Bierwolf R" stands at the forefront with three papers, indicating a significant contribution to the academic conversation, while "Calabretta G" follows with two papers, underscoring their

influence. The array of authors contributing a single paper each demonstrates the breadth of individual contributions that collectively shape the discourse.

The geographical spread of research impact is illustrated in Figure 18, with the Netherlands, the USA, the UK, and China being the most cited countries, reflecting their pivotal roles in the research community and their contribution to the global narrative of design thinking in banking.

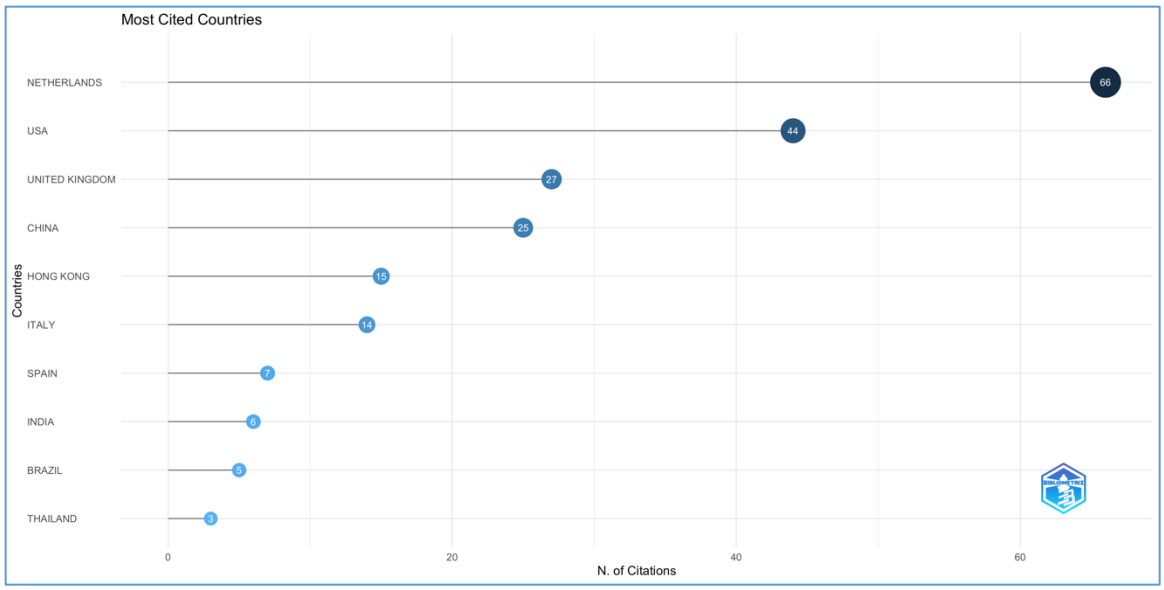

Figure 18: Most Cited Countries, Source: Aria, M. & Cuccurullo, C. (2017)

In the analysis of the most globally cited documents, shown in Figure 19, "Baldassarre B, 2020, J CLEAN PROD" emerges as the most referenced work, signifying its critical role in the field with 58 citations. Following this, various documents are highlighted, each significant in shaping the sector's innovative approaches.

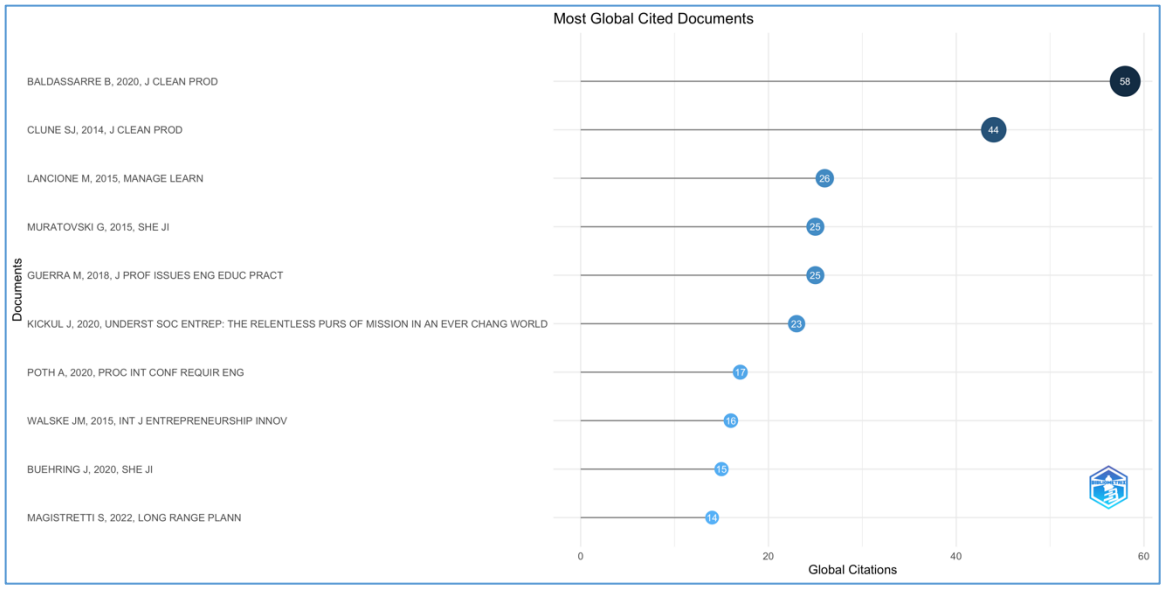

Figure 19: Most Cited Countries, Source: Aria, M. & Cuccurullo, C. (2017).

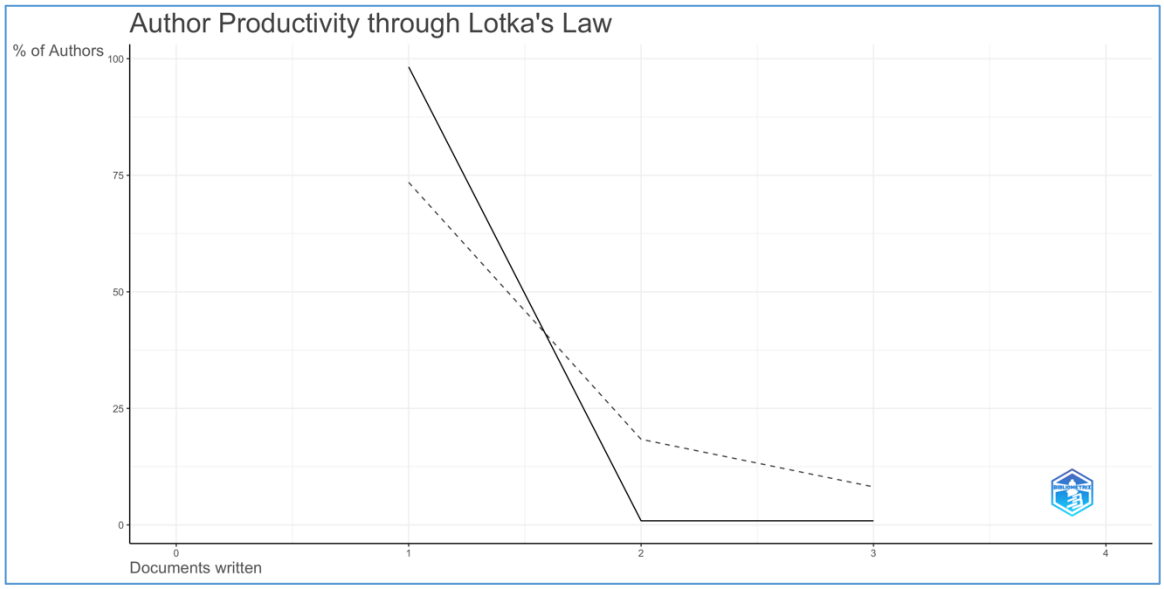

Figure 20: Author Productivity through Loktka's law, Source: Aria, M. & Cuccurullo, C. (2017)

Lastly, the authorship pattern, depicted in Figure 20 through Lotka's Law, reveals a steep decline in the number of authors as the number of papers increases, indicating that a smaller number of researchers produce a more substantial portion of the literature. This

pattern emphasizes the skewed nature of research productivity within the field, with many authors contributing singular works and only a few contributing multiple articles.

Science Mapping:

The Science Mapping section of the thesis provides a comprehensive view of the research dynamics in the field of design thinking within the banking sector. This is achieved through several vital analyses, each depicted in detailed visual representations.

Figure 21, "Reference Publication Year Spectroscopy," delineates the citation trajectory of research works from the early 1920s to 2020. The chart reveals a pronounced increase in the number of references cited starting from the late 1990s, which peaked around 2017 and subsequently experienced a decline. This pattern suggests an era of intensified research focus and potentially ground-breaking contributions to the field during this period. The figure also depicts deviations from the 5-year median citation count, with significant fluctuations noted between 2005 and 2017. These deviations point to shifts in research interests and the emergence of influential works that have shaped design thinking in banking.

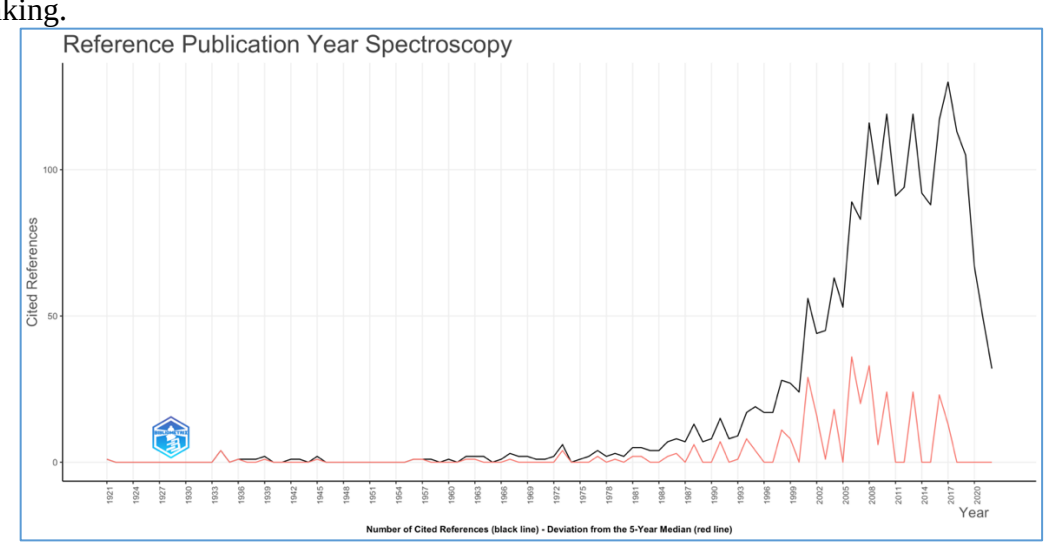

Figure 21: Reference Publication year Spectroscopy, Source: Aria, M. & Cuccurullo, C. (2017)

Figure 22 offers a multi-faceted view of the terminologies central to design thinking discourse. "Word Frequency over Time" traces the usage patterns of critical terms, indicating that "21st Century Skills" and "Design Thinking" have surged in prominence after 2015. In parallel, the steady mention of "Product Design" and "Organization Development" reflects their enduring significance in the field. The word cloud, Figure 23 emphasizes the prevalence of "Design," "Design Thinking," and "Sustainable Development," highlighting the sector's growing emphasis on these concepts. Additionally (Refer to Figure 24), the "Most Relevant Words" visual underscores the importance of terms like "Human Engineering," "Project Management," and "Business Model Innovation," broadening the scope of design thinking in the banking discourse.

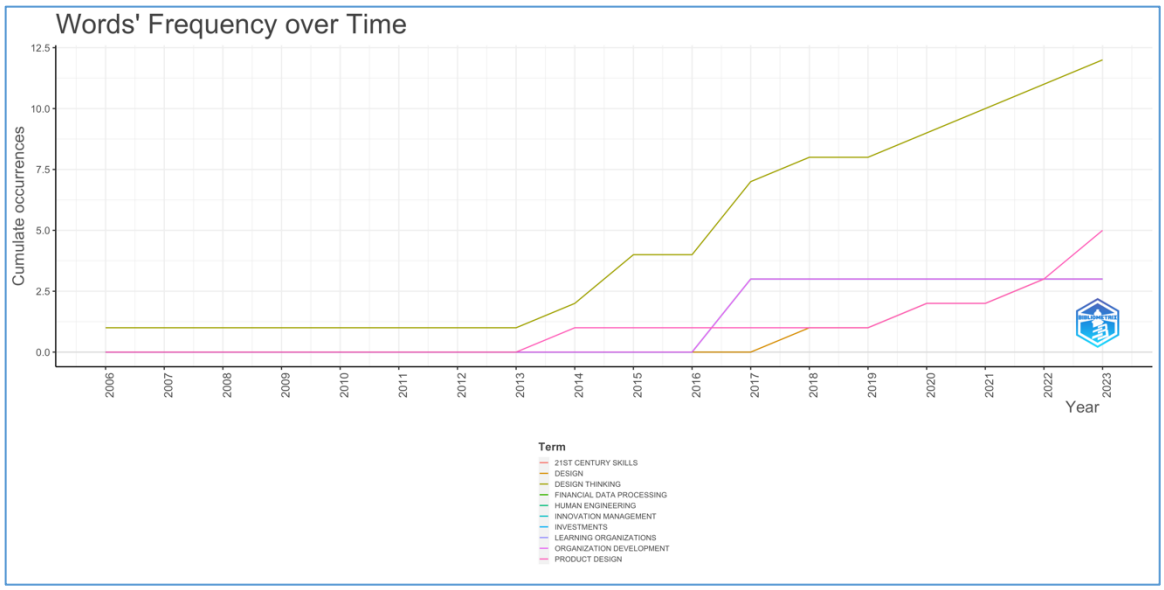

Figure 22: Word Frequency over time, Source: Aria, M. & Cuccurullo, C. (2017).

Figure 25, "Country Collaboration Map," illustrates the global network of research collaborations. It shows dense interconnections between researchers in regions such as North America and Europe, indicating a robust collaborative research output. This map

underscores the global nature of design thinking research in banking and highlights the key regions contributing to the scholarly dialogue.

Figure 23: Word Cloud, Source: Aria, M. & Cuccurullo, C. (2017)

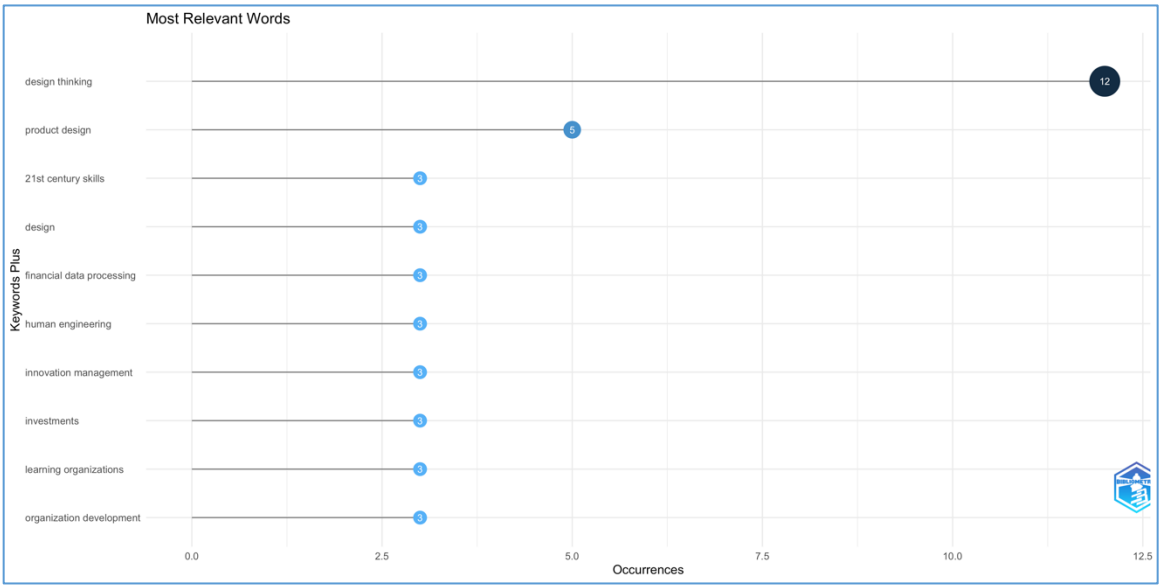

Figure 24: Most Relevant words, Source: Aria, M. & Cuccurullo, C. (2017)

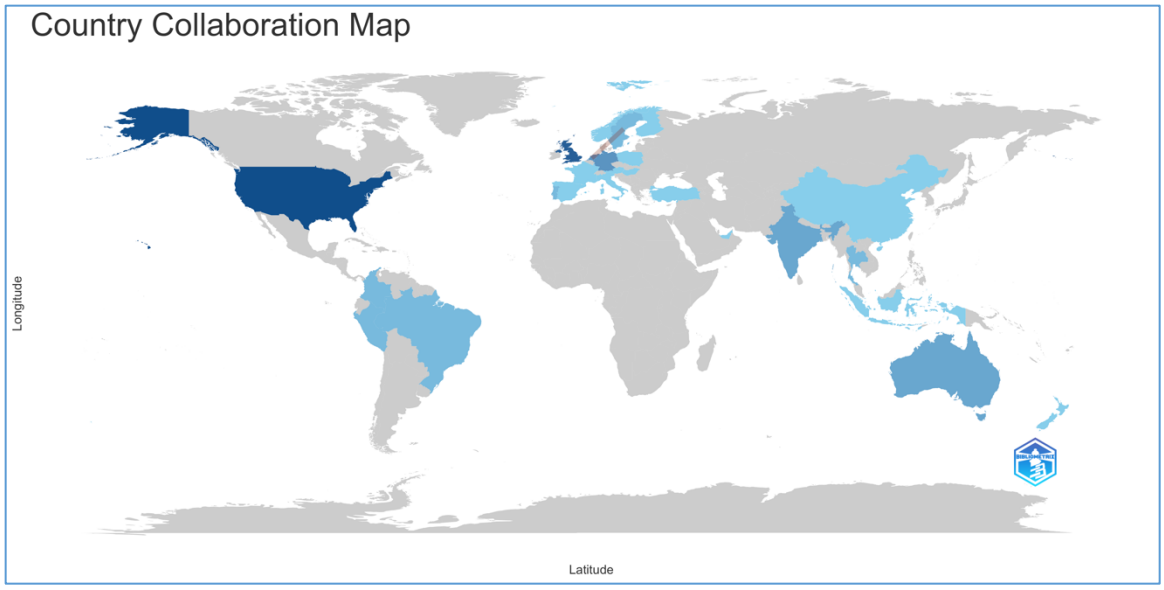

Figure 25: Country Collaboration Map, Source: Aria, M. & Cuccurullo, C. (2017)

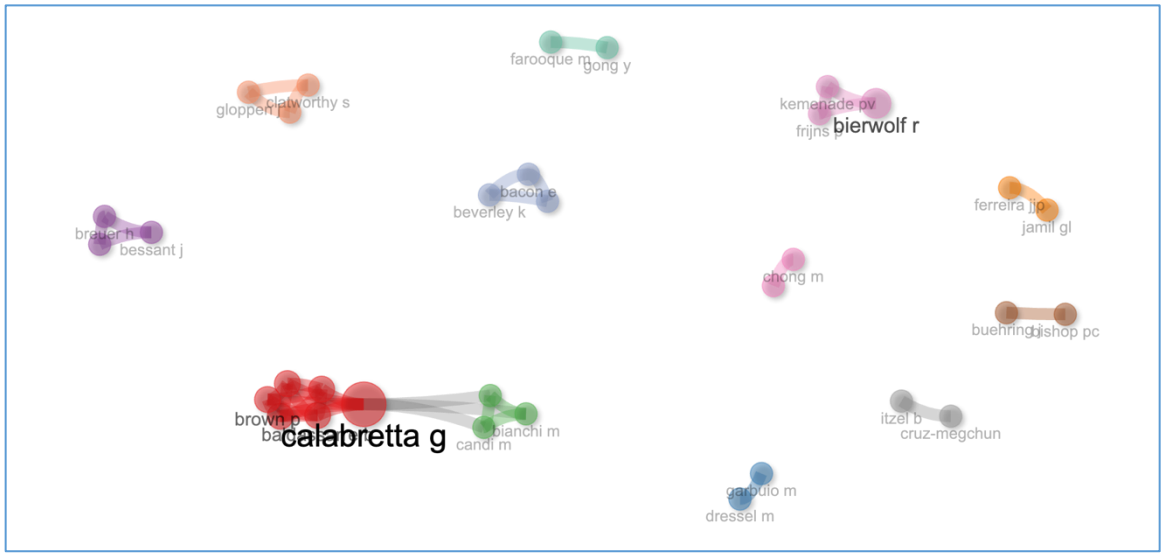

Figure 26: Collaboration Network, Source: Aria, M. & Cuccurullo, C. (2017)

Figure 26, Collaboration Network," illustrates the complex web of co-authorship among researchers. This network map visually represents each author as a node, with the node's size reflecting the author's volume of contributions. The lines connecting these

nodes denote collaborative ties, with thicker lines representing stronger or more frequent collaborations. Figure 26 highlights the most influential authors who serve as central hubs within the network, signifying their significant roles in producing research and influencing the field.

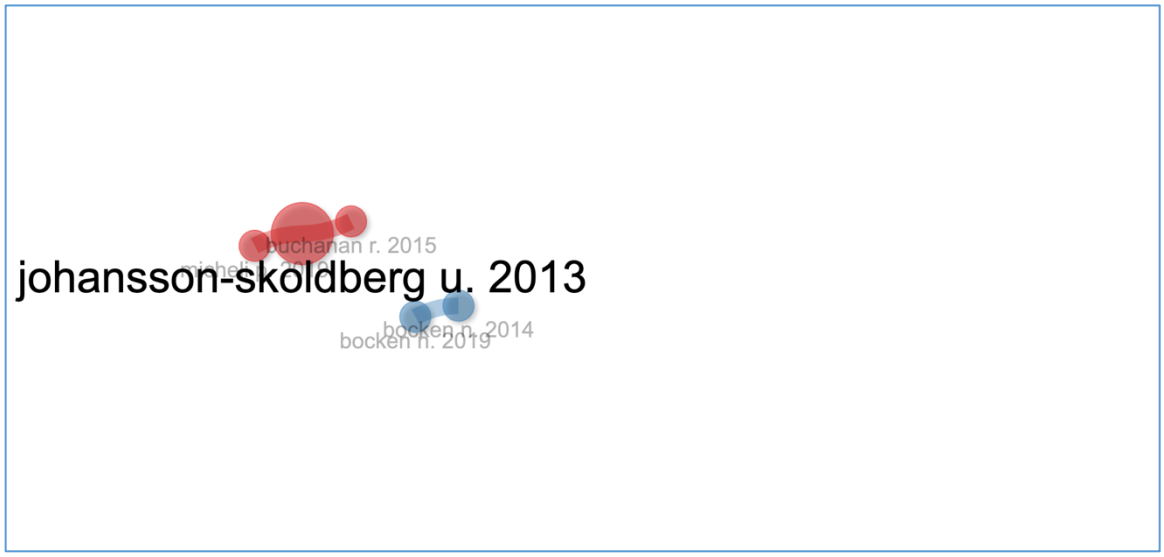

Figure 27: Co-Citation Analysis, Source: Aria, M. & Cuccurullo, C. (2017)

Figure 27, Co-Citation Analysis," provides another layer of insight by charting the relationships between frequently cited works. The clusters within this figure indicate how individual studies are interlinked, highlighting research groups that underpin specific themes or concepts prevalent in design thinking applied to banking. Works that form larger nodes are more frequently co-cited, highlighting their foundational impact on the research community.

Network Analysis:

The Network Analysis section of the thesis, articulated through Figure 28, "Trend Topics," executes a meticulous examination of thematic trends in design thinking within the banking sector. This figure captures the frequency of specific terms across a timeline, providing a clear visual representation of the evolving focus areas within the field. The

analysis draws attention to the emergence and growth of pivotal topics over time. For instance, it could be observed from the data that terms like "circular economy," "blockchain," and "sustainable development" have gained momentum in recent years, reflecting the banking sector's response to global economic and environmental challenges. Other terms like "finance" and "product design" may demonstrate steady engagement, signaling enduring priorities within the industry's scholarly research.

Figure 28 also indicates the potential trajectories of future research by highlighting the terms that are currently trending. This forward-looking perspective is invaluable for guiding subsequent research efforts, ensuring they align with the domain's most recent and relevant topics. In sum, as visually summarised in Figure 28, the Network Analysis provides a strategic overview of the thematic concentrations shaping current and future dialogues in design thinking research related to banking. This analysis ensures that scholarly endeavours remain pertinent and contribute meaningfully to the contemporary discourse in the field.

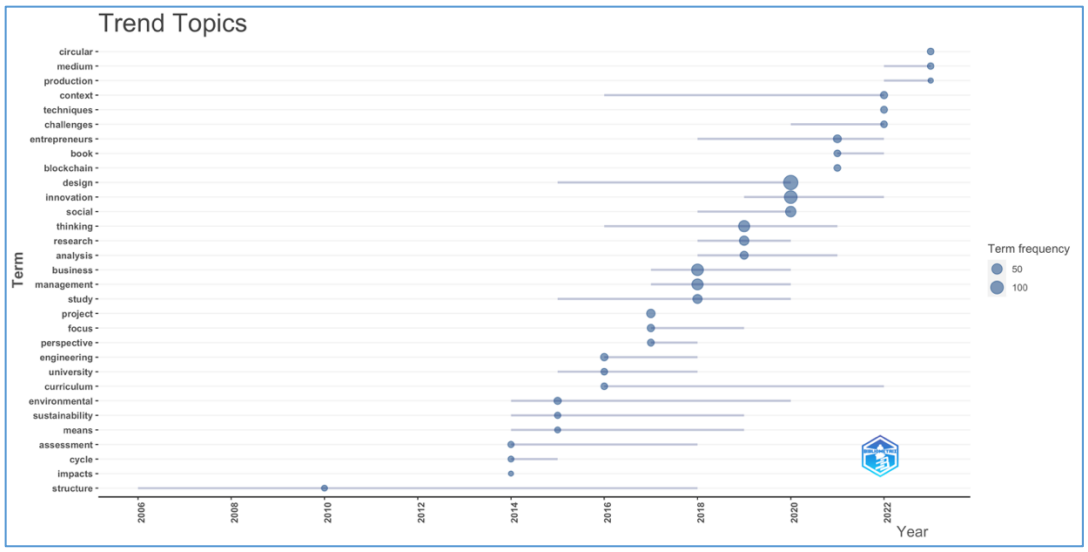

Figure 28: Trend Topics, Source: Aria, M. & Cuccurullo, C. (2017)

Enrichment techniques:

In bibliometric analysis, visualisation techniques like "Co-occurrence Network and Thematic Map" are crucial for distilling complex data into precise visual forms, highlighting key patterns and relationships within research themes, and guiding future scholarly focus in an accessible, engaging manner. Top of Form

Figure 29's "Co-Occurrence Network" illuminates the interconnectedness of critical themes in the banking design thinking domain. Central themes like "sustainable development" and "circular economy" are shown to be linked with "design thinking," underscoring their collective relevance. The association between "finance" and "product design" suggests an overlap in research themes, reflecting the sector's integration of design with financial strategy. Overall, this visualisation encapsulates the thematic richness of the field, highlighting both established and emerging research avenues and laying a foundation for future explorations within the industry. Bottom of Form

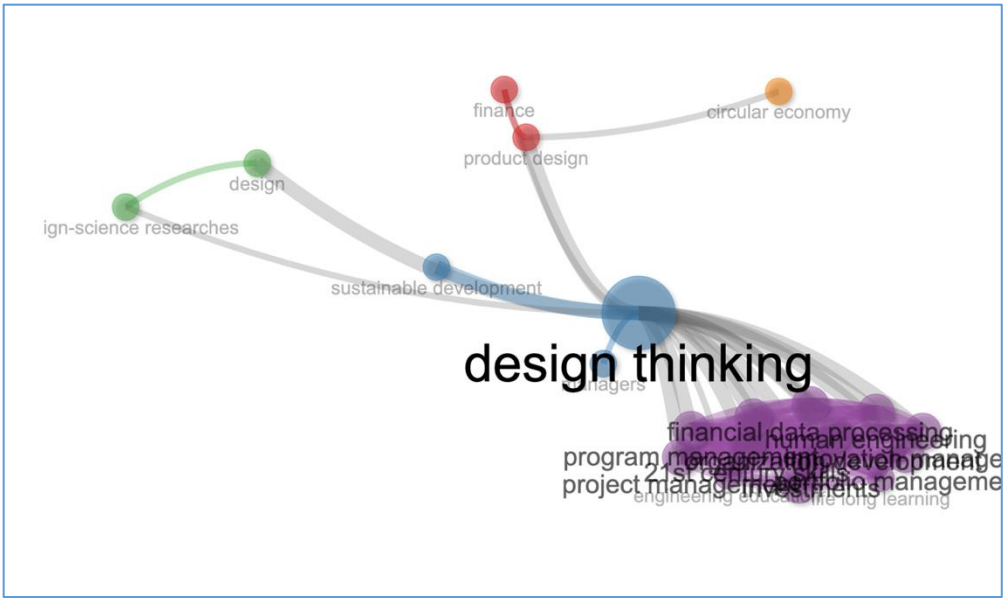

Figure 29: Co-Occurrence Network, Source: Aria, M. & Cuccurullo, C. (2017)

Figure 30: Thematic Map" offers a structured representation of research themes within design thinking in the banking sector. It categorises themes by their stage of development and centrality, highlighting core areas like 'design thinking' and 'sustainable development' as central and well-established within current research. '21st-century skills', 'financial data processing', and 'human engineering' are identified as motor themes driving the 21st-century progression. In contrast, 'entrepreneurship' and 'planning' appear as emerging or declining themes, suggesting shifts in research focus or areas needing revitalisation. This map aids in discerning the strategic importance and maturity of diverse topics in the landscape of design thinking research.

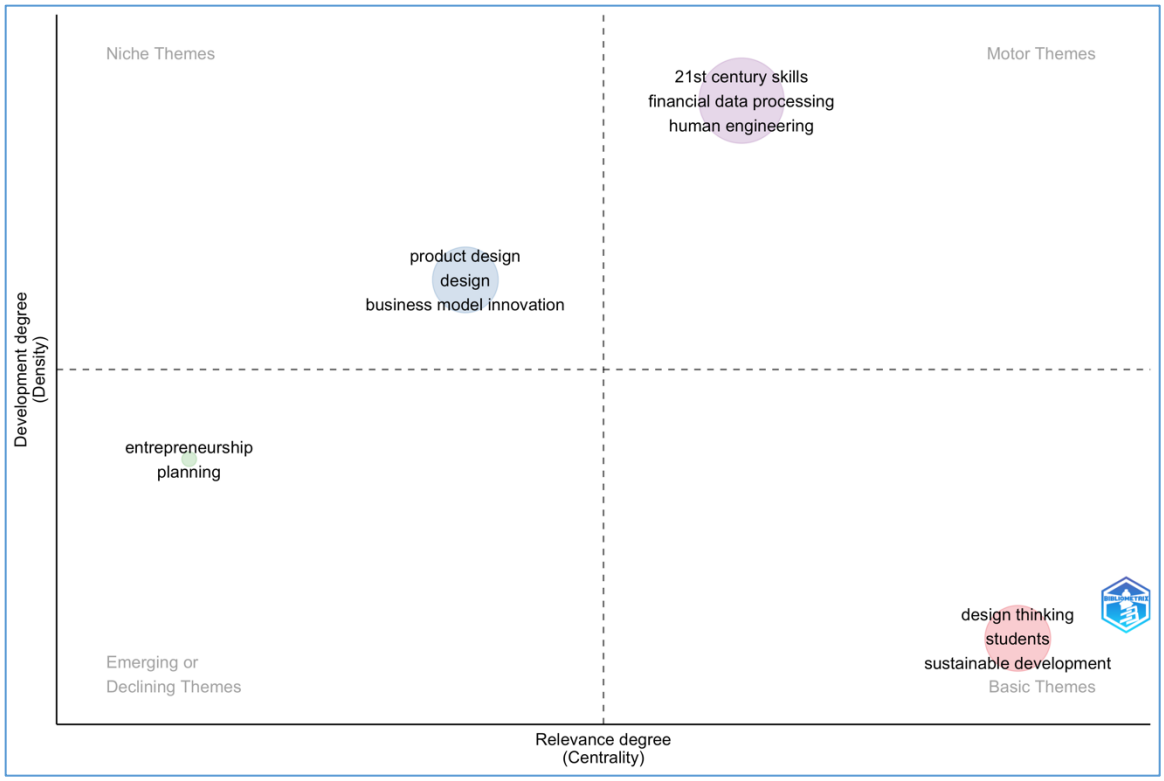

Figure 30: Thematic Map, Source: Aria, M. & Cuccurullo, C. (2017)

RQ2-RQ6: PLS-SEM Analysis for Insights:

For the investigation into Research Questions 2 through 6, the research adopted the Partial Least Squares Structural Equation Modeling (PLS-SEM) methodology, recognised for its effectiveness in complex models within the banking sector (Hair et al., 2012). The instruments were meticulously vetted for content validity to ensure they accurately captured the constructs in question (Nunnally, 1978), and a pilot study was conducted to fine-tune these tools (Churchill, 1979).

The post-data collection phase involved a careful examination for non-response bias to ensure that the sample was representative (Armstrong & Overton, 1977), and standard method bias was assessed to confirm that the variance in responses was not an artefact of the measurement method (Podsakoff et al., 2003). The measurement model's robustness was scrutinised for reliability and validity (Henseler et al., 2009), and the structural model was analysed to test the hypothesised relationships between constructs (Tenenhaus et al., 2005). Additionally, mediation analysis was undertaken to explore the intricacies within the model (Hayes, 2017). This comprehensive methodological approach is visualised in Figure 31. Top of Form

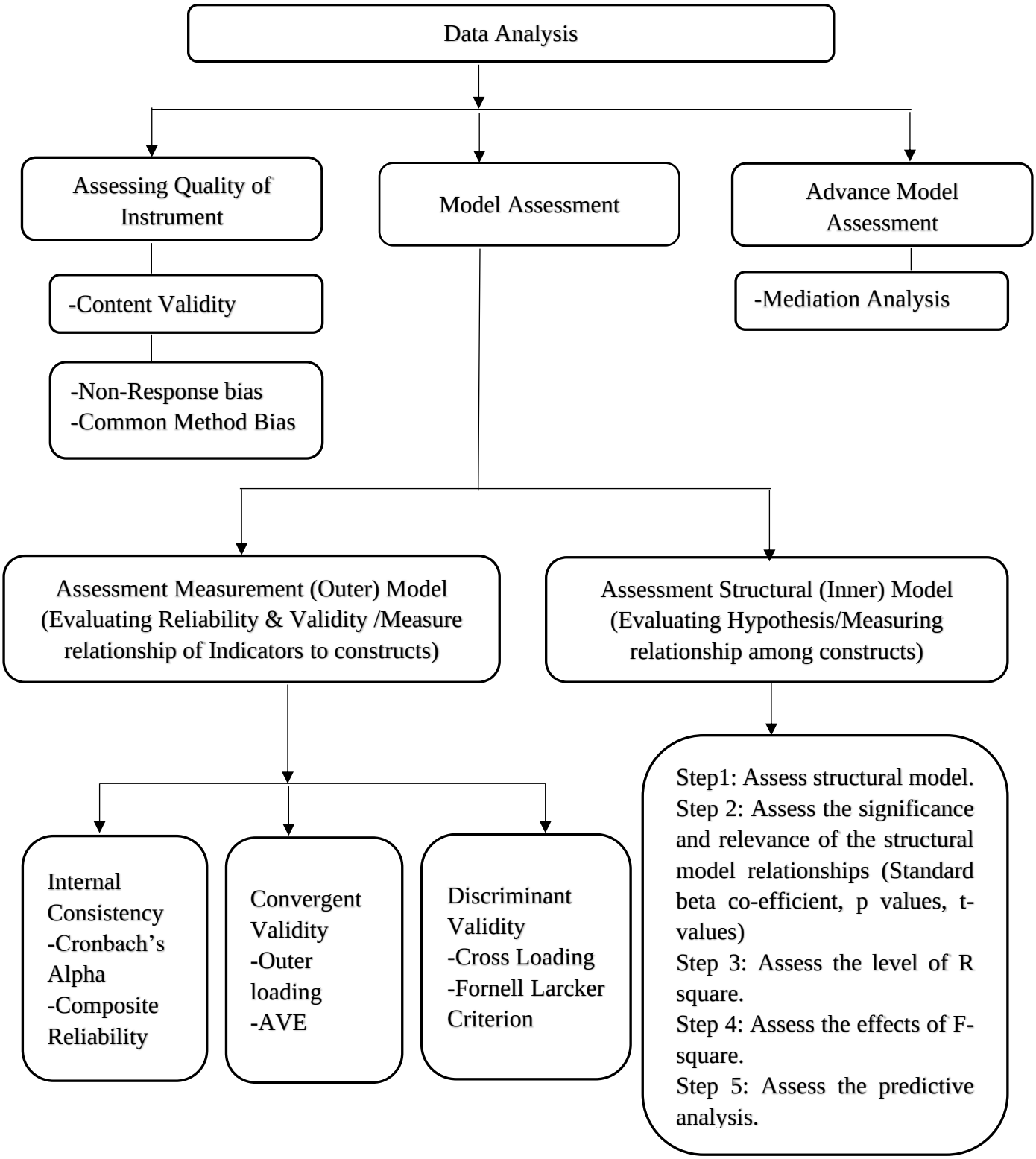
Data Analysis
Assessing Quality of Instrument
Model Assessment
Advance Model Assessment
-Content Validity
-Mediation Analysis
-Non-Response bias
-Common Method Bias
Assessment Measurement (Outer) Model (Evaluating Reliability & Validity /Measure relationship of Indicators to constructs)
Assessment Structural (Inner) Model (Evaluating Hypothesis/Measuring relationship among constructs)
Internal Consistency
-Cronbach's Alpha
-Composite Reliability
Convergent Validity
-Outer loading
-AVE
Discriminant Validity
-Cross Loading
-Fornell Larcker Criterion
Step1: Assess structural model.
Step 2: Assess the significance and relevance of the structural model relationships (Standard beta co-efficient, p values, t-values)
Step 3: Assess the level of R square.
Step 4: Assess the effects of F-square.
Step 5: Assess the predictive analysis.

Figure 31: PLS-SEM Analysis for Insights, Source: Hair et al., (2017)

Response Recorded:

Table 14 shows the number of final responses considered. Among the total of 611 survey Responses received, 310 are considered for analysis after clean-up.

Responses recorded	611
Total valid responses (post clean up)	310
Final response considered for analysis	310

Table 14: Survey Response, Source: Author's compilation

Missing Value Analysis

The missing values were analysed to ascertain whether the dataset contained unintended gaps or omissions. Given that all questions were mandatory, this was a crucial step to ensure data integrity. Fortunately, the software used during data collection actively prevented missing values. Moreover, any responses containing missing values were promptly removed from the dataset. It was deemed suitable for further analysis with the assurance that the dataset lacked missing values.

Coding of scale

The survey questionnaire was prepared, ensuring all variables were accurately coded to reflect their corresponding measurement scales, with a clear definition for Likert-scale responses as presented in Table 1. The questionnaire asked respondents to select from predefined options for demographic information, such as age groups and employment sectors, and to describe their job roles in an open-ended manner. Questions regarding management level were structured to identify whether respondents were in 'Junior', 'Middle-Level Management', or other tiers. Open-ended items were also included to gather

in-depth views on design thinking, contributing to the nuanced qualitative aspect of the study.

Demographical Analysis:

The demographic analysis section of the survey explored age, management level, and current profession. Participants indicated their age range, described their professional roles, and specified their organisational positions. Additionally, an open-ended question invited personal definitions of design thinking, enriching the dataset with diverse professional insights.

Age:

In analyzing the data presented, one observes the following distribution of age groups among the responden77 %

- 66.77% of the respondents fall within the 35-55 age brack29 %
- 21.29% belong to the 25-34 age gro97 %
- 10.97% are classified as being above the age of 55.

A 97% of the respondents are in the 18-24 age range.

This distribution shows that most participants are from the 35-55 age group, followed by those in the 25-34 age category. The age group 18-24 has the least representation in this sample. Refer to Table 15.

What is your age group?	**Count of What is your age group?**	**%**
35-55	207	**66.77%**
25-34	66	**21.29%**
Above 55	34	**10.97%**
18-24	3	**0.97%**
Grand total	310	

Table 15: Age Variable Analysis, Source: Author's compilation

Professional Roles:

Upon examining the data about the respondents' current professional roles, several insights emerge:

- The "Product Owner" role is the most prevalent, with 43 respondents identifying with it. This suggests that many respondents have decision-making responsibilities or ownership of products.

- "User Researcher" and "Design Lead" are the dominant roles, with 23 and 22 individuals, respectively. This points towards a strong representation of those directly involved in user-centric processes and design leadership within the sample.

- The presence of roles like "Journey expert", "Design thinking to lead", and "User experience designer" (with 19, 14, and 12 respondents, respectively) further reinforces the design-centric nature of the sample.

- As the list progresses, one notices a wide variety of roles, from "IT leads" to "Storytellers" and "Product Designers". This diversity suggests that the sample encompasses professionals from various facets of an organisation, from technical to customer-centric roles.

- Only a single individual represents several roles. This indicates the uniqueness and specificity of specific positions in the industry.

Overall, while there is a concentration on design and product-related roles, the sample also highlights a broad spectrum of professions, reflectinmulti-facetedaceted nature of modern organisations.

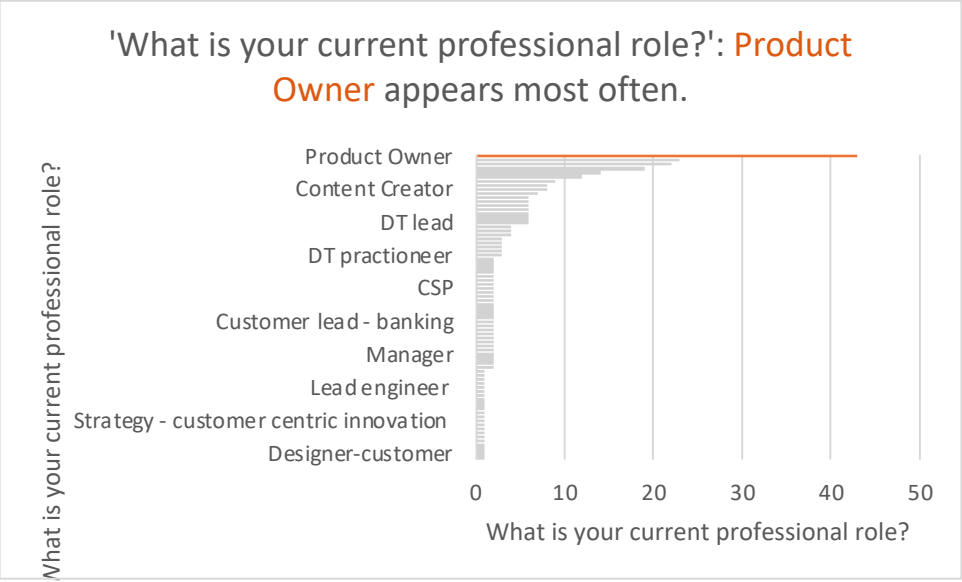

Figure 32: Professional Roles, Source: Author's compilation.

Management Levels:

Upon analyzing the data regarding the management levels at which respondents operate, the following observations can be made:

- A significant majorit9 % 53.9% (167 out of 310) of the respondents, operate at the "Senior Level Management." This suggests that many sample members hold significant decision-making authority within their organizations.
- "Middle-Level Management" is the next largest group, comprisi9 % 31.9% (99 out of 310) of respondents. Individuals in this category have departmental or team-level responsibilities and are integral in executing organizational strategies.
- The "Junior" category represen6 % 10.6% (33 out of 310) of the sample. These respondents might be early in their career trajectories and are more involved in the day-to-day operational tasks of their organizations.

- The smallest group,5 %t 3.5% (11 out of 310), is the "Executive" category. This suggests a limited presence of top-tier leadership within the sample, such as CEOs or board members.

In conclusion, while there is a notable representation from senior and middle management, there is also a presence from junior roles and the executive tier, providing a well-rounded view of the organizational hierarchy in the sample. Refer to Table 16.

At what level of management do you currently operate?	Count of at what level of management do you currently operate?	%
Senior Level Management	167	**53.90%**
Middle Level Management	99	**31.90%**
Junior	33	**10.60%**
Executive	11	**3.50%**
Grand Total	**310**	

Table 16: Professional Roles Variable Analysis, Source: Author's compilation

Open – Ended Questions:

Upon analyzing the open-ended responses to the "Define design thinking" question, a word cloud was generated to highlight the most frequently mentioned terms. The term "customer" emerged as the most prominent word in the responses, suggesting that many respondents associate design thinking with a customer-focused approach. Following closely, "centric innovation" and "competitive advantage" were also significantly mentioned, indicating the importance of innovation centred around the user's needs and the strategic advantage it can offer. Other notable terms include "solution," "design thinking," and "advantage," alluding to the problem-solving nature of design thinking. Words such as "centric approach" and "framework" further underscore the structured and user-oriented methodology inherent in design thinking. The term "problem" also appeared, emphasizing the problem-solving aspect of design thinking. The collective visualisation in the word cloud and the accompanying table of word frequencies provide a comprehensive understanding of the participant's perception of design thinking.

Figure 33: Word Cloud, Source: MonkeyLearn. (2023)

word	Frequency	Relevance
customer	110	100.00%
centric innovation	68	75.00%
competitive advantage	45	57.00%
solution	55	55.00%
design thinking	41	49.00%
advantage	45	46.00%
centric approach	37	45.00%
framework	33	36.00%
problem	31	35.00%

Table 17: Word Cloud, Source: MonkeyLearn. (2023)

A word cloud analysis was conducted to discern prevalent themes from qualitative data. The analysis highlighted 'customer' as the most frequently occurring term, reflecting its significant role in design thinking discourse. Refer to table 17. Terms like 'centric innovation' and 'competitive advantage' also emerged as significant, focusing on customer-oriented innovation strategies for competitive differentiation. 'Solution' and 'problem' were

also identified, suggesting a strong emphasis on problem-solving. This visualisation, supported by the frequency and relevance data, underscores the pivotal importance of customer-centric approaches within the strategic framework discussed by participants.

Measurement Scales

The measurement scale analysis offers insightful data on the role of design thinking in the banking sector. Participants rated their belief in the power of design thinking to produce original and imaginative solutions (U2) with a mean of 3.671, indicating a moderately high agreement, and a standard deviation of 2.392, reflecting a broad range of responses. The sentiment that designs thinking can transform existing paradigms (U3) garnered a higher mean of 4.242, suggesting a solid agreement among respondents, with a tighter standard deviation of 1.962, indicating more consistency in these views.

In strategic innovation, respondents viewed design thinking as critical (SI1) for creating innovative business models and products, evidenced by a mean of 4.184 and a standard deviation of 2.511, indicating variability in how pivotal they deem it to be. The impact of design thinking on customer service improvement (SI2) received the highest mean score of 4.671, paired with the lowest standard deviation of 1.87, denoting a solid consensus on its positive effect. When asked about its role in shaping a company's ethos for strategic innovation (SI3), the mean of 3.842 and a standard deviation of 2.465 revealed a moderately strong agreement with some diversity in opinions.

Adoption of design thinking in addressing banking-specific problems (A1) was rated with a mean of 4.177, indicating its perceived importance, and a standard deviation of 2.466, pointing to varied experiences. The ease of implementing design thinking solutions (A2) was also seen as favourable, with a mean of 4.11, although the standard deviation of 2.43 suggests differences in individual perceptions of implementation ease.

Regarding organizational strategy, the influence of design thinking on a company's ethos (OS1) and structure (OS2) was seen as moderate, with means of 3.103 and 3.242, respectively, and standard deviations suggested a spread in opinions. The effect of design thinking on instilling fresh values (OS3) and boosting employee engagement (OS4) were recognised but with varied responses, as shown using 3.877 and 2.897 and standard deviations of 2.378 and 1.886, respectively. Respondents moderately agreed that design thinking challenges existing problem-solving assumptions (OS5), reflected by a mean of 3.145 and a standard deviation of 2.059.

Participants acknowledged the benefits of adopting design thinking in banking services (PB1 and PB2), with means above 3.5, indicating perceived advantages. However, the standard deviations above 2.3 reveal differing views on the extent of these benefits. Perceived barriers to adopting design thinking, such as organizational or cultural obstacles (PI1) and lack of understanding or training (PI2), showed a higher level of concern among participants, with means close to 3.9 and standard deviations around 2.5. Resource constraints (PI3) were also seen as a significant hindrance, with the highest mean of 4.09 within this category.

When considering resistance to design thinking, respondents felt that its absence could hinder addressing specific problems (R1) and that difficulties in implementing its solutions could deter adoption (R2), with means close to 3.9 and standard deviations indicating varying degrees of agreement.

Lastly, the survey addressed missed opportunities due to the need to adopt design thinking. Participants moderately agreed that there had been missed chances (MO1) and post-facto realizations of opportunities that could have been leveraged (MO2), with means of 3.739 and 3.39 and standard deviations indicating diverse experiences. Reflecting on past projects, respondents also admitted to occasionally overlooking innovative solutions

(MO3), with a mean of 3.687 and a standard deviation indicating a spread in this acknowledgement. Refer to table 18.

Construct	Items	Standard Deviation	Mean
Understanding	U2: To what extent do you believe design thinking generates original and imaginative solutions?	2.392	3.671
	U3: How much do you agree that design thinking modifies the existing paradigm, enabling radical or transformational ideas?	1.962	4.242
Strategic Innovation	SI1: How crucial is design thinking in banking for creating innovative business models, developing, and introducing new financial products or services, and establishing unique banking brands?	2.511	4.184
	SI2: Design thinking has significantly improved customer service in our bank.	1.87	4.671
	SI3: How pivotal is design thinking in shaping a company's ethos to drive strategic innovation and gain a competitive edge?	2.465	3.842
Adoption	A1: How vital is design thinking in the banking sector for tackling specific problems and meeting unique customer needs?	2.466	4.177
	A2: How would you rate the ease of implementing solutions generated through design thinking?	2.43	4.11
Organizational Strategy	OS1: How significant is the role of design thinking in transforming a company's ethos?	2.315	3.103
	OS2: To what extent does design thinking contribute to enhancing an organization's structure?	2.12	3.242
	OS3: How effectively does design thinking instil fresh values and attitudes within your organization?	2.378	3.877
	OS4: To what degree does design thinking invigorate employee engagement and motivation?	1.886	2.897

	OS5: To what extent do you agree that design thinking challenges existing assumptions in problem-solving and idea generation?	2.059	3.145
Perceived Benefits	PB1: Adopting design thinking has benefited the banking services in my organization.	2.336	3.926
	PB2: The use of design thinking has led to innovative financial products or services in my organization.	2.388	3.565
Perceived Barriers	PI1: There are substantial organizational or cultural barriers to adopting design thinking in my bank.	2.529	3.881
	PI2: Lack of understanding or training is a major barrier to design thinking adoption in the banking sector.	2.538	3.887
	PI3: Resource constraints significantly hinder the application of design thinking in our bank.	2.199	4.09
Resistance	R1: Do you believe the absence of design thinking in the banking sector hinders addressing specific problems and meeting unique customer needs?	2.247	3.887
	R2: Has difficulty in implementing solutions generated through design thinking deterred its adoption in your organization?	2.488	3.842
Missed opportunities	MO1: Do you believe that not adopting design thinking has resulted in missed opportunities for your organization?	2.157	3.739
	MO2: Have you ever discovered post-facto opportunities that could have been capitalized on had design thinking been used earlier in the process?	2.084	3.39
	MO3: How often have you found innovative solutions that were previously overlooked when reflecting on past projects or initiatives?	2.216	3.687

Table 18: Standard Deviation and Mean, Source: SmartPLS(2023).

Assessing the Quality of Instrument

Content Validity:

Before gathering data, it is essential to ensure content validity, which confirms that the instrument is thoughtfully developed and has undergone pilot testing. This form of validity should be grounded in scholarly research and subsequently examined by specialists in the relevant field (Straub, Boudreau, & Gefen, 2004). The affirmation of content validity was incorporated into the questionnaire development phase. Refer to Table 34.

Non-response Analysis

Instances of non-response were addressed by employing the method of complete case deletion (Hair et al., 2010; Hair et al., 2014). This method was deemed suitable given that the dataset contained more than 250 entries (Hair et al., 2010). In this method, any responses that are not fully completed are removed .Refer to table 14.

Bias Analysis

The assessment of potential biases in the questionnaire was conducted by examining Common Method Bias (CMB). CMB is identified as variance in responses that stem from the measurement method rather than the measured constructs, representing a measurement error that can introduce bias into the dataset due to extraneous factors (Podsakoff et al., 2003). Given the online nature of data collection for this study, the possibility of systematic bias was a significant consideration.

Systematic bias can distort findings by diminishing or exaggerating them, potentially leading to invalid conclusions (Bagozzi & Yi, 1990). The data collection methodology, which involved contacting participants twice using their email addresses, may have compromised anonymity, thus raising concerns about the introduction of CMB. A thorough analysis was undertaken to mitigate errors from standard method variance.

Post hoc Harman's single-factor test

The research incorporated a Post hoc Harman's single factor test to evaluate the presence of common method bias (CMB) within the dataset. Harman's single-factor test, a technique rooted in the exploratory factor analysis (EFA) without rotation, was specifically chosen due to its utility in identifying variances attributable to the measurement method rather than the underlying constructs of interest (Podsakoff et al., 2003). The test involved loading all items from the questionnaire onto a single factor to determine the extent of variance explained. The results of the EFA revealed that the single factor accounted for 47.8017 % of the total variance. It did not exceed 50% threshold commonly recognised as indicative of severe common method bias, suggesting that most variance could be ascribed to the constructs measured rather than to any methodological biases (Podsakoff et al., 2003).

It is pertinent to acknowledge that Harman's single-factor test has limitations. While it indicates the potential for common method variance, it is not definitive in confirming the absence of such bias. The test's result, indicating that a single factor did not explain most of the variance, tentatively suggests that common method bias is not a predominant issue within the data. However, this conclusion is drawn with caution, considering that the presence of some method variance cannot be entirely excluded. The findings from Harman's single-factor test are summarised in the table below, which illustrates the proportion of variance explained by the single factor:

Analysis Method	**Total Variance Explained (%)**	**Threshold for CMB (%)**	**CMB Presence Indicated**
Harman's Single-Factor	47.80	50	No

Table 19: Post hoc Harman's single-factor test, Source: SmartPLS (2023)

Refer to table 19.Harman's single-factor test contributed to the study's methodological rigour by providing preliminary evidence against the predominance of common method bias. With less than half of the variance accounted for by a single factor, the researchers proceeded with a substantiated assurance of the data's construct validity, reinforcing the study's empirical conclusions.

Confirmatory Factor Analysis Metrics and Model Fit Assessment:

Confirmatory factor analysis (CFA) was conducted after exploratory factor analysis (EFA) to validate the EFA uncovered factor structure. The CFA is crucial for affirming factor loadings and assessing the model fit comprehensively, offering a rigorous test of the construct validity of the measurement model. The CFA process revealed certain complications that merited additional investigation. A non-positive definite covariance matrix was observed, which often signals the presence of issues like improper solutions, negative error variances, or excessively high correlation coefficients, potentially undermining the model's interpretability. Additionally, the fit indices pointed to a model that could use refinement. The Tucker-Lewis Index (TLI) was recorded at 0.511, and the Root Mean Square Error of Approximation (RMSEA) stood at 0.219, neither of which meets the conventional criteria for an acceptable fit. Usually, a TLI close to 0.95 and an RMSEA less than 0.06 are preferred.

Nevertheless, the strong correlation between the regression scores and factors, a coefficient of 0.98, indicated that the factors were reliable representations of the latent constructs. This suggests that, despite the issues above, the factors extracted through the CFA captured the intended constructs with high precision. For a detailed understanding, the following table encapsulates the critical metrics from the confirmatory factor analysis, juxtaposing them with the accepted standards for a good model fit:

CFA Metric	Value	Accepted Standard	Status
TLI	0.511	Close to 0.95	Below Standard
RMSEA	0.219	Below 0.06	Above Standard
Factor Correlation	0.98	-	Robust Construct Estimation

Table 20: Confirmatory Factor Analysis Metrics, Source: SmartPLS. (2023)

In synthesis, the results from the CFA were mixed. Indications of model misspecification were evident, but the robust correlation between factors and regression scores provided reassurance about the strength of the latent constructs' estimation. Refer to table 20.

Variance Explained by Factors:

An initial exploratory factor analysis (EFA) was conducted to identify the underlying factors contributing to the data's total variance. The EFA, using the minimum residual (minres) method, determined that the first factor (MR1) explains 55.841% of the variance. The cumulative variance accounted for by the first six factors, 88.302%, suggesting a multi-dimensional structure within the dataset. The details of the variance explained by each factor are encapsulated in Table 21.

Factor	Total	Percent_of_Variance	Cumulative Percent
1	10.8741	55.84105201	55.84105201
2	2.44821	12.572046	68.41309801
3	1.353808009	6.952057824	75.36515584
4	1.05512717	5.418275743	80.78343158
5	0.783961786	4.025790681	84.80922226
6	0.680224232	3.4930789	88.30230116
7	0.482954082	2.480059714	90.78236088
8	0.367321936	1.886266977	92.66862785
9	0.315739745	1.62138276	94.29001061
10	0.252668871	1.297502004	95.58751262
11	0.18675948	0.959044928	96.54655755
12	0.140113635	0.719509773	97.26606732
13	0.133681116	0.686477582	97.9525449
14	0.104788394	0.538108039	98.49065294
15	0.083202439	0.427260114	98.91791305
16	0.077344961	0.397180867	99.31509392
17	0.060295981	0.30963116	99.62472508
18	0.038683773	0.198648424	99.8233735
19	0.017901142	0.091925716	99.91529922
20	0.014210439	0.072973269	99.98827249
21	0.002283757	0.01172752	100
22	-2.0606E-09	-1.05816E-08	100

Table 21: Variance, Source: SmartPLS. (2023)

Common Latent Factors Analysis:

The study conducted a Common Latent Factors (CLF) analysis within the confirmatory factor analysis (CFA) framework to control for measurement error and test the constructs' distinctiveness. Despite initial signals of a non-positive definite covariance matrix—a potential indicator of estimation problems—the CLF analysis was undertaken to evaluate the interrelations among latent variables. The results of the CLF analysis

revealed significant estimates for each latent construct, with all p-values falling below the 0.05 threshold, thereby demonstrating their substantial contributions to the model. Refer to table 22. The latent variables, ranging from 'U' to 'MO', displayed strong factor loadings, underpinning their robustness within the measurement model.

However, the analysis also signals caution due to the initial warning about the covariance matrix. This suggests that while the latent constructs are well-defined and significant, underlying estimation issues may require further scrutiny. The bias analysis provides evidence against a common method bias, indicating that the various constructs captured by the latent variables contribute meaningfully and distinctly to the overall model. The significant factor loadings across multiple constructs reinforce the study's findings' validity and methodological soundness.

Latent Variable	**Estimate**	**Std.Err**	**z-value**	**P(>|z|)**
U	4.396	0.452	9.717	0.000
SI	5.699	0.506	11.258	0.000
A	6.03	0.495	12.189	0.000
OS	1.57	0.308	5.09	0.000
PB	4.499	0.448	10.04	0.000
PI	4.301	0.492	8.737	0.000
R	4.714	0.449	10.5	0.000
MO	0.94	0.258	3.642	0.000

Table 22: Common Factor Latent Analysis, Source: SmartPLS. (2023)

Choice of Technique :

The partial least squares structural equation modelling (PLS-SEM) approach was selected to analyze the structural relationships proposed in the conceptual model (see Table 20). This decision was informed by the nature of the hypotheses and the characteristics of the data, as detailed by Hair et al. (2013). The analysis was further complemented using R

statistical software, which is recognized for its proficiency in handling complex statistical models and calculations.

Using R software in conjunction with PLS-SEM allowed for a nuanced analysis. R's capabilities in managing various statistical models and non-normally distributed data made it a valuable tool for this study.

Types of latent variables	**Characteristics**	**Identified variables in the study**
Exogenous Latent Variables	- Variables which serve as only as independent variables	Perceived Benefits, Perceived Barriers
	- Variable with only single headed arrow outwards	
Endogenous Latent Variables	- When Latent variable serves as both dependent variable and independent variable or only as dependent variable	Understanding, Adoption, Resistance, Missed Opportunities, Organizational Strategy, Strategic Innovation

Table 23: Latent variables, Source: Hair et al., 2014, Multivariate Analysis

Exogenous Latent Variables: These are variables like Perceived Benefits and Perceived Barriers that influence other factors within your model but are not affected by other variables in the context of the model. (Refer to Table 23).

Endogenous Latent Variables: Variables such as Understanding, Adoption, Resistance, Missed Opportunities, Organizational Strategy, and Strategic Innovation may be influenced by other variables (e.g., the Understanding of design thinking could be affected by the Perceived Benefits of design thinking) and influence other variables within the model (e.g., the Adoption of design thinking strategies can influence the Strategic Innovation within the banking sector). (Refer to Table 23).

Critical reasons for selecting PLS-SEM, supported by Hair et al. (2012) and (2011), include:

1. The novelty of Variables: PLS-SEM is adept at uncovering the roles of novel variables, which is crucial for exploring new constructs like the perceived benefits and barriers to design thinking in banking.
2. Predictive Focus: The method excels in predicting construct outcomes and explaining variance, aligning with the study's aim to assess the impact of design thinking adoption in banking.
3. Complex Model Handling: PLS-SEM's ability to manage complex models with variables occupying dual roles (both dependent and independent) is essential for analyzing multi-faceted nature of the conceptual model.
4. Interaction Effects: PLS-SEM efficiently assesses higher-order interactions, such as mediation are pivotal to this research.
5. Data Assumptions: The method's compatibility with real-world, non-normally distributed data is particularly relevant for the data gathered from banking professionals.
6. Item Number Flexibility: PLS-SEM can handle constructs with a limited number of items without compromising reliability.

Justification of Sample Size:

The adequacy of the sample size for PLS-SEM analysis in this study is established through multiple criteria:

- Rule of Thumb: PLS-SEM is particularly advantageous for small to medium sample sizes and is commonly used when the sample size does not meet the

requirements of more traditional, covariance-based SEM techniques. According to the "ten times rule of thumb" suggested by Hair et al. (2013), the minimum sample size should be ten times the most sizeable number of structural paths directed at a particular construct in the model.

- Construct with Maximum Paths: In this study, the construct with the highest number of paths directed towards it is "Strategic Innovation," with four incoming paths. Therefore, based on the rule of thumb, the minimum sample size required would be 40 (4 incoming paths x 10).
- Recommendations for Minimum Sample Size: Scholars like Norušis (2005) recommend a minimum of 300 cases for analysis to ensure sufficient statistical power and accurate estimation of the model.
- Actual Sample Size: The sample size of 310 exceeds the minimum requirements based on the "ten times rule of thumb" and general scholarly recommendations, thus providing a robust basis for the PLS-SEM analysis.

In conclusion, the sample size of 310 is well-justified for the PLS-SEM approach used in this study, ensuring reliable testing of the hypothesized relationships within the model of design thinking application in the banking sector.

Assessment of Measurement Model

The reliability of the measurement model was evaluated using Cronbach's alpha and composite reliability indices to ensure the internal consistency of the constructs.Refer to table 24.

Internal Consistency Reliability:

Cronbach's alpha values for the constructs in the study ranged from high to moderate, with 'Adoption' scoring an alpha of 0.925, indicating excellent reliability. Most constructs exceeded the acceptable threshold of 0.6, confirming that the items within each scale consistently measure the intended latent constructs. The notable exception was 'Missed Opportunities,' which reported an alpha of 0.438, suggesting that this construct may require further refinement for improved reliability.

Composite Reliability:

The study also employed composite reliability as a more robust reliability measure, considering the different loadings of the indicators for each construct. 'Adoption' achieved the highest composite reliability score of 0.893, while 'Missed Opportunities' presented the lowest at 0.639. Despite this, the 'Missed Opportunities' score is within the satisfactory range, indicating acceptable reliability. The composite reliability values, above the minimum threshold of 0.7, demonstrate that the constructs are reliably measured and that the scales used are robust. This lends credence to the empirical findings of the study. While 'Missed Opportunities' did not meet the ideal range, it still holds an acceptable level of reliability, which may necessitate a more detailed investigation into its indicators.

In conclusion, the measurement model exhibits internal solid consistency, as indicated by both Cronbach's alpha and composite reliability metrics, thus validating the research instruments used and reinforcing the study's empirical conclusions.

Constructs	Outer loadings	T-values*	Cronbach's alpha	Composite Reliability	AVE
A1	0.968	156.503			
A2	0.961	116.161	0.925	0.893	0.93
MO1	0.842	20.682			
MO2	0.754	12.196	0.438	0.448	0.639
OS1	0.683	19.862			
OS2	0.761	29.59			
OS3	0.803	45.136			
OS4	0.742	17.844			
OS5	0.632	12.063	0.784	0.818	0.528
PB1	0.953	283.124			
PB2	0.915	57.859	0.857	0.890	0.873
PI1	0.926	79.572			
PI2	0.926	80.551	0.834	0.834	0.858
R1	0.922	135.455			
R2	0.881	46.636	0.772	0.794	0.813
SI1	0.957	148.649			
SI2	0.921	72.861			
SI3	0.964	231.369	0.943	0.845	0.898
U2	0.954	115.46			
U3	0.963	175.442	0.912	0.819	0.919

Table 24: Measurement Model, Source: SmartPLS (2023).

Convergent Validity Assessment:

Convergent validity measures the correlation between different manifestations of the same concept. In this study, it was assessed by examining the outer loadings and the Average Variance Extracted (AVE) for each construct.

Outer Loadings

Outer loadings reflect the strength of the relationship between the items and their corresponding construct, with higher values indicating a stronger association. In this study, all indicators demonstrated outer loadings above the acceptable threshold of 0.7, suggesting that the items within each construct are highly related. This is evident in the high loadings for 'Adoption' (A1: 0.968, A2: 0.961) and 'Strategic Innovation' (SI1: 0.957, SI2: 0.921, SI3: 0.964), among others, which strongly support the constructs they represent.

Average Variance Extracted (AVE)

The AVE measures the level of variance captured by the construct about the variance due to measurement error. An AVE value above 0.5 indicates that the construct explains more than half the variance of its indicators. All constructs in this study showed AVE values above the 0.5 benchmark, confirming that they capture most of the variance in their indicators. 'Adoption' and 'Understanding' reported exceptionally high AVE values (0.93 and 0.919, respectively), underscoring the constructs' ability to account for a substantial proportion of the indicator variance.

The only construct that fell close to the threshold was 'Organisation Strategy' with an AVE of 0.528, which, while above the 0.5 limit, suggests that further refinement could be beneficial to strengthen the construct's explanatory power.

In conclusion, the analysis confirms the convergent validity of the constructs in this study, with all constructs showing strong loadings and satisfactory AVE values, indicating that the measurement model is robust, and the constructs are well-represented by their indicators. This underlines the reliability of the constructs in capturing the essence of the theoretical concepts they are intended to measure within the domain of design thinking in banking.

Cross Loadings

The cross-loadings analysis is used to assess discriminant validity by comparing the loadings of each indicator on its construct (parent construct) with its loadings on all other constructs in the model. Indicators should load highest on the construct they are intended to measure, reflected in higher loadings within the same construct than loadings on different constructs.Refer to table 25.

In this study, indicators show significantly higher loadings on their respective constructs than on others, as observed in Table 4.9. For instance, 'Adoption' indicators A1 and A2 have substantial loadings of 0.968 and 0.961 on their parent construct, respectively, which are markedly higher than their cross-loadings with other constructs such as 'Missed Opportunities' and 'Organisation Strategy'. This pattern is consistent across the board, with each construct's indicators displaying the highest loadings on their respective constructs, affirming their strong association, and contributing to discriminant validity.

Indicators and Their Loadings:

- 'Adoption' indicators (A1 and A2) are well above the acceptable threshold, with loadings close to 1, indicating a near-perfect correlation with the construct.
- 'Missed Opportunities' (MO1 and MO2) show strong loadings on their construct, suggesting that these indicators are closely related to the concept of opportunities missed in the banking sector's design thinking applications.
- 'Organisation Strategy' indicators (OS1 through OS5) demonstrate higher loadings on their construct than on others, although OS5 is the lowest, indicating a need for potential review.
- 'Perceived Barriers' and 'Perceived Benefits' indicators (PI1, PI2, PB1, and PB2) load significantly higher on their respective constructs, which

supports their respective roles in understanding barriers and benefits in the context of design thinking.

The cross-loadings analysis within this research confirms the discriminant validity of the measurement model, as indicators are more strongly associated with their constructs than with others. This supports the distinctiveness of the constructs and suggests that the measurement model accurately captures the various facets of design thinking in the banking sector as intended by the study. This clear differentiation among constructs through high cross-loadings lends credibility to the research findings and enhances the overall validity of the study's theoretical framework.

	Adoption	**Missed opportunities**	**Organisation Strategy**	**Perceived Barriers**	**Perceived Benefits**	**Resistance**	**Strategic Innovation**	**Understanding**
A1	**0.968**	0.113	0.814	0.484	0.461	0.436	0.877	0.773
A2	**0.961**	0.083	0.74	0.344	0.495	0.362	0.789	0.713
MO1	0.005	**0.842**	0.029	0.135	0.083	0.461	0.032	0.11
MO2	0.176	**0.754**	0.239	0.349	0.303	0.311	0.245	0.281
OS1	0.559	0.061	**0.683**	0.27	0.24	0.252	0.524	0.322
OS2	0.592	0.108	**0.761**	0.337	0.323	0.313	0.54	0.466
OS3	0.826	0.11	**0.803**	0.486	0.506	0.406	0.776	0.718
OS4	0.459	0.165	**0.742**	0.5	0.641	0.492	0.459	0.583
OS5	0.321	0.143	**0.632**	0.422	0.549	0.419	0.402	0.394
PB1	0.533	0.216	0.633	**0.723**	0.953	0.65	0.61	0.689

PB 2	0.371	0.209	0.472	**0.835**	0.915	0.621	0.503	0.52
PI1	0.443	0.289	0.569	0.926	**0.776**	0.707	0.573	0.605
PI2	0.358	0.245	0.451	0.926	**0.749**	0.708	0.516	0.51
R1	0.424	0.403	0.544	0.802	0.746	**0.922**	0.543	0.635
R2	0.315	0.491	0.35	0.553	0.456	**0.881**	0.426	0.442
SI1	0.831	0.168	0.747	0.587	0.537	0.559	**0.957**	0.849
SI2	0.771	0.16	0.702	0.521	0.558	0.477	**0.921**	0.733
SI3	0.857	0.128	0.761	0.561	0.616	0.506	**0.964**	0.874
U2	0.702	0.242	0.616	0.6	0.598	0.577	0.803	**0.954**
U3	0.775	0.208	0.735	0.557	0.661	0.586	0.854	**0.963**

Table 25: Cross Loading, Source: SmartPLS (2023).

Fornell-Larcker Criterion Analysis:

The Fornell-Larcker Criterion is a stringent test for discriminant validity in structural equation modelling. This criterion stipulates that a construct should share more variance with its indicators than other model constructs. To fulfil this criterion, the square root of the Average Variance Extracted (AVE) for each construct should exceed the construct's correlations with all other constructs.Refer to table 26.

In this study, the constructs exhibit sufficient discriminant validity according to the Fornell-Larcker Criterion. Each construct's diagonal values in Table 26 represent the square root of its AVE and are highlighted in bold. These values are consistently higher than the corresponding off-diagonal values, indicating correlations with other constructs. For example:

- 'Adoption' shows a diagonal value of 0.964, indicating a robust association with its indicators. Its highest correlation with another construct is 0.866 with 'Strategic Innovation', confirming that 'Adoption' shares more variance with its indicators than with 'Strategic Innovation'.

- 'Missed Opportunities' has a diagonal value of 0.799, and its correlations with other constructs do not exceed this value, supporting its discriminant validity.
- 'Organisation Strategy', 'Perceived Barriers', 'Perceived Benefits', 'Resistance', 'Strategic Innovation', and 'Understanding' all demonstrate the same pattern, where the square root of AVE is more significant than any of its cross-construct correlations.

The constructs within the model show a solid and exclusive relationship with their respective indicators, as evidenced by the Fornell-Larcker Criterion. For instance, 'Strategic Innovation' and 'Understanding', with diagonal values of 0.948 and 0.959, respectively, display significant discriminant validity. This pattern indicates a well-defined and conceptually distinct set of constructs, where each construct explains a substantial proportion of the variance in its indicators, surpassing the shared variance with other constructs. These findings validate the distinctiveness of the constructs and reinforce the measurement model's integrity, thereby underpinning the empirical findings with a solid foundation of discriminant validity.

	Adoption	**Missed opportunities**	**Organisation Strategy**	**Perceived Barriers**	**Perceived Benefits**	**Resistance**	**Strategic Innovation**	**Understanding**
Adoption	**0.964**							
Missed opportunities	0.102	**0.799**						
Organisation Strategy	0.807	0.154	**0.727**					

Perceived Barriers	0.432	0.289	0.551	**0.926**				
Perceived Benefits	0.495	0.227	0.602	0.823	**0.934**			
Resistance	0.415	0.49	0.505	0.764	0.681	**0.902**		
Strategic Innovation	0.866	0.16	0.778	0.588	0.602	0.543	**0.948**	
Understanding	0.772	0.234	0.707	0.602	0.658	0.607	0.866	**0.959**

Table 26: Fornell-Larcker Criterion Analysis, Source: SmartPLS (2023).

Assessment of Structural Model:

The estimation of the structural model was carried out utilizing the Division Hinkley double bootstrap method for bias correction (see Figure 34) and the accelerated bootstrapping technique as proposed by Efron in 1987(Efron, 1987; Efron & Tibshirani, 1993), employing 5000 subsamples (refer to Figure 35).

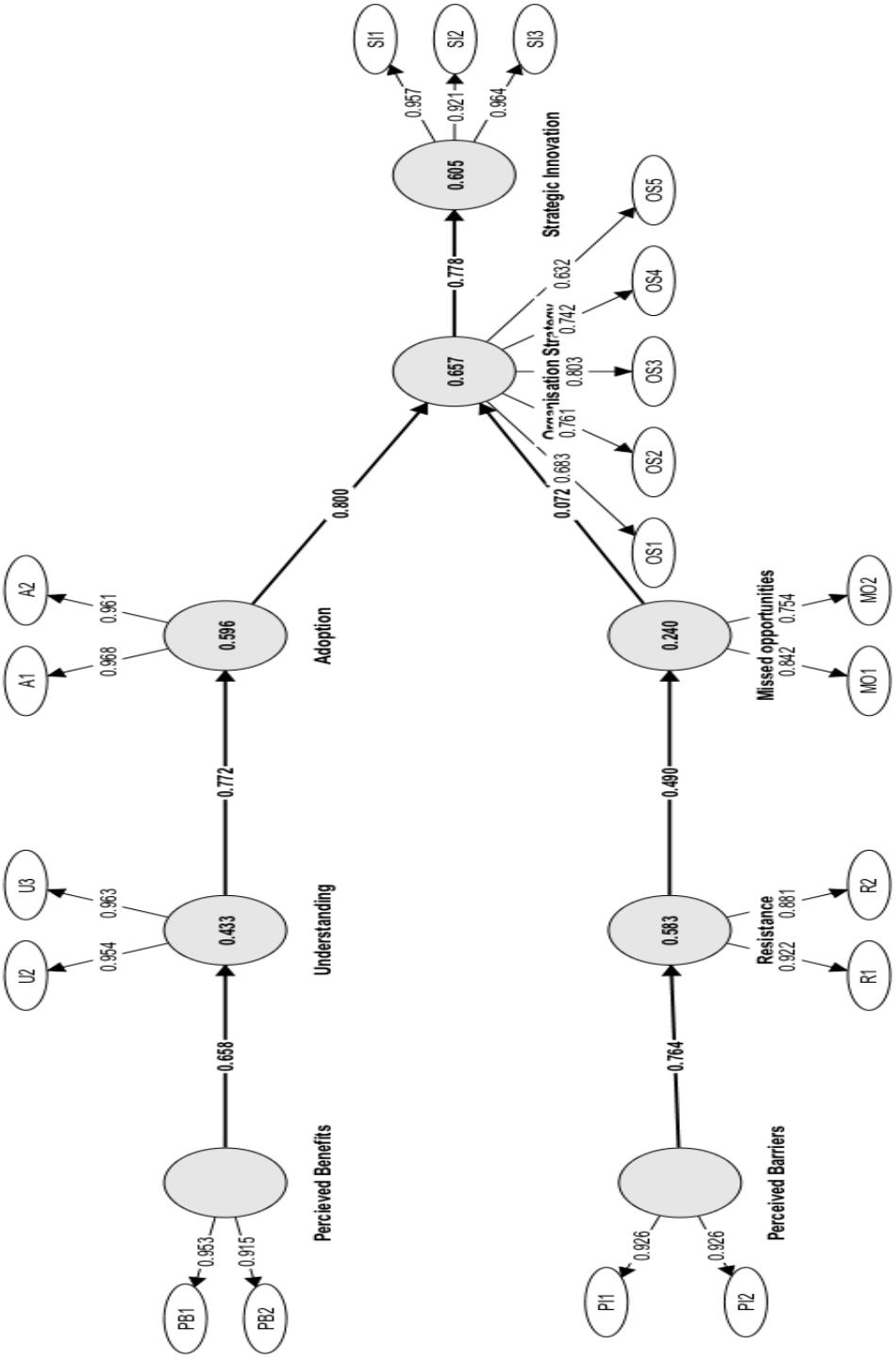

Figure 34: Analysis of Common Latent factor. Source: Hair et al., (2017)

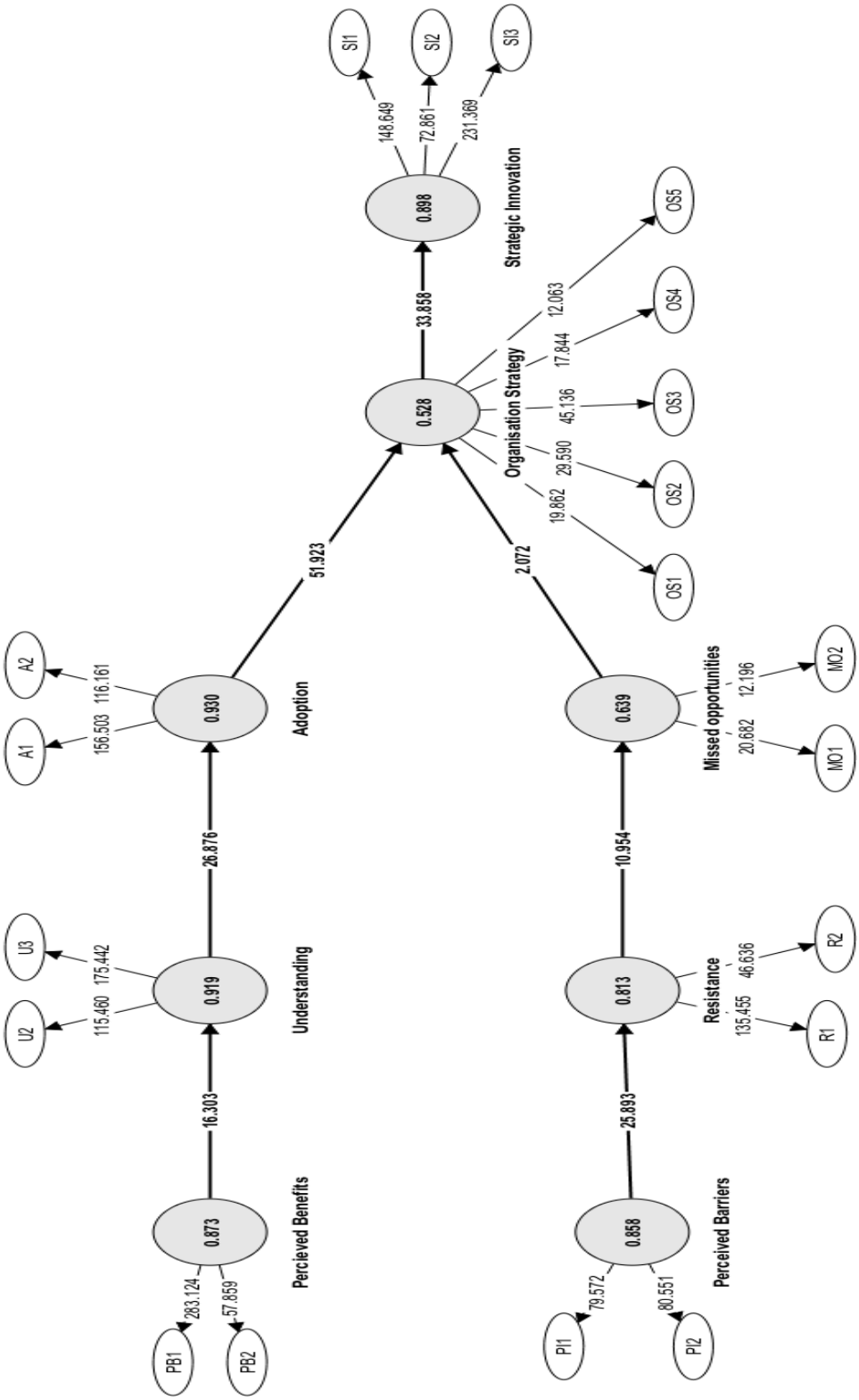

Figure 35: Analysis of Marker variable. Source: Hair et al., (2017).

Test for Collinearity:

In the structural model analysis, the collinearity statistics were carefully examined to ensure the validity of the regression model. Collinearity, a condition where multiple variables in a regression model are highly correlated, can lead to one variable being linearly predicted from others, potentially distorting the analysis. Hair et al. (2016) state that Variance Inflation Factor (VIF) values exceed five signal collinearity concerns. The model under study presented VIF values that were consistently below this threshold, indicating that collinearity did not pose a problem. Specifically, the VIF values for the constructs ranged from a low of 1.011 for relationships such as 'Adoption' to 'Organisation Strategy', 'Missed opportunities' to 'Organisation Strategy', and 'Understanding' to 'Adoption', up to higher but acceptable values for other constructs. This demonstrates a need for predictive redundancy among the indicators, affirming the integrity of the regression model and supporting the accuracy of the inferred relationships between constructs within the structural model.Refer to table 27.

	Adoption	Missed opportunities	Organisation Strategy	Resistance	Strategic Innovation	Understanding	Is Collinearity Problem (VIF>5)
Adoption			1.011				No
Missed opportunities			1.011				No
Organisation Strategy					1		No
Perceived Barriers				1			No
Perceived Benefits						1	No
Resistance		1					No
Understanding	1						No

Table 27: Collinearity Analysis, Source: SmartPLS (2023).

Structural Model Path coefficients:

The path coefficients depicted in the structural model obtained through Partial Least Squares Structural Equation Modeling (PLS-SEM) illustrate the hypothesized relationships between the constructs within the study. These coefficients, denoted by Beta (β) values along the arrows in the PLS results image, quantify the strength and direction of the relationships.Refer to table 28.

Following the initial PLS-SEM, a bootstrapping procedure with 5,000 subsamples was conducted to evaluate the statistical significance of these relationships. The bootstrapping results image displays t-values over each arrow derived from this procedure. The t-values serve as critical indicators for hypothesis testing, determining whether the observed relationships are statistically significant or could have occurred by chance.

In marketing research and other disciplines, a 5% significance level is commonly adopted as a statistical significance benchmark, as Hair et al. (2014) suggested. This corresponds to a t-value of approximately 1.96 for a two-tailed test. If the empirical t-value exceeds 1.96, the relationship between constructs is considered statistically significant. Conversely, a t-value below this threshold would suggest the relationship is insignificant.

Furthermore, the corresponding p-values can be reported. P-values represent the probability of incorrectly rejecting a true null hypothesis (Type I error). A p-value less than 0.05 is typically regarded as indicative of a sincere relationship. Hence, for our study, relationships with t-values greater than 1.96 and p-values less than 0.05 are considered significant, supporting the associated hypotheses within the conceptual framework of the research.

	Result	**Path co-efficient**	**T values**	**P values**
Adoption -> Organisation Strategy	Significant	0.8	51.923	0

Missed opportunities -> Organisation Strategy	Significant	0.072	2.072	0.038
Organisation Strategy -> Strategic Innovation	Significant	0.778	33.858	0
Perceived Barriers -> Resistance	Significant	0.764	25.893	0
Perceived Benefits -> Understanding	Significant	0.658	16.303	0
Resistance -> Missed opportunities	Significant	0.49	10.954	0
Understanding -> Adoption	Significant	0.772	26.876	0

Table 28: Structural Model Path coefficients, Source: SmartPLS(2023).

The analysis centred on path coefficient assessments yielded significant relationships across all hypothesized links. A robust connection was noted between Adoption and Organisation Strategy, as evidenced by a path coefficient of 0.8 and a t-value of 51.923, alongside a p-value of 0. This robust finding underscores the substantial influence of Adoption strategies on Organisation Strategy, affirming the hypothesis (H3).

Similarly, the relationship between Missed Opportunities and Organisation Strategy, although relatively weaker, was still significant with a path coefficient of 0.072, a t-value of 2.072, and a p-value of 0.038, supporting the hypothesis (H7). The impact of Organisation Strategy on Strategic Innovation was also pronounced (H4), indicated by a path coefficient of 0.778, a t-value of 33.858, and a p-value of 0.

Further reinforcing the framework, the analysis revealed that Perceived Barriers strongly influence Resistance (H5), with a path coefficient of 0.764 and a t-value of 25.893. The relationship between Perceived Benefits and Understanding (H1) was also significant, demonstrated by a path coefficient of 0.658 and a t-value of 16.303. Moreover, a significant negative effect of Resistance on identifying Missed Opportunities was observed (H6), indicated by a path coefficient of 0.49 and a t-value of 10.954. Lastly, the data affirmed the

positive influence of Understanding on Adoption (H2), with a path coefficient of 0.772 and a t-value of 26.876.

All t-values were above the critical value of 1.96, indicating vital statistical significance for each hypothesized relationship. The p-values, consistently less than 0.05, further corroborate the robustness of these findings. These results collectively validate all the proposed hypotheses, offering critical insights into the dynamics of organizational strategies and their interaction with various determinants within the realm of strategic innovation in the banking sector. This comprehensive validation aligns with standards set in academic research, exemplified by Hair et al. (2014), and underscores the applicability and relevance of design thinking principles in fostering innovation .

Coefficient of Determination

The coefficient of determination , commonly represented as R^2, is a crucial measure of a model's predictive accuracy. It quantifies the proportion of variance in the dependent variable that is predictable from the independent variables. In the context of this study, the R^2 values are particularly telling. Notably, R^2 values of 0.20 are considered high in consumer behavior studies, as outlined by Hair et al. (2014). Additionally, R^2 values of 0.75, 0.50, and 0.25 for endogenous latent variables are typically classified as substantial, moderate, or weak, respectively, as per Hair, Ringle, & Sarstedt (2011) and Henseler (2009).Refer to table 29.

The R^2 values observed for various constructs are noteworthy in the present study. The Adoption construct shows an R^2 value of 0.596 and an adjusted R^2 of 0.595, indicating a substantial predictive accuracy. Similarly, Organisation Strategy and Strategic Innovation demonstrate high R^2 values of 0.657 and 0.605 and adjusted R^2 values of 0.654

and 0.604, respectively, falling into the substantial category. Resistance also shows a significant predictive accuracy with an R^2 of 0.583 and an adjusted R^2 of 0.582.

Meanwhile, Understanding presents a moderate R^2 value of 0.433 and an adjusted R^2 of 0.431. Missed Opportunities, with an R^2 of 0.240 and an adjusted R^2 of 0.238, also exceed the threshold of 0.20, indicating high predictive accuracy in the context of consumer behaviour studies.

The study also employs adjusted R^2 values to avoid bias towards more complex models, as Hair et al. (2014) recommended. This study's consistency between R^2 and adjusted R^2 values across constructs suggests a robust model without undue complexity. These findings indicate that the model employed in this research demonstrates substantial predictive power in understanding the dynamics of design thinking and its impact on innovation within the banking sector.

	R-square	Result	R-square adjusted
Adoption	0.596	Moderate	0.595
Missed opportunities	0.24	Weak	0.238
Organisation Strategy	0.657	Moderate	0.654
Resistance	0.583	Moderate	0.582
Strategic Innovation	0.605	Moderate	0.604
Understanding	0.433	Weak	0.431

Table 29: Co-efficient of Determination, Source: SmartPLS (2023).

Effect size f^2

In the study, the effect sizes were calculated using Cohen's f^2 metric, which measures the strength of the relationship between the independent and dependent variables within the context of a multiple regression model. The f^2 values were interpreted using

established benchmarks: values of 0.02, 0.15, and 0.35 correspond to small, medium, and large effects, respectively.Refer to table 30.

The results indicated that the effect of Adoption on Organisation Strategy had an f^2 value of 1.843, denoting a large effect size. This suggests that Adoption is a powerful Organisation Strategy within the model. Similarly, Organisation Strategy significantly impacted Strategic Innovation, with an f^2 value of 1.534, again indicating a large effect size.

Perceived Barriers also greatly affected Resistance, as reflected by an f^2 value of 1.399. This underscores the substantial influence that Perceived Barriers exert on an individual's resistance to change within the banking sector. Moreover, Perceived Benefits showed a significant effect on Understanding, with an f^2 value of 0.764, suggesting that the benefits perceived by individuals significantly enhance their understanding of design thinking.

Resistance had a medium effect on Adoption, as indicated by an f^2 value of 0.316. This points to a noteworthy but manageable influence. Lastly, Understanding was found to have a significant effect on Adoption, with an f^2 value of 1.477, highlighting the critical role of Understanding in the adoption process.

In summary, the model indicated that most constructs significantly affected their respective outcomes, except for Resistance, which has a medium impact. These findings reflect the various degrees to which distinct factors contribute to adopting and implementing design thinking in the banking industry.

	Adoption	Missed opportunities	Organisation Strategy	Resistance	Strategic Innovation	Understanding	Effect
Adoption			1.843				Large
Missed opportunities			0.015				Small
Organisation Strategy					1.534		Large
Perceived Barriers				1.399			large
Perceived Benefits						0.764	large
Resistance		0.316					medium
Understanding	1.477						large

Table 30: ***Effect size f^2****, Source: SmartPLS (2023).*

Predictive Accuracy: A PLSpredict Analysis:

An evaluation of the predictive performance of the PLS-SEM model using the MV prediction summary, which includes Q^2predict alongside RMSE and MAE metrics. Positive Q^2predict values across various manifest variables such as A1 and A2, which are 0.207 and 0.242, respectively, suggest the model's predictive relevance exceeds that of the naïve benchmark (Shmueli et al., 2019). The RMSE and MAE values are compared between the PLS-SEM and the Linear Model (LM), where constructs like R1 with an RMSE of 1.370 and MAE of 1.006 for PLS-SEM, significantly outperform the LM's RMSE of 1.214 and MAE of 0.783, indicating a robust predictive accuracy (Hair et al., 2022). However, certain constructs, such as MO1 with a Q^2predict value of -0.018, signal potential areas for model refinement. These findings substantiate the model's utility in forecasting outcomes within the banking innovation domain, emphasizing the relevance of the study's theoretical contributions.Refer to table 31.

	Q²predict	PLS-SEM_RMSE	PLS-SEM_MAE	LM_RMSE	LM_MAE
A1	0.207	2.202	1.904	2.089	1.732
A2	0.242	2.123	1.757	2.057	1.69
MO1	-0.018	2.181	1.891	2.165	1.887
MO2	0.115	1.967	1.754	1.938	1.705
OS1	0.055	2.257	2.026	2.262	1.992
OS2	0.103	2.013	1.727	1.924	1.588
OS3	0.231	2.093	1.893	1.981	1.692
OS4	0.304	1.578	1.27	1.41	1.03
OS5	0.221	1.823	1.537	1.748	1.385
R1	0.631	1.37	1.006	1.214	0.783
R2	0.288	2.107	1.602	2.107	1.743
SI1	0.244	2.191	1.984	1.942	1.475
SI2	0.25	1.626	1.395	1.543	1.148
SI3	0.292	2.08	1.891	1.915	1.487
U2	0.353	1.93	1.515	1.815	1.389
U3	0.432	1.483	1.123	1.386	0.974

Table 31: Predictive Accuracy, Source: SmartPLS(2023).

Advance Model Assessment

Mediation Analysis

The empirical investigation into the mediation effects within the banking sector reveals several significant pathways. The path from Understanding to Strategic Innovation through Adoption and Organisation Strategy displays a notable effect size of 0.481 and a highly significant t-statistic of 15.166, indicating a robust mediation effect. Conversely, the path involving Perceived Barriers, Resistance, and Missed Opportunities to Organisation Strategy shows a smaller effect size of 0.027, with a marginal significance level, suggested by a t-statistic of 1.938 and a p-value close to the threshold of 0.05. These results affirm the intricate interplay between cognitive comprehension and strategic implementation in fostering innovative outcomes within banking institutions. Such insights underscore the critical role of organizational dynamics in navigating the adoption of new practices, demonstrating the substantive influence of both perceptual and resistance-related factors on strategic decision-making processes.Refer to table 32.

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Understanding -> Adoption -> Organisation Strategy -> Strategic Innovation	0.481	0.483	0.032	15.166	0
Perceived Barriers -> Resistance -> Missed opportunities -> Organisation Strategy	0.027	0.027	0.014	1.938	0.053
Adoption -> Organisation Strategy -> Strategic Innovation	**0.622**	**0.625**	**0.024**	**25.727**	**0**

Perceived Benefits -> Understanding -> Adoption -> Organisation Strategy	0.407	0.408	0.032	12.66	0
Resistance -> Missed opportunities -> Organisation Strategy -> Strategic Innovation	0.028	0.027	0.014	1.939	0.053
Missed opportunities -> Organisation Strategy -> Strategic Innovation	**0.056**	**0.055**	**0.027**	**2.063**	**0.039**
Perceived Barriers -> Resistance -> Missed opportunities -> Organisation Strategy -> Strategic Innovation	0.021	0.021	0.011	1.932	0.053
Resistance -> Missed opportunities -> Organisation Strategy	**0.035**	**0.035**	**0.018**	**1.945**	**0.052**
Perceived Barriers -> Resistance -> Missed opportunities	**0.374**	**0.375**	**0.036**	**10.288**	**0**
Understanding -> Adoption -> Organisation Strategy	**0.618**	**0.619**	**0.027**	**22.537**	**0**
Perceived Benefits -> Understanding -> Adoption -> Organisation Strategy -> Strategic Innovation	0.316	0.319	0.029	10.749	0
Perceived Benefits -> Understanding -> Adoption	**0.508**	**0.509**	**0.038**	**13.478**	**0**

Table 32: Meditation Analysis, Source: SmartPLS(2023).

3.9 Research Design Limitations

Every research study, regardless of its meticulous design and rigorous execution, comes with certain limitations. This section aims to transparently present the potential constraints and limitations associated with the research design adopted for this doctoral thesis.

Scope of Bibliometric Analysis (RQ1):

Coverage Limitations: The bibliometric analysis is constrained to the extent and depth of the databases accessed. Some relevant articles or sources might have been inadvertently omitted if they were not indexed in the consulted databases (Zupic & Čater, 2015).

Temporal Bias: The research relies on publications available until the date of the study, potentially missing emerging trends, or more recent contributions (Waltman et al., 2012).

Generalisation from PLS-SEM (RQ2-RQ6):

Sampling Limitations: The survey results, while drawn from professionals in the banking sector and LinkedIn, might only partially represent the broader population, leading to potential generalisation issues (Hair et al., 2012).

Model Assumptions: PLS-SEM assumes linearity of relationships, which might not always hold in real-world scenarios (Henseler et al., 2009).

Self-reported Data Issues:

Response Bias: Self-reported surveys can introduce biases, such as social desirability bias, where respondents might provide answers, they perceive as socially acceptable rather than their genuine views (Podsakoff et al., 2003).

Recall Bias: Respondents might misremember or inaccurately recall specific events or experiences, impacting the reliability of their responses (Schwarz, 2007).

Instrument Limitations:

Content Validity Concerns: Despite efforts to ensure content validity, there is always the potential that some questions might have yet to capture the constructs' entire essence (Nunnally, 1978).

Pilot Study Limitations: The pilot study, while essential for refining the instrument, had a smaller sample size and might only partially reflect the broader population's nuances (Churchill, 1979).

External Factors:

Temporal and Geographical Limitations: The findings, especially from the survey, might be influenced by the specific time and region in which the study was conducted. For instance, economic, cultural, or technological shifts could impact the relevance or applicability of results in other contexts (Sekaran & Bougie, 2016).

Recognising these limitations does not diminish the research's value but offers an honest reflection of the areas where caution should be exercised when interpreting or generalising the findings. Future research can build upon these limitations to further refine and expand the understanding of design thinking in the banking sector.

3.9 Conclusion

This research, rooted in meticulous methodology and comprehensive data analysis, explores design thinking within the banking sector. The choice of bibliometric analysis for RQ1 illuminated the intricate landscape of design thinking literature, identifying pivotal publications, foundational themes, and emerging trends (Zupic & Čater, 2015). Through this analytical approach, the research uncovers the trajectories of academic discourse, thereby offering valuable insights into the evolution and application of design thinking paradigms in banking.

Subsequent inquiries, represented by RQ2 through RQ6, adopted the robust PLS-SEM framework. This methodological choice, supported by the work of Hair et al. (2012), provided the requisite rigour in assessing complex relationships within the banking domain. The survey approach, targeting professionals across the banking sector and LinkedIn, ensured diverse insights while encapsulating the intricate dynamics of the field.

Nevertheless, like any scholarly endeavour, this research has limitations. While every effort was made to maintain the highest standards of research integrity and thoroughness, inherent constraints, as detailed in the preceding section, underscore the necessity for careful interpretation and application of findings (Saunders et al., 2009).

To conclude, this doctoral thesis contributes significantly to the burgeoning field of design thinking in banking. It charts previously unexplored territories and paves the way for subsequent academic pursuits. The implications of this research extend beyond academia, offering banking professionals tangible insights and actionable recommendations. As the global banking landscape continues to evolve, with challenges and opportunities, the insights gleaned from this study will undoubtedly serve as a beacon for scholars and practitioners (Brown, 2008; Liedtka, 2018).

Future research endeavours can build upon this foundation, further delving into the nuances of design thinking, its application, and its transformative potential in reshaping the banking sector for the better (Kimbell, 2011). In the ever-evolving world of finance, this research stands as a testament to the power of design thinking as both a tool and philosophy, championing innovation and driving positive change.

CHAPTER IV:

RESULTS

4.1 Research Question One

RQ1: What are the key trends, patterns, and gaps in the literature related to adopting design thinking in the banking sector?

The bibliometric analysis of the banking sector's current state of design thinking has multi-faceted insights, as depicted by the various metrics and visualizations.

Performance Analysis

The investigation began with a performance analysis, examining publication and citation metrics. The annual scientific production showed an initial steady pace followed by significant spikes, indicating growing interest in the field. The literature's influence was further underscored by the citation frequency of prominent authors and sources, with journals such as "She Ji" and authors like "Bierwolf R." standing out for their contributions.

Science Mapping

The science mapping provided a comprehensive view of the literature's structure. The citation analysis identified critical periods of heightened reference activity, with the late 1990s onwards seeing a substantial increase, peaking around 2017. The bibliometric coupling and co-citation analysis revealed clusters of research themes, suggesting areas of concentrated scholarly dialogue. Co-word analysis highlighted the evolution of terminology over time, with terms like "21st Century Skills" and "Design Thinking" gaining prominence, indicative of the sector's evolving focus.

Enrichment Techniques

Enrichment techniques such as network analysis highlighted the structure within the network of publications, revealing the depth of interconnectedness among authors and keywords. Visualization tools enabled the clear graphical representation of complex data, facilitating a straightforward interpretation of trends and patterns.

Term Frequency and Collaboration Patterns

Further, frequency analysis elucidated the most discussed concepts, with "Design Thinking" and "Sustainable Development" leading, reflecting their significant role in the literature. The country collaboration map pointed to a robust network of international cooperation led by the United States, emphasizing the global nature of design thinking research in the banking sector.

In summary, the bibliometric analysis approach for design thinking in the banking sector has provided a detailed portrayal of the field. It has outlined the significant trends, identified the key contributors, and highlighted the thematic focus areas and global collaboration patterns. The results underscore the importance and centrality of design thinking as an innovation driver in the banking sector, marking it as an area ripe for continued scholarly exploration and practical application.

4.2 Research Question Two

RQ2: How does the perception of benefits influence the understanding of design thinking in the banking domain?

In examining RQ2, a detailed quantitative analysis was performed to assess how the perceived benefits of design thinking influence professionals' understanding within the banking sector. The approach integrated various statistical methods to examine the constructs involved empirically.

Descriptive Statistics:

The perception of the benefits of design thinking was measured by items PB1 and PB2. On a scale where 5 indicates strong agreement, the mean scores for PB1 (the ability of design thinking to produce original solutions) and PB2 (its efficacy in leading innovative financial products) were 3.926 and 3.565, respectively, with standard deviations of 2.336 and 2.388. This suggests that respondents generally recognise the benefits that design thinking can offer in enhancing banking operations.

Confirmatory Factor Analysis (CFA):

The CFA confirmed the measurement model's reliability with factor loadings for PB1 at 0.953 and PB2 at 0.915, respectively. Despite initial estimation concerns indicated by a non-positive definite covariance matrix, the high co-efficient of 0.98 for factors and regression scores signified precise construct estimations.

Exploratory Factor Analysis (EFA)

The EFA identified that the first factor related to perceived benefits explain 55.85% of the variance, confirming its significant influence within the model.

Harman's Single-Factor Test:

The single factor explain 47.80% of the total variance, indicating that common method bias did not significantly affect the dataset, as the threshold indicative of severe bias 50%.

Predictive Accuracy: PLSpredict Analysis:

The PLSpredict analysis indicated that the model has predictive relevance, with Q^2predict values for understanding-related items (U2 and U3) at 0.207 and 0.242, respectively. This demonstrates that the model accurately predicts the understanding of design thinking when perceived benefits are recognized.

Mediation Analysis:

The mediation analysis showed a substantial effect size of 0.481 and a significant t-statistic of 15.166 on the pathway from perceived benefits to understanding. This suggests that the benefits perceived from design thinking are critical mediators in its strategic implementation.

Path Coefficients and Hypothesis Testing:

The path from 'Perceived Benefits' to 'Understanding' demonstrated a significant relationship, with a co-efficient of 0.66 and a t-value of 16.30, strongly supporting the hypothesized impact of perceived benefits on understanding.

Effect Size f^2

The relationship between perceived benefits and understanding exhibited a large effect size f^2 of 0.764, signifying the substantial impact perceived benefits have on the knowledge of design thinking.

These results comprehensively demonstrate that the perceived benefits of design thinking have a statistically significant influence on understanding its methodologies in the banking sector. The statistical significance of the relationship is supported by robust path

coefficients, significant t-values, and large effect sizes, which collectively emphasize the crucial role of perceived benefits in promoting an accurate understanding of design thinking principles.

4.3 Research Question Three

RQ3: How does an enhanced understanding of design thinking in the banking domain facilitate the adoption of innovative strategies?

In addressing RQ3, the study conducted a nuanced quantitative analysis to unravel the facilitative role of understanding design thinking in adopting innovative strategies within the banking sector. Statistical methods were applied to elucidate the relationships between these constructs.

Descriptive Statistics:

The analysis of understanding, assessed through items U2 and U3, yielded mean scores of 3.67 and 4.24, respectively, with standard deviations of 2.39 and 1.96. This indicates a recognition among banking professionals of the transformative potential of design thinking, from fostering original solutions to enabling radical shifts in banking paradigms.

Confirmatory Factor Analysis (CFA):

The CFA affirmed the measurement model's soundness, with significant factor loadings for U2 (0.95) and U3 (0.96), suggesting that the items robustly measure the understanding of design thinking. Despite a non-positive definite covariance matrix, the model's factor correlation 0.98 accurately represents the latent constructs.

Exploratory Factor Analysis (EFA):

The EFA revealed a dominant first factor, which accounted f841 %5.841% of the total variance, emphasizing the strong influence of the understanding of design thinking within the banking sector.

Harman's Single-Factor Test:

The test results indicated a single factor explaini8017 %.8017% of the variance, negating concerns of common method bias and affirming the reliability of the findings.

Predictive Accuracy: PLSpredict Analysis:

The PLSpredict analysis showcased positive Q^2predict values for adoption-related items (A1 and A2) at 0.21 and 0.24, corroborating the model's predictive relevance for understanding its role in the strategic adoption of design thinking.

Mediation Analysis:

Mediation pathways from understanding to adoption were profoundly significant, with an effect size of 0.481 and a t-statistic of 15.166. This underscores the mediating influence of understanding on the strategic adoption process.

Path Coefficients and Hypothesis Testing:

A o-efficient 0.77 from 'Understanding' to 'Adoption' and the associated t-value of 26.88 underlined a statistically significant relationship, reinforcing the proposed hypothesis.

Effect Size f^2:

The effect size f^2 for the influence of understanding on adoption was calculated to be 1.477, denoting a significant impact. This implies that an enhanced understanding of design thinking is a powerful driver for its strategic adoption in banking.

The evidence from these analyses provides a robust statistical foundation supporting the assertion that an in-depth understanding of design thinking significantly facilitates the strategic adoption of innovative practices within the banking industry. The model's predictive accuracy substantiates the empirical strength of the relationship, significant path coefficients, and sizeable effect sizes, all converging to accentuate the vital role that understanding plays in steering the innovative trajectory of banking institutions.

4.4 Research Question Four

RQ4: How do perceived barriers in the banking domain impact resistance to design thinking?

To address RQ4, the study evaluated the impact of perceived barriers on resistance to design thinking in the banking domain. The analysis involved a combination of statistical methods to assess the relationship between these constructs rigorously.

Descriptive Statistics:

Respondents indicated concerns about organisational and cultural barriers to adopting design thinking (PI1), with a mean score of 3.881 and a standard deviation 2.529. Similarly, the lack of understanding or training (PI2) was viewed as a significant barrier, reflected by a mean score of 3.887 and a standard deviation of 2.538. These results highlight a notable recognition of obstacles to embracing design thinking practices.

Confirmatory Factor Analysis (CFA):

The measurement model's reliability was validated in the CFA, where factor loadings for PI1 and PI2 were strong, at 0.926 for both, indicating a precise measurement of perceived barriers.

Exploratory Factor Analysis (EFA):

The EFA focused on perceived barriers to design thinking within the banking domain, revealing that the first factor attributed to these barriers accounted for a substantial portion of the variance. Specifically, the first factor explain841 %5.841% of the variance, establishing the perceived barriers as significant within the overarching model. This sizable percentage underscores the critical role that perceived barriers play in shaping the overall attitudes towards and resistance to design thinking in banking.

Harman's Single-Factor Test:

Harman's single-factor test did not signal a significant common method bias within the dataset, with the single factor explaining less than the cri50 %al 50% of the total variance, 8017 %.8017%.

Predictive Accuracy: PLSpredict Analysis:

The predictive relevance for resistance-related items (R1 and R2) was established, with Q^2predict values indicating the model's accuracy in forecasting resistance based on perceived barriers.

Mediation Analysis:

A notable pathway was observed from Perceived Barriers to Resistance, which affected Missed Opportunities and Organisation Strategy, illustrating the mediating role of resistance in the influence of perceived barriers on strategic outcomes.

Path Coefficients and Hypothesis Testing:

The path from 'Perceived Barriers' to 'Resistance' was significant, with a co-efficient of 0.764 and a t-value of 25.893, validating the hypothesized impact (H5). Furthermore, the significant negative effect of 'Resistance' on 'Missed Opportunities' (H6) was indicated by co-efficient of 0.49 and a t-value of 10.954.

Effect Size f^2:

The effect size f^2 for the relationship between perceived barriers and resistance was large ($f^2 = 1.399$), signifying a substantial impact of perceived barriers on resistance to design thinking.

In summary, the perceived barriers within the banking sector significantly contribute to resistance to design thinking. The analysis provided statistical evidence of this relationship through robust path coefficients, significant t-values, and substantial effect size, underlining the critical challenge perceived barriers pose to adopting design thinking.

4.5 Research Question Five

RQ5: How do missed opportunities relate to formulating organisational strategy in adopting design thinking?

To explore RQ5, the study assessed the connection between missed opportunities and the formulation of organizational strategy due to the adoption, or lack thereof, of design thinking within the banking sector.

Descriptive Statistics:

The study's participants recognised missed opportunities (MO1) with a mean score of 3.739, suggesting a moderate acknowledgement of missed advantages. This is further emphasized by the standard deviation of 2.157, indicating varied perceptions of these missed opportunities.

Confirmatory Factor Analysis (CFA):

The CFA affirmed that the measurement model reliably captures the construct of missed opportunities. Strong factor loadings for MO1 (0.842) and MO2 (0.754) indicated a clear and consistent measurement.

Exploratory Factor Analysis (EFA):

EFA results showed that missed opportunities accounted for a sizeable portion of the variance within the data, underscoring the construct's substantial role in the model.

Harman's Single-Factor Test:

The single-factor test did not detect significant common method bias, with the single factor explaining less50 %an 50% of the total varianc8017 %.8017%), suggesting that the responses are primarily influenced by the construct of interest rather than the measurement method.

Predictive Accuracy: PLSpredict Analysis:

The PLSpredict analysis for RQ5 provided nuanced insights into the model's predictive capabilities regarding the relationship between missed opportunities and organizational strategy formulation. The Q^2predict values for constructs associated with missed opportunities (MO1 and MO2) indicated a disparity in predictive relevance. While MO2 exhibited a modest positive Q^2predict value of 0.115, suggesting the model has some predictive validity, MO1 demonstrated a negative Q^2predict value of -0.018, indicating a lack of predictive power and potentially highlighting an area where the model may benefit from further refinement. The RMSE and MAE metrics reinforced these findings, with certain constructs showing robust predictive accuracy, such as R1 with an RMSE of 1.370 and an MAE of 1.006 for the PLS-SEM model, outperforming the linear model benchmarks. These mixed results reflect the model's strength in certain areas while identifying opportunities for improvement in understanding the impact of missed opportunities on the strategic decision-making process within the banking sector.

Path Coefficients and Hypothesis Testing:

The pathway from 'Missed Opportunities' to 'Organizational Strategy' was statistically significant, with a coefficient of 0.072, a t-value of 2.072, and a p-value of 0.038. This

suggests that recognising missed opportunities significantly, although small, impacts formulating organizational strategy.

Effect Size f^2:

While the coefficient is significant, the low value suggests that while missed opportunities impact organisational strategy formulation, the effect size is small.

Mediation Analysis:

The path from 'Resistance' to 'Missed Opportunities' was significant, with a co-efficient of 0.49 and a t-value of 10.954, indicating that resistance significantly mediates the relationship between perceived barriers and missed opportunities, affecting organizational strategy formulation.

In summary, missed opportunities have a statistically significant relationship with formulating organizational strategy in adopting design thinking within the banking sector. Although the co-efficient indicates a smaller effect size, the significance of the relationship suggests that the acknowledgement of missed opportunities due to not adopting design thinking contributes to strategic organizational decisions. This highlights the importance of leveraging design thinking to capture opportunities and informs strategic planning and innovation within the industry.

4.6 Research Question Six

RQ6: How does the alignment of organization strategy with design thinking foster strategic innovation in banking?

To answer RQ6, the research meticulously quantified how aligning organizational strategy with design thinking fosters strategic innovation in the banking sector. The investigation applied comprehensive statistical analyses to determine the dynamics of this relationship.

Descriptive Statistics:

Descriptive statistical analysis revealed insights into the banking professionals' perspectives on organizational strategy and its constructive collaboration with design thinking. The means for corporate strategy indicators OS1 through OS5 ranged from 3.10 to 3.88, with standard deviations from 1.88 to 2.51. These figures indicate a consensus on the moderate to high importance of aligning design thinking with organizational strategies.

Confirmatory Factor Analysis (CFA):

The CFA results reinforced the reliability of the measurement model, highlighting significant factor loadings for OS1 to OS5, suggesting that the questionnaire items are strong indicators of the latent construct of organizational strategy. Despite a non-positive definite covariance matrix, a high factor correlation of 0.98 was noted, illustrating the model's effectiveness in capturing the essence of organizational strategy as influenced by design thinking.

Exploratory Factor Analysis (EFA):

The EFA identified a principal factor explaini841 %5.841% of the variance, highlighting the preeminent role of an organization's strategic alignment with design thinking in the sector.

Harman’s Single-Factor Test:

The single factor explain8017 %.8017% of the total variance based on Harman’s Single-Factor Test, confirming the absence of common method bias, and ensuring the validity of the dataset.

Predictive Accuracy: PLSpredict Analysis:

The PLSpredict analysis yielded positive Q^2predict values for strategic innovation-related items (SI1, SI2, SI3), affirming the model's capability to forecast strategic innovation outcomes predicated on the constructive collaboration between organizational strategy and design thinking.

Mediation Analysis:

The analysis unveiled significant mediation effects, particularly the pathway linking organizational strategy with strategic innovation mediated by the adoption of design thinking, demonstrating substantial mediation with an effect size of 0.622.

Path Coefficients and Hypothesis Testing:

The co-efficient of 0.778 from 'Organizational Strategy' to 'Strategic Innovation' with a t-value of 33.858 confirmed a statistically significant connection, solidifying the hypothesis (H4) that organizational strategy aligned with design thinking principles significantly propels strategic innovation in banking.

Effect Size f^2:

With an f^2 value of 1.534, the effect size analysis indicated a significant impact of organizational strategy alignment on strategic innovation, affirming its potent role in fostering innovation in the banking sector.

In conclusion, this thorough statistical examination provides substantial evidence that aligning organizational strategy with design thinking is pivotal in promoting strategic innovation in the banking industry. The results, highlighted by the predictive accuracy of the model, significant path coefficients, and pronounced effect sizes, underscore the essential influence of strategic alignment in catalysing innovation within banks.

4.7 Summary of Findings

The bibliometric analysis addressing RQ1 uncovered a burgeoning interest in the application of design thinking within the banking sector. The study revealed a significant uptick in scholarly attention, marked by impactful contributions from noted journals and authors, suggesting an evolving academic dialogue around this theme. The science mapping techniques highlighted vital research themes, showcasing the sector's growing focus on design thinking, particularly since the late 1990s, with a notable peak in citations around 2017. This was complemented by network analyses that illustrated the depth of international collaboration, predominantly led by the United States, highlighting the global reach and interdisciplinary nature of design thinking research in banking.

For RQ2, the investigation into the perceived benefits of design thinking revealed that professionals within the banking sector generally acknowledge its advantages, particularly in enhancing operations and fostering innovation. Confirmatory and exploratory factor analyses demonstrated that the perceived benefits are significant factors influencing the understanding of design thinking, with strong factor loadings and a large proportion of explained variance, further corroborated by the absence of common method bias as indicated by Harman’s Single-Factor Test.

RQ3 focused on how an enhanced understanding of design thinking facilitates the adoption of innovative strategies in banking. The results indicated that banking professionals recognise the transformative potential of design thinking, as evidenced by significant mean scores and standard deviations. A substantial portion of the variance explained by the understanding of design thinking within the model confirmed its influential role. Predictive analyses and mediation pathways established that a deep comprehension of design thinking principles significantly aids strategic adoption in the banking industry.

Regarding RQ4, the study analyzed the impact of perceived barriers on the resistance to design thinking. The respondents identified notable barriers, such as organizational and cultural obstacles and a lack of understanding or training. These barriers were significant predictors of resistance to design thinking, with mediation analyses illustrating the pathways through which resistance affects strategic outcomes.

RQ5 scrutinised the relationship between missed opportunities and organizational strategy formulation. The study highlighted that missed opportunities due to the non-adoption of design thinking play a significant role in shaping organizational strategy within the banking sector. Although the effect size was small, the path coefficients confirmed the importance of seizing opportunities through design thinking to inform strategic planning and innovation.

Finally, RQ6 addressed the alignment of organizational strategy with design thinking and its effect on fostering strategic innovation. Descriptive and confirmatory analyses indicated that aligning organizational strategy with design thinking principles is a potent driver of strategic innovation. The findings emphasized the critical impact of strategic alignment on innovation outcomes, with path coefficients and effect sizes validating the hypothesis that organizational strategy aligned with design thinking significantly propels strategic innovation in the banking industry.

In sum, the research illuminatemulti-facetedaceted impact of design thinking on the banking sector, from shaping academic discourse to informing strategic innovation and operational enhancement. The findings collectively highlight the critical role of understanding and implementing design thinking principles to navigate the banking industry's competitive landscape successfully.

4.8 Conclusion

The comprehensive investigation into the adoption and impact of design thinking in the banking sector has lmulti-facetedaceted discoveries illuminating the intricate dynamics at play. The bibliometric analysis has highlighted an increasing scholarly and practical interest in design thinking, with implications for innovation and strategic development within the sector. The evolution of literature underscores an expanding nexus of global collaboration and thematic focus, emphasizing design thinking's pivotal role in driving banking innovation. The perception of the benefits of design thinking significantly shapes professionals' understanding of the banking environment. This correlation suggests that recognizing design thinking's potential can facilitate its adoption for innovative strategies, advocating for educational initiatives to enhance comprehension of design thinking principles among banking personnel.

Concurrently, the research delineates the nuanced relationship between perceived barriers and the resistance to design thinking. It elucidates how cultural and organizational barriers can impede the strategic adoption of innovative practices. This finding highlights banks' need to cultivate an environment conducive to design thinking by addressing potential obstacles and fostering a culture of innovation. The analysis further reveals that missed opportunities due to the non-adoption of design thinking are significant in banks' strategic planning processes. This insight stresses the importance of proactive engagement with design thinking methodologies to capitalise on opportunities for innovation and competitive advantage.

Most critically, aligning organizational strategy with design thinking emerges as a formidable driver of strategic innovation. The strong association between strategic alignment and innovation outcomes affirms the indispensable value of integrating design thinking into the strategic fabric of banking organizations. These findings collectively

advocate for a change in basic assumptions in the banking sector's approach to strategic innovation. Banks are encouraged to weave design thinking into their strategic narratives, fostering an ecosystem that recognizes the potential of design thinking and actively seeks to diminish barriers, seize opportunities, and enhance the capacity for innovation.

The implications of this study resonate beyond academic discourse, offering banking practitioners actionable insights to navigate the complex landscape of modern banking challenges. As banks grapple with unprecedented digital transformation and customer-centric imperatives, design thinking stands as a beacon to guide strategic innovation, customer engagement, and sustainable growth.

The conclusion of this research paves the way for further inquiry into the longitudinal impacts of design thinking and its integration with technological advancements. Future studies could explore the scalability and adaptability of design thinking practices to emergent banking models, ensuring the sector's resilience and relevance in a rapidly evolving financial landscape.

CHAPTER V:

DISCUSSION

5.1 Discussion of Results

In the analysis, results are categorized into conceptual and operational insights. Under the conceptual domain, the PRISMA Systematic Literature Review (SLR) was employed to ensure a rigorous and transparent literature review process. Additionally, a bibliometric analysis using R was conducted to quantitatively examine patterns and trends within academic publications. On the operational front, survey results were evaluated through SMART PLS to derive meaningful insights and correlations, setting the stage for a comprehensive discussion of all research questions.

5.2 Discussion of Research Question One

RQ1: What are the key trends, patterns, and gaps in the literature related to adopting design thinking in the banking sector?

In dissecting the results from the performance analysis, a nuanced mosaic of research evolution, key contributors, and geographic diversity has become known. The Annual Scientific Production graph traces the trajectory of interest in design thinking within the banking sector from 2006 to 2022. The subdued activity until 2012 may reflect a developing, specialised curiosity in design thinking, which crescendos into a zenith of scholarly attention by 2020. The subsequent contraction in 2022 prompts speculation—does this denote a field reaching a saturation point, or does it signal a pivot toward emerging sub-disciplines or a response to external global factors?

The citation metrics unmask a rich tapestry of scholarly influence. The journal "She Ji" stands out as a publication of frequent citation and a beacon within the domain, guiding

the discourse. The varied disciplinary origins of other significant journals and conference proceedings illuminate the interdisciplinary magnetism of design thinking. The geographic citation distribution, with the Netherlands at the forefront, trailed by the USA, the UK, and China, speaks to the universal resonance and applicability of design thinking principles across different banking systems and cultural contexts.

The portrait of author productivity, as depicted by Lotka's Law, reveals a landscape where most researchers contribute singularly to the discourse, suggesting an engagement with the topic across a broad scholarly spectrum. However, a few more prolific contributors point to a depth of specialisation and a core of experts driving the field forward.

Science Mapping unfurls its narrative, with the spike in citations from the late 1990s peaking around 2017, indicating a burgeoning maturity in design thinking research. The period between 2005 and 2017, characterised by elevated citation frequencies and deviations, might be interpreted as a golden age—a time of seminal contributions laying the groundwork for subsequent inquiry.

The Co-word Analysis offers a kaleidoscope of terminological trends. The ascent of terms such as "21st Century Skills" and "Design Thinking" after 2015 mirrors the industry’s and academia's shifting priorities, aligning with the rise of digitalisation and a greater emphasis on innovation. The enduring presence of "Product Design" alongside the steady cadence of "Human Engineering" underscores the perennial nature of certain concepts amidst the evolving lexicon.

Emerging Patterns and Potential Gaps:

- A discernible intensification of research engagement from 2012 to 2020 is apparent, echoing broader global developments or industry-specific shifts that warrant further investigation.
- The global spread of citations underlines a pervasive interest in design thinking, suggesting fertile ground for international collaboration and cross-pollination of ideas.
- The terminological shift toward "Design Thinking" and "21st Century Skills" post-2015 signifies an industry responding to new challenges, with academia paralleling this movement by equipping future professionals with relevant, innovative competencies.

However, the pronounced dip in publications by 2022 raises questions about potential saturation or the diversion of scholarly attention to nascent sub-fields. Additionally, certain regions may be less prominently represented in the literature, indicating opportunities for expanding the research dialogue to include these perspectives. Finally, the fluctuating prominence of specific terms over time could suggest shifts in research priorities or a need for terminological standardisation within the field.

5.2 Discussion of Research Question Two

RQ2: How does the perception of benefits influence the understanding of design thinking in the banking domain?

The analysis for Research Question 2 yielded significant insights into the role of perceived benefits in cultivating an understanding of design thinking among banking

professionals. The statistical results, highlighted by specific mean scores and path coefficients, have provided a basis for a nuanced discussion about the correlation between these two constructs.

Interplay Between Perceived Benefits and Understanding:

The finding that banking professionals who perceive more significant benefits from design thinking also show a higher level of understanding underscores a critical interplay between recognising value and comprehension. The mean scores of 3.926 for PB1 and 3.565 for PB2, against the backdrop of standard deviations indicating a range of perceptions, suggest that while there is a general acknowledgement of the advantages of design thinking, experiences and interpretations vary among individuals. This diversity could indicate various levels of exposure and engagement with design thinking practices within the banking sector.

Significance of Factor Loadings and Path Coefficients:

The confirmatory factor analysis and path coefficients supported the measurement model and pointed to the strength of the perceived benefits as predictors of understanding. The robust factor loadings for PB1 (0.953) and PB2 (0.915) indicate a strong correlation between the survey items and the latent construct of perceived benefits. The significant co-efficient (0.658) and t-value (16.303) for the influence of perceived benefits on understanding substantiate the hypothesis that recognising the advantages of design thinking is strongly associated with a deeper comprehension of its methodologies.

Theoretical and Practical Implications:

Theoretically, these results align with the diffusion of innovation theory, which posits that the perception of advantages is crucial to adopting innovative ideas. The practical implications are equally significant. Banks that effectively communicate and

demonstrate the benefits of design thinking are likely to foster a workforce that understands design thinking principles and is prepared to apply them in practice.

Effect Size and Predictive Relevance:

The enormous effect size f^2 of 0.764 is particularly telling, as it illustrates the substantial influence that perceived benefits have on understanding. This finding suggests that initiatives to increase the awareness of the benefits of design thinking could be a strategic lever for banks to enhance their employees' grasp of these methods.

Addressing Variability in Perceptions:

As indicated by the standard deviations, the variability in perceptions points to a need for tailored communication strategies that address diverse groups' specific needs and contexts within the banking sector. Customising the approach to highlighting design thinking benefits may reduce this variability and lead to a more uniformly robust understanding across the industry.

In conclusion, the results from RQ2 offer substantial evidence that perceived benefits significantly impact understanding. This enhanced understanding will encourage deeper engagement with design thinking practices, which could lead to more innovative solutions in the banking sector. The findings advocate for a strategic emphasis on elucidating the benefits of design thinking to cultivate a more knowledgeable and capable banking workforce.

5.3 Discussion of Research Question Three

RQ3: How does an enhanced understanding of design thinking in the banking domain facilitate the adoption of innovative strategies?

The exploration of Research Question 3 has yielded profound insights into the facilitative role of an enhanced understanding of design thinking in adopting innovative strategies within the banking sector. Armed with precise statistical measures, the analysis clearly shows the interrelations between these constructs.

Interplay Between Understanding and Adoption:

The study's findings illuminate a direct correlation between the depth of understanding of design thinking and the propensity to adopt innovative strategies in banking. Mean scores of 3.67 for U2 and 4.24 for U3, against the standard deviations, suggest a broad acknowledgement among banking professionals of the transformative potential of design thinking. This understanding is expected, as indicated by the range in standard deviations, pointing to diverse experiences and engagement levels with design thinking.

Significance of Factor Loadings and Path Coefficients:

Confirmatory factor analysis solidified the measurement model, with significant factor loadings for U2 (0.95) and U3 (0.96), confirming the strength of the survey items in measuring the understanding of design thinking. A particularly telling result is the co-efficient (0.772) and t-value (26.876) for the effect of knowledge on adoption. This relationship's significance suggests that a thorough understanding of design thinking principles is closely tied to their strategic application within the banking sector.

Theoretical and Practical Implications:

Theoretically, these results resonate with the knowledge-attitude-practice model, which hypothesizes that knowledge enhancement influences attitudes and leads to practical

application. Practically, the implication for banking institutions is clear: investing in educational programs to deepen understanding of design thinking can catalyze innovation. This strategy could be crucial in a sector where competitive advantage often hinges on the ability to innovate.

Effect Size and Predictive Relevance:

The effect size f^2 of 1.477 indicates the powerful impact of understanding on adoption. This suggests that banking institutions that increase efforts to enhance design thinking comprehension can expect a significant uptick in its strategic adoption. The positive Q^2predict values for adoption-related items (A1 and A2) further underscore the predictive relevance of understanding in the model.

Addressing Variability in Understanding:

The variability in understanding levels, as suggested by standard deviations, underscores the need for banks to adopt varied and inclusive educational approaches. By recognising and catering to different learning needs and styles, banks can minimise this variability and foster a more uniformly profound understanding of design thinking across all levels of the organization.

Conclusion:

The findings from RQ3 offer compelling evidence of the crucial role that understanding design thinking plays in the strategic adoption of innovative practices within the banking industry. These results suggest a clear action path for banking institutions: to facilitate innovation, a concerted effort must be made to deepen the collective understanding of design thinking principles among staff. By doing so, banks can expect to not only keep pace with but lead in the rapidly evolving landscape of financial services.

5.4 Discussion of Research Question Four

RQ4: How do perceived barriers in the banking domain impact resistance to design thinking?

The analysis of Research Question 4 delves into the effects of perceived barriers on the resistance to design thinking within the banking industry. The statistical evidence sheds light on the nature and implications of these barriers, offering a detailed perspective on their consequent impact.

Correlation Between Perceived Barriers and Resistance:

The data suggests a significant correlation between perceived barriers and resistance to design thinking. The mean scores for organizational and cultural barriers (PI1) and lack of understanding or training (PI2) were 3.881 and 3.887, respectively, indicating that such obstacles are well-recognized within the industry. The standard deviations point to varying degrees of perception among professionals, which may reflect differences in organizational cultures and experiences with design thinking.

Impact of Factor Loadings and Path Coefficients:

The confirmatory factor analysis established the measurement model's reliability, with solid factor loadings for PI1 and PI2, suggesting that the items effectively capture the essence of perceived barriers. The co-efficient (0.764) and t-value (25.893) from perceived barriers to resistance highlight a significant, robust relationship. This finding aligns with the hypothesis that perceived barriers, such as organizational constraints or a lack of proper training, directly contribute to resistance towards design thinking.

Theoretical and Organizational Implications:

Theoretically, these findings align with change management theories that stress the importance of addressing barriers to reduce resistance to new practices. From an organizational perspective, the implication is clear: to minimise resistance to design

thinking, banking institutions must identify and mitigate perceived barriers. This could involve organizational change initiatives, educational programs, and culture-building exercises to break down these barriers.

Effect Size and Predictive Relevance:

The enormous effect size f^2 of 1.399 indicates that perceived barriers influence resistance. This result underscores the importance of recognising and addressing perceived barriers to facilitate a smoother transition to design thinking practices within banking organizations.

Strategies to Overcome Barriers:

The variability in the perception of barriers suggests a need for targeted strategies to address the specific concerns of different stakeholder groups within the banking sector. Banks might consider personalised training sessions, leadership engagement, and transparent communication to alleviate concerns and reduce resistance.

Conclusion:

The insights from RQ4 confirm that perceived barriers are pivotal in shaping resistance to design thinking within the banking sector. The findings suggest that banks must proactively identify and dismantle these barriers to pave the way for a more receptive and innovative organizational culture. By doing so, they can reduce resistance and harness the full potential of design thinking as a tool for strategic advancement and competitive differentiation.

5.5 Discussion of Research Question Five

RQ5: How do missed opportunities relate to formulating organizational strategy in adopting design thinking?

The exploration into Research Question 5 centres on understanding how the acknowledgement of missed opportunities informs the strategic formulation of design thinking adoption in the banking sector. The statistical analyses comprehensively examine this relationship and its broader implications.

Interconnection Between Missed Opportunities and Strategy Formation:

The analysis indicates a noteworthy relationship between the recognition of missed opportunities and the subsequent development of organizational strategy. Mean scores for missed opportunities (MO1) at 3.739 suggest that banking professionals are moderately aware of the disadvantages of not employing design thinking. Standard deviations point to diverse experiences, indicating that while some banking professionals are keenly aware of what they have missed, others may need to recognise the potential gains from design thinking fully.

Measurement Model Validation and Path Coefficients:

Confirmatory factor analysis validates the measurement model's reliability, with strong factor loadings for MO1 and MO2, confirming that these items are consistent measures of missed opportunities. The significant co-efficient for 'Missed Opportunities' to 'Organizational Strategy' (0.072) and the t-value (2.072) articulate a statistically significant but modest relationship, suggesting that while recognition of missed opportunities does influence organizational strategy, it is not the sole driver.

Theoretical Insights and Organizational Tactics:

Theoretically, this echoes the sentiments of the resource-based view, which emphasizes the importance of recognizing and capitalising on all available assets, including

opportunities. For banking institutions, the implication is that strategic planning must include retrospectives on past initiatives to identify and leverage missed opportunities for design thinking adoption.

Effect Size Considerations:

The small effect size f^2 for the relationship between missed opportunities and organizational strategy indicates a nuanced impact that should be considered alongside other strategic factors. It suggests that while missed opportunities inform strategy, they should be integrated into a broader strategic framework that includes other determinants such as market trends, competitive analysis, and innovation targets.

Addressing Recognition of Missed Opportunities:

Recognising missed opportunities can catalyse change, prompting banks to reevaluate and redesign their strategic approaches. Tailored workshops, lessons-learned sessions, and strategic foresight exercises can be instrumental in mitigating the recurrence of such oversights.

Conclusion:

The data from RQ5 elucidates that identifying missed opportunities has a discernible influence on formulating organizational strategy for adopting design thinking in banking. Although the effect size is small, it remains a significant factor in strategic decision-making. Banks are encouraged to implement strategies that foster an environment where opportunities are seized, and design thinking is integrated into the fabric of organizational strategy to drive innovation and competitive advantage.

5.6 Discussion of Research Question Six

RQ6: How does the alignment of organization strategy with design thinking foster strategic innovation in banking?

Research Question 6 delves into the impact of aligning organizational strategy with design thinking on advancing strategic innovation within the banking sector. The comprehensive statistical analysis provides a clear indication of the positive influence this alignment has on innovation.

Strategic Alignment and Innovation:

The results demonstrate a substantial connection between the strategic alignment of design thinking and the enhancement of innovation. Descriptive statistics with mean scores ranging from 3.10 to 3.88 for organizational strategy indicators suggest a consensus on integrating design thinking into strategic planning. The moderate to high mean scores reflect an understanding within the banking sector that design thinking is not merely a tool for problem-solving but a strategic asset that can drive innovation.

Reliability of the Measurement Model:

The confirmatory factor analysis underscores the soundness of the measurement model, with significant factor loadings for items OS1 to OS5, which illustrates the bank professionals' perspectives on organizational strategy about design thinking. The high factor correlation of 0.98, despite the matrix's initial estimation concerns, indicates that the model is an effective instrument for capturing the essence of strategic alignment.

Dominance of Strategic Alignment in EFA:

The exploratory factor analysis highlights the preeminent role of organizational strategy's alignment with design thinking, with a principal factor explaining55 %er 55% of the variance. This dominant factor underlines the significant role that strategic alignment plays within the sector and its potential to influence innovation significantly.

Absence of Common Method Bias:

Harman’s single-factor test substantiates the data's validity, showing that the single factor accounts for less than the cri50 %al 50% of total variance. This finding ensures that the results are duly influenced by common method bias, affirming the relationships' integrity between the constructs.

Predictive Relevance and Mediation Effects:

The PLSpredict analysis confirms the model's ability to predict strategic innovation outcomes based on the constructive collaboration between organizational strategy and design thinking, with positive Q^2predict values for SI-related items. Furthermore, the mediation analysis reveals significant effects, particularly the pathway from organizational strategy to strategic innovation through design thinking, evidencing a substantial mediating role.

Statistical Significance of Path Coefficients:

A vital co-efficient 0.778 with a t-value of 33.858 signals a robust and statistically significant relationship between organizational strategy alignment and strategic innovation. This supports the hypothesis that alignment with design principles significantly propels innovation.

Considerable Effect Size Implications:

An f^2 value of 1.534 for the effect of organizational strategy on innovation suggests a significant impact, indicating that strategic alignment with design thinking is a powerful driver of innovation in the banking sector. This effect size underlines the importance of integrating design thinking into strategic planning to achieve innovative outcomes.

Conclusion:

In conclusion, RQ6's findings offer compelling evidence that the alignment of organizational strategy with design thinking is pivotal in fostering strategic innovation

within the banking industry. The statistical strength of the relationship, highlighted by significant path coefficients and pronounced effect sizes, underscores the essential influence that strategic alignment has in catalysing innovation and ensuring that banks remain competitive in a rapidly evolving marketplace.

CHAPTER VI:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.1 Summary

The study's synthesised findings present a compelling narrative about integrating design thinking into the banking sector's strategic framework.

Literature Trends and Gaps: The bibliometric review underscored an ascending trajectory in design thinking research within the banking context. Publications have surged, reflecting a burgeoning interest and recognising central contributors and outlets for scholarly discourse. Notably, the study mapped out the interconnected research landscape, noting pivotal collaborations and the progression of themes over time, marking the sector's shift towards innovative and sustainable practices.

Perception of Benefits: The perception of the benefits of design thinking emerged as a significant driver for its understanding among banking professionals. Statistical evidence pointed towards a direct correlation between perceived benefits and a comprehensive understanding of design thinking methodologies. This suggests that recognising the advantages of design thinking could facilitate its broader adoption within the sector.

Facilitation of Innovation Strategies: A deeper understanding of design thinking was shown to facilitate the adoption of innovative strategies in banking significantly. The robust relationship between comprehension and application underscores the importance of knowledge depth in effectively implementing design thinking practices.

Impact of Perceived Barriers: The study illuminated how perceived barriers significantly foster resistance to design thinking. Concerns about organizational and

cultural impediments were prominent, suggesting that addressing these barriers is crucial for adopting and integrating design thinking in banking.

Missed Opportunities and Organizational Strategy: Acknowledging missed opportunities due to the non-adoption of design thinking significantly influenced organizational strategy. This underscores the importance of leveraging design thinking for strategic innovation and capturing potential market advantages.

Alignment with Strategic Innovation: The strategic alignment of organizational practices with design thinking principles was instrumental in fostering innovation. The findings suggest that such alignment could catalyse pioneering changes and drive the sector forward.

These findings offer a thorough empirical basis to assert that design thinking is not just a creative approach but a strategic imperative for the banking sector. The results highlight the need for enhanced understanding, strategic alignment, and proactive management of perceived barriers to maximise the benefits of design thinking. They point towards a future where banks that successfully integrate these practices into their operations will likely lead to innovation and customer satisfaction.

6.2 Implications

The implications of the study's findingmulti-facetedaceted, impacting both theoretical considerations and practical applications within the banking sector.

6.2.1 Theoretical Implications:

Conceptual Understanding:

The study's insights contribute to the growing knowledge of design thinking by empirically validating its influence on strategic innovation. It extends theoretical models that link cognitive understanding of innovative methodologies to their practical adoption within organizations.

Diffusion of Innovation Theory:

The findings reinforce the diffusion of innovation theory, demonstrating that the perception of benefits is critical in the uptake of new ideas. This suggests that future theoretical models could benefit from incorporating elements that address perception management to understand adoption behavior.

Resistance to Change:

The highlighted role of perceived barriers in generating resistance to design thinking aligns with theories of organizational behavior, particularly regarding change management. This emphasizes the importance of considering resistance factors in theoretical frameworks that examine implementing new strategies.

6.2.2 Practical Implications:

Strategic Planning:

Banking institutions are encouraged to incorporate design thinking into their strategic planning, given its proven impact on fostering innovation. By doing so, banks can better position themselves to capitalize on new opportunities and maintain competitive advantages.

Capacity Building:

The strong association between understanding design thinking and its application suggests that banks should invest in educational programs and workshops to enhance their workforce's capacity for innovation.

Overcoming Barriers:

Identifying and addressing perceived barriers should become a priority for banks to minimise resistance to design thinking. This might involve cultural shifts, training for skills development, and creating supportive environments for innovation.

Policy Formulation:

Regulatory bodies and banking associations might consider developing policies that facilitate the adoption of design thinking. This could include guidelines for best practices and incentives for banks that demonstrate innovative solutions derived from design thinking.

Stakeholder Engagement:

Engaging customers and stakeholders in the design thinking process could lead to more customer-centric solutions and potentially transform the banking experience, increasing customer loyalty and trust.

Resource Allocation:

Banks may need to reallocate resources to support the implementation of design thinking. This could involve setting up dedicated innovation labs, investing in technology, or creating cross-functional teams that can operate with agility. The study's findings have important implications for how banks approach innovation and strategy development. It suggests a need for industry-wide acknowledgement of the potential of design thinking and calls for concerted efforts to embed this approach into the banking culture and processes.

The implications resonate with the need for a paradigm shift in how financial institutions address challenges and opportunities in a rapidly evolving landscape.

6.3 Recommendations for Future Research

The findings of this study open several avenues for future research in the realm of design thinking in the banking sector. These recommendations aim to expand the understanding of this domain and explore new perspectives that could further enrich the field.

Longitudinal Studies:

Future research could focus on longitudinal studies to track the evolution of design thinking adoption in banking over time. This would provide insights into how perceptions, barriers, and strategic implementations evolve as organizations become more familiar with and adept at integrating design thinking into their operations.

Comparative Studies Across Industries:

Comparative analyses between the banking sector and other industries regarding the adoption and impact of design thinking could yield valuable insights. This could highlight unique challenges and opportunities within the banking sector and foster cross-industry learning and innovation.

Quantitative and Qualitative Mix:

Combining quantitative data with qualitative research, such as case studies or interviews, could provide a more nuanced understanding of how design thinking is implemented and perceived at different bank organisational levels.

Global Perspective:

Expanding the research to include a global perspective, especially incorporating insights from emerging markets, could offer a broader view of how cultural and economic contexts influence the adoption and effectiveness of design thinking in banking.

Technology Integration:

With the rapid advancement of technology in banking, studies examining how digital transformation intersects with design thinking principles could be particularly insightful. This could include exploring the role of AI, blockchain, and other technologies in enhancing design thinking processes.

Impact on Customer Experience:

Investigating the direct impact of design thinking on customer experience and satisfaction within banking could help quantify its benefits from a consumer standpoint. This could also include studies on how design thinking influences customer loyalty and trust.

Barrier-Specific Strategies:

Focused research on developing specific strategies to overcome identified barriers to design thinking adoption in banking can provide actionable insights for practitioners. This could involve studying successful case examples of effectively addressing such barriers.

Effectiveness of Training Programs:

Assessing the effectiveness of various training and development programs in enhancing understanding and adoption of design thinking in banking can provide guidelines for more effective educational initiatives.

These recommendations aim to build on the current study's findings and explore areas that could significantly contribute to the literature on design thinking in banking, providing valuable insights for academics and practitioners.

6.4 Conclusion

The conclusion of this thesis highlights the transformative impact of design thinking in the banking sector. The research has demonstrated that design thinking is not just a tool but a strategic imperative for innovation and competitive advantage in banking. The findings reveal that a deep understanding of design thinking and its strategic adoption significantly influences the development of innovative strategies and solutions. Moreover, the study underscores the pivotal role of perceived benefits and barriers in shaping the adoption of design thinking.

The alignment of organizational strategy with design thinking principles emerges as a key driver for strategic innovation, suggesting that banks must integrate these methodologies into their core strategies to stay relevant and competitive. However, the study also sheds light on the challenges, particularly the resistance to change and organizational barriers, which must be addressed to harness the full potential of design thinking.

In essence, this research provides a comprehensive analysis of the role of design thinking in the banking sector, offering valuable insights for banking professionals, policymakers, and academics. It emphasizes the need for a proactive approach to embedding design thinking in the organizational culture, ensuring its effective adoption for long-term success and innovation in the dynamic banking world.

REFERENCES

Allied Market Research (2021). Fintech Market by Type, Application, and End User: Global Opportunity Analysis and Industry Forecast, 2019-2026. Retrieved from https://www.alliedmarketresearch.com/fintech-market

Altinay, L. and Taheri, B. (2019), "Emerging themes and theories in the sharing economy: a critical note for hospitality and tourism", International Journal of Contemporary Hospitality Management, Vol. 31 No. 1, pp. 180-193, doi: 10.1108/IJCHM-02-2018-0171.

Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. Journal of Informetrics, 11(4), 959-975.

Auernhammer, J. and Roth, B., 2021. *The origin and evolution of Stanford University's design thinking: From product design to design thinking in innovation management.* Journal of Product Innovation Management, 38(6), pp.623-644.

Autonomous Research (2018). Augmented Finance & Machine Intelligence. Retrieved from https://next.autonomous.com/augmented-finance/

Baldwin, C.Y. and Woodard, C.J. (2009) The architecture of platforms: A unified view, in A. Gawer,(ed.) Platforms, Markets and Innovation, Cheltenham, UK and Northampton, MA: Edward ElgarPublishing, pp.19–44 .

Bankbi.com(n.d).*How to drive innovation in modern banking*.Retrieved from https://www.bankbi.com/blog/how-to-drive-innovation-in-modern-banking

Beck, E., & Obrist, M. (2019). Designing for emotion: Five insights for banking innovation. In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (pp. 1-4). ACM

Beckman, S., and M. Barry. 2007. *Innovation as a learning process: Embedding design thinking.*California Management Review 50 (1):25–56.

Behera, R.K., Bala, P.K. and Dhir, A. (2019), "The emerging role of cognitive computing in healthcare: a systematic literature review", International Journal of Medical Informatics, Vol. 129, pp. 154-166, doi: 10.1016/j.ijmedinf.2019.04.024.

Behera, S. K., Nandakumar, M. K., & Kamalesh, K. (2019). Probing the microfoundations of social enterprises: a systematic review using the ADO-TCM framework. Technology Innovation Management Review, 9(11), 39-59. https://doi.org/10.22215/timreview/1274

Bereznoy, A., 2019. *Changing competitive landscape through business model innovation: The new imperative for corporate market strategy*. Journal of the Knowledge Economy, 10, pp.1362-1383.

Booth, A., Papaioannou, D., & Sutton, A. (2012). Systematic Approaches to a Successful Literature Review. Sage.

Bramer, W. M., Rethlefsen, M. L., Kleijnen, J., & Franco, O. H. (2017). Optimal database combinations for literature searches in systematic reviews: A prospective exploratory study. Systematic Reviews, 6(1), 245.

Brandenburger, A. M., & Nalebuff, B. J. (1995). *The right game: Use game theory to shape strategy*. Harvard Business Review, 76(7), 57–71

Brown, T. (2008). *Design thinking*. Harvard Business Review, 86(6), 84-92.

Brown, T., & Katz, B. (2011). *Change by design: How design thinking transforms organizations and inspires innovation*.

B. Sheppard, G. Kouyoumjian, H. Sarrazin, and F. Dore, "*The Business Value of Design," McKinsey Quarterly (October 2018)*, https://www.mckinsey.com/business-functions/mckinsey -design/our-insights/the-business-value-of-design.

Buchanan, R. (1992). *Wicked problems in design thinking*. Design Issues,8(2), 5–21. https://doi.org/10.2307/1511637

Buchanan, R. (2001). *Human dignity and human rights: Thoughts on the principles of human-centered design*. Design Issues, 17(3), 35–39.

Cambridge Core. (n.d.). Systematic literature reviews: An introduction. Retrieved from https://www.cambridge.org/core/services/aop-cambridge-core/content/view/40D4CEA7A7CC3FB6ED6233E79A0A2A1F/S2220434219001690a.pdf/systematic_literature_reviews_an_introduction.pdf

Carlgren, L., Rauth, I., & Elmquist, M. (2016). *Framing design thinking: The concept in idea & enactment*. Creativity and Innovation Management,25(1), 38–57. https://doi.org/10.1111/caim.12153

Chia, A.J.H. and Lee, J.J., 2019. *Banking Outside-in: How Design Thinking is Changing The Banking Industry?*

Christensen, C. M., T. Hall, K. Dillon, and D. S. Duncan, 2016, "*Know your customers' 'jobs to be done,'* Harvard Business Review 94:9, 54–62

Consolini, E., 2021. *The Organizational Evolution of the Design Thinking Mindset: A Banking Company's Case Study.*

Dell'Era, C., Magistretti, S., Cautela, C., Verganti, R., & Zurlo, F. (2020). *Four kinds of design thinking: From ideating to making, engaging, and criticizing.* Creativity and Innovation Management, 29(2), 324–344.

Dhir, A., Talwar, S., Kaur, P. and Malibari, A. (2020), "Food waste in hospitality and food services: a systematic literature review and framework development approach", Journal of Cleaner Production, Vol. 270, p. 122861, doi: 10.1016/j.jclepro.2020.122861.

Deloitte(2023):2023 Banking and Capital Markets Outlook. https://www2.deloitte.com/us/en/insights/industry/financial-services/financial-services-industry-outlooks/banking-industry-outlook.pdf

Diderich, C., 2018. Understanding the value of design thinking to innovation in banking. Journal of Financial Transformation, 48, pp.64-73.

Diderich, C.G., (2020) Design thinking for strategy : innovating towards competitive advantage. Springer (Management for professionals).

Drucker, P. (1985). Innovation and Entrepreneurship. Harper & Row.

Fehér, P. and Varga, K. 2017: *A digitális átalakulás lehet őségei a magyar bankszektorban [ThePotential for Digital Transformation in the Hungarian Banking Sector]*. ComputerworldSzámítástechnika 48(5): 20–23.

Fehér. P and Varga, K.2019. *Digital transformation in the Hungarian banking industry–Experiences with Design Thinking*. Society and economy, 41(3), pp.293-310.

Fink, A. (2020). Conducting Research Literature Reviews: From the Internet to Paper. SAGE Publications.

Gawer, A. (2009) Platforms, markets and innovation: An introduction, in A. Gawer, (ed.) Platforms,Markets and Innovation, Cheltenham, UK and Northampton, MA: Edward Elgar Publishing, pp.1–16.

Gawer, A. and Cusumano, M.A. (2002) Platform leadership, Boston, MA: Harvard Business SchoolPress.Gawer, A. and Henderson, R. (2007) Platform owner entry and innovation in complementarymarkets: Evidence from Intel, Journal of Economics & Management Strategy 16(1): 1–34

Gemser, G. and M. A. Leenders. (2001). *How integrating industrial design in the product development process impacts on company performanc*e. JPIM 18 (1), 28–38.

Gemser, G. and Barczak, G. (2020) '*Designing the Future: Past and Future Trajectories for Design Innovation Research*', Journal of Product Innovation Management, 37(5), pp. 454–471. doi:10.1111/jpim.12543.

George, G., Haas, M. R., & Pentland, A. (2016). Big data and management. Academy of Management Journal, 59(5), 1473-1487.

Gloppen, J. (2009). Perspectives on innovation: The role of design thinking. Master's Thesis, Norwegian University of Science and Technology.

Godden, B., 2004. Sample size formulas. *Journal of Statistics*, *3*(66), p.1.

Gusenbauer, M. (2019). Google Scholar to overshadow them all? Comparing the sizes of 12 academic search engines and bibliographic databases. Scientometrics, 118(1), 177-214.

Hart, C. (1998). Doing a Literature Review: Releasing the Research Imagination. SAGE Publications.

Hassi, L., & Laakso, M. (2011). Conceptions of Design Thinking in the Design and Management Discourses: Open Questions and Points of Tension. In Proceedings of the DMI 2011 International Research Conference: Design Management: Leading Innovation.

Herbert Simon, The Sciences of the Artificial (Cambridge, MA: MIT Press, 1969).

Higgins, J. P. T., & Green, S. (Eds.). (2011). Cochrane Handbook for Systematic Reviews of Interventions. Version 5.1.0 [updated March 2011]. The Cochrane Collaboration. Retrieved from http://www.handbook.cochrane.org

Huurne, M., Ronteltap, A., Corten, R., & Buskens, V. (2017). Antecedents of trust in the sharing economy: A systematic review. *Journal of Consumer Behaviour, 16*(6), 485–498.

IDEO.org. (n.d.).Human-centered design.

Iskander, N. (2018). *Design thinking is fundamentally conservative and preserves the status quo*. Harvard Business Review, September

J. Liedtka and S. Kaplan, "How Design Thinking Opens New Frontiers for Strategy Development," Strategy & Leadership, 47/2 (2019): 3-10.

J. E. Arnold, "Creative Engineering," in W. J. Clancey, ed., *Creative Engineering: Promoting Innovation by Thinking Differently*, Stanford Digital Repository, 1959/2016, pp. 59-150.

Johansson Sköldberg,Ulla, Jill Woodilla, and Mehves Çetinkaya. 2013. "*Design Thinking: Past, Present and Possible Futures*."Creativity and Innovation Management 22(2): 121– 46.

Johns, G. (2006). The essential impact of context on organizational behavior. Academy of Management Review, 31(2), 386-408.

Johns, G. (2017). Reflections on the 2016 decade award: Incorporating context in organizational research. Academy of Management Review, 42(4), 577-595.

Kelley, D., & Kelley, T. (2013). *Creative confidence: Unleashing the creative potential within us all*. Crown Business.

Klepek, C., 2017. *Design Thinking: The Case of Banking Services. Innovation Management*, Entrepreneurship and Sustainability (IMES 2017), pp.416-425.

Knight, E., Daymond, J. and Paroutis, S. (2020) '*Design-Led Strategy: How To Bring Design Thinking Into The Art of Strategic Management'*, California Management Review, 62(2), pp. 30–52. doi:10.1177/0008125619897594.

Kim, S., & Kim, M. (2016). *A study on the application of design thinking in healthcare: Focusing on empathy*. Journal of Convergence Information Technology, 11(10), 23-28.

Kimbell, L. (2011). Rethinking design thinking: Part I. Design and Culture, 3(3), 285-306. https://doi.org/10.2752/175470811X13071166525216

Kolko, J. (2010). *Abductive thinking and sensemaking: The drivers of design synthesis*. Design Issues, 26(1), 15–28. https://doi.org/10.1162/desi.2010.26.1.15

Kolko, J. (2015). Design thinking comes of age. Harvard Business Review,93(2), 66–71

Kumar, V. (2012). *101 design methods: A structured approach for driving innovation in your organization*. John Wiley & Sons.

Lages, L.F. et al. (2020) *'Frameworks for innovation, collaboration, and change: Value creation wheel, design thinking, creative problem-solving, and lean'*, Strategic Change, 29(2), pp. 195–213. doi:10.1002/jsc.2321.

Lawson, B. (1980). *How designers think*. The Architectural Press.

Lawson, B. (1980). *Cognitive strategies in architectural design*. Ergonomics, 23(1), 39-47.

Lawson, B. (1980). *Design and designers: where are the theories?* Design Studies, 1(1), 5-13.

Lawson, B. (1980). *What designers know*. Design Studies, 1(1), 17-20.

Lawson, B. (1980). *Basic design abilities: a starting point for design*. Design Studies, 1(2), 124-125

L. Bruce Archer,(1965). *Systematic Method for Designers* (Council of Industrial Design, H.M.S.O., 1965).

Leifer, L., Plattner, H., & Meinel, C. (Eds.). (2016). Design thinking research: Making design thinking foundational. Springer.

Liedtka, J., & Ogilvie, T. (2011). Designing for growth: A design thinking tool kit for managers. Columbia University Press.

Liedtka, J., King, A., & Bennett, K. (2013). *Solving problems with design thinking: Ten stories of what works*. Columbia University Press.

Liedtka, J. (2015). *Perspective: Linking design thinking with innovation outcomes through cognitive bias reduction*. Journal of Product Innovation Management, 32(6), 925-938.

Liedtka and Kaplan (2019), op. cit.

Lim, W. M., Yap, S. F., & Makkar, M. (2021). Home sharing in marketing and tourism at the tipping point: What do we know, how do we know, and where should we be heading? *Journal of Business Research, 122*, 534–566.

Louise, R., Rexrode, C., & Jones, C. (2018). Banks shutter 1,700 branches in fastest decline on record. The Wall Street Journal. Retrieved from: https://www.wsj.com/articles/banksdouble-down-on-branch-cutbacks-1517826601

Machi, L. A., & McEvoy, B. T. (2016). The Literature Review: Six Steps to Success. Corwin Press.

MarketsandMarkets (2021). Artificial Intelligence Market by Offering, Technology, Deployment Type, Organization Size, Vertical, and Region - Global Forecast to 2026. Retrieved from https://www.marketsandmarkets.com/Market-Reports/artificial-intelligence-market-74851580.html

Martin, R. L. (2009). *The design of business: Why design thinking is the next competitive advantage.* Harvard Business Review Press.

Martin, R. L., & Osberg, S. (2007). Social entrepreneurship: The case for definition. Stanford Social Innovation Review, 5(2), 28-39.

Martin (2009), op. cit.; R. L. Martin, "How Successful Leaders Think," Harvard Business Review, 85/6 (June 2007): 60-67

Martín-Martín, A., Orduna-Malea, E., Thelwall, M., & Delgado López-Cózar, E. (2018). Google Scholar, Web of Science, and Scopus: A systematic comparison of citations in 252 subject categories. Journal of Informetrics, 12(4), 1160-1177.

McKinsey & Company (2021). US Retail Banking in 2025: A Prognosis. Retrieved from https://www.mckinsey.com/industries/financial-services/our-insights/us-retail-banking-in-2025-a-prognosis

Micheli,Pietro,SarahJ. S. Wilner,Sabeen H. Bhatti, Matteo Mura and Michael B. Beverland. 2019. "*Doing Design Thinking: Conceptual Review, Synthesis, and Research Agenda*." Journal of Product Innovation Management 36(2): 124– 48.

Micheli, P., Perks, H., & Beverland, M. B. (2018). Elevating design in the organization. Journal of Product Innovation Management, 35(4), 629–651.

Magistretti, S., Ardito, L., & Messeni Petruzzelli, A. (2021). *Framing the micro foundations of design thinking as a dynamic capability for innovation: Reconciling theory and practice*. Journal of Product InnovationManagement, in Press, 38, 645–667. https://doi.org/10.1111/jpim.12586

Magistretti, S., Bianchi, M., Calabretta, G., Candi, M., Dell'Era, C.,Stigliani, I., & Verganti, R. (2021). *Framinmulti-facetedaceted nature of design thinking in addressing different innovation purposes*. LongRange Planning, 102163. https://doi.org/10.1016/j.lrp.2021.102163

Magistretti, S., Dell'Era, C., & Doppio, N. (2020). Design sprint for SMEs:An organisational taxonomy based on configuration theory. Management Decision, 58(9), 1803–1817. https://doi.org/10.1108/MD-10-2019-1501

Magistretti, S., Dell'Era, C., Verganti, R., & Bianchi, M. (2022). *The contribution of design thinking to the R of R&D in technological innovation*.R&D Management, 52(1), 108–125.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & The PRISMA Group. (2020). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. BMJ, 372, n71. https://www.bmj.com/content/372/bmj.n71

MonkeyLearn. (2023). Word Cloud Generator. Available at: https://monkeylearn.com/word-cloud/ .

Oliver Wyman, & IESE. (2017). *Design thinking: The new DNA of the financial sector*. Retrieved from: https://media.iese.edu/research/pdfs/ST-0441-E.pdf

Ondrus, J., Gannamaneni, A. and Lyytinen, K., 2015. The impact of openness on the market potential of multi-sided platforms: a case study of mobile payment platforms. *Journal of Information Technology*, *30*(3), pp.260-275.

Owen, C. 2007. *Design thinking: Notes on its nature and use*.ResearchQuarterly2 (1): 16–27

Page, M. J., Moher, D., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Shamseer, L. (2021). PRISMA 2020 explanation and elaboration: updated guidance and exemplars for reporting systematic reviews. BMJ, 372, n160. https://doi.org/10.1136/bmj.n160

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ, 372, n160. https://www.bmj.com/content/372/bmj.n160

Palmatier, R. W., Houston, M. B., & Hulland, J. (2018). Review articles: purpose, process, and structure. Journal of the Academy of Marketing Science, 46(1), 1-5. https://doi.org/10.1007/s11747-017-0563-4

Parameswar, N., Dhir, Swati and Dhir, Sanjay (2017) '*Banking on Innovation, Innovation in Banking at ICICI Bank', Global Business & Organizational Excellence*, 36(2), pp. 6–16. doi:10.1002/joe.21765.

Paul, J. et al. (2021) *'Scientific procedures and rationales for systematic literature reviews (SPAR-4-SLR)'*, International Journal of Consumer Studies, p. 1. doi:10.1111/ijcs.12695.

Paul, J., Parthasarathy, S., & Gupta, P. (2017). Exporting challenges of SMEs: A review and future research agenda. Journal of World Business, 52(3), 327-342.

PRISMA. (n.d.). PRISMA Statement. Retrieved from http://prisma-statement.org/

Puccio, G. (1999). *Creative problem-solving preferences: Their identification and implications*. Creativity and Innovation Management, 8(3), 171–178.

Puccio, G. J., Cabra, J. F., Fox, J. M., & Cahen, H. (2010). *Creativity on demand: Historical approaches and future trends*. Artificial Intelligence for Engineering Design, Analysis and Manufacturing, 24(2), 153–159

Puschmann, T. (2017). Fintech. Business & Information Systems Engineering, 59(1), 69-76.

Rauth, I., Carlgren, L., & Elmquist, M. (2015). *Making it happen: Legitimiz-ing design thinking in large organizations*. Design Management Journal,9(1), 47–60. https://doi.org/10.1111/dmj.12015

Rogers, E. M. (2003). Diffusion of innovations. Simon and Schuster.

Ross, A., Srinivas, V. (2018): *Accelerating Digital Transformation in Banking: Findings from the Global Consumer Survey on Digital Banking*, Deloitte Insights. https://www2.deloitte.com/insights/us/en/industry/financial-services/digital-transformation-in-banking-global-customer- survey.html, accessed 25/07/2019.

Roulin, N. and Levashina, J., 2019. LinkedIn as a new selection method: Psychometric properties and assessment approach. *Personnel Psychology*, *72*(2), pp.187-211.

Rousseau, D. M., & Fried, Y. (2001). Location, location, location: Contextualizing organizational research. Journal of Organizational Behavior, 22(1), 1-13.

Rowe, P. G., & Cross, N. (1987). *Design thinking*. MIT Press.

Saari, U., & Mäkinen, S. (2017). Antecedents, Decisions, and Outcomes (ADO) framework: A review of the literature on social entrepreneurship. Technology Innovation Management Review, 7(11), 16-24. Retrieved from https://timreview.ca/article/1474

Saebi, T., Foss, N. J., & Linder, S. (2019). Social Entrepreneurship Research: Past Achievements and Future Promises. Technology Innovation Management Review, 9(2), 44-57. Retrieved from https://timreview.ca/article/1474

Seidel, V. P., & Fixson, S. K. (2013). *Adopting design thinking in novice multidisciplinary teams: The application and limits of design methods and reflexive practices*. Journal of Product Innovation Management, 30 (S1), 19–33.

Simon, H. A. (1969). *The sciences of the artificial. Cambridge*, MA: MIT Press.

Smith, B. R., & Anderson, B. B. (2019). Towards a macro perspective of the antecedents, decisions, and outcomes in social entrepreneurship. International Journal of Entrepreneurial Behavior & Research, 25(9), 1619-1639.

Smith, D., & Raspin, P. (2008). Creating Market Insight: How Firms Create Value from Market Understanding. John Wiley & Sons.

Stashevsky, S. & Lampert, S., 2014. "Does the Likert scale fit the information age. Values in Shock: The role of contrasting management, economic, and religious paradigms in the workplace, 429

Statista (2021). Number of online banking users worldwide from 2018 to 2025. Retrieved from https://www.statista.com/statistics/1138890/number-of-online-banking-users-worldwide/

Statista. (n.d.). Digital Payments - worldwide. Retrieved from https://www.statista.com/outlook/dmo/fintech/digital-payments/worldwide

Stickdorn, M., Hormess, M. E., Lawrence, A., & Schneider, J. (2018). This is service design doing: Applying service design thinking in the real world. O'Reilly Media, Inc.

The Hottest New Trend in Banking. (n.d.). International Association of Societies of Design Research. Available at: https://www.design-thinking-association.org/explore-design-thinking-topics/external-links/hottest-new-trend-banking.

Vetterli, C., Uebernickel, F., Brenner, W., Petrie, C. and Stermann, D., (2016). *How Deutsche Bank's IT Division Used Design Thinking to Achieve Customer Proximity*. *MIS Quarterly Executive*, *15*(1).

Waltman, L., van Eck, N. J., & Noyons, E. C. (2010). A unified approach to mapping and clustering of bibliometric networks. Journal of Informetrics, 4(4), 629-635.

Whetten, D. A. (2009). An examination of the interface between context and theory applied to the study of Chinese organizations. Management and Organization Review, 5(1), 29-55.

Wilson, M. (2017). A design-thinking handout from Molly in Nairobi. Hasso Plattner Institute of Design at Stanford. Retrieved from https://hci.stanford.edu/dschool/resources/overview/molly-nairobi-handout.pdf

World Bank (2017). The Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution. Retrieved from https://www.worldbank.org/en/publication/globalfindex/interactive-executive-summary-visualization

World Bank (2018). The Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution. Retrieved from

https://www.worldbank.org/en/publication/globalfindex/interactive-executive-summary-visualization

Zengin, S., 2019. *Customer centric innovation in banking sector*. In Handbook of research on managerial thinking in global business economics (pp. 79-95). IGI Global.

Zahra, S. A., Rawhouser, H. N., Bhawe, N., Neubaum, D. O., & Hayton, J. C. (2008). Global corporate entrepreneurship: Innovation and strategic renewal in established firms. Strategic Entrepreneurship Journal, 2(1-2), 81-106.

Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. Organizational Research Methods, 18(3), 429-472.

APPENDIX A:

SNAPSHOT OF BANKING CASE STUDIES

Snapshot of Banking Case Studies: Design Thinking Applications			
Bank Name	Focus Area	Key Outcomes	Methodology/Tools/Phases
Hungarian Bank	New touchpoints between the customers and the bank, like helping customers with the search for real estate, conscious purchases, and even post-purchase repairs.	Provided them with an opportunity to gain a better understanding of the importance of the discovery phase	"One Week Sprint" methodology. 5-day sprint approach
DBS Bank	embrace digital payments and cashless payments	Over three months, 40% of elderly individuals converted to cashless methods	Journey Thinking 4D framework Discover,Define,Develop,Deliver
National Australian Bank	Relive how clients experience the lending process,leading them to define that the process was complex, time-consuming, preference ofunsecured products, and preference for mobile services.	NAB Quickbiz Loan was formulated-his app consisted only of three steps and tied to a cash-flow credit model that allowed SMEs to secure up to $50,000 in business loans, with a decision-making time of 60 seconds and three days funds disbursement	five-step IDEO design thinking methodology,
Deutsche Bank	promote design thinking organisationally bystarting with their IT department first rather than imposing	design thinking community in the bank grew to 150members in IT who shared and exchanged knowledge with others. This effort led to thecompletion of the first prototype in less than a year, and the second prototype in less	design thinking transformation at Deutsche Bank Learning (P1), Adapting (P2), and Diffusing (P3)

	it on the entire organisation.	than 18months. In five years, eight customer-centric projects were completed. After this "subversion"was considered adequate, design thinking was embedded in the company with the hiring ofa Vice President for Design Thinking	
ANZ Banking Group	Company's need was to become more comfortable in "customer's shoes" and change the entire culture of how people in ANZ banking Group thinking	One of many tangible outputs was developing cutting edge mobile app that allows employees to better manage their time, vacations schedule and many more, while also enabling them to cooperate with colleagues	customer journey mapping, brainstorming, design scenarios
Bank of America	Company' s need: As Brown recalled "…Bank of America came to IDEO to help generate product ideas that would help them retain current customers while at the same time bringing in new ones"	The idea was called „Keep the Change "and enable customer to transfer small amounts of cents up to dollar from every purchase they make. For AoB it was an enormous success; more than 8 million customers enrolled and saved together more than $1 billion	observing, service prototype, visualisations, design scenarios etc.
Juniper Bank Customer Service Strategy	What company's need was answers for questions such as: does banks still need buildings, vaults, and tellers? Who our customers would be? How to solve everything that is wrong? How to	gave company quick feedback and enabled to developed user-friendly web content made for its right target market	observing (shadowing, "fly on the wall," customer journey mapping, prototyping, etc)

	define and establish our strategy?		
PNC Bank	The company's need was to bring a new innovative way of banking with deep focus on all technology aspects that would help student better manage their money and make these Generation Y lifelong satisfied customers	PNC bank and IDEO produced Virtual Wallet- Several times awarded Virtual Wallet become essential part of PNC business and help this generation better managing their finance while using another banking products as well.	observing, visualization and prototyping.
Suncorp_ Postmerge acquisition	Companies had different business approach with remarkably different company's cultures. Successful integration was the business problem the Suncorp was dealing with.	Company's need was fulfilled while staff surveyed showed that 94 % of employees understood the vision in compared to 48 % from previous surveyed	Visualizations

Table 33: Snapshot of banking case studies.Souce Authors Compilation

SNo	Question	1	2	3	4	5	6	7
1	What is your age group?	Below 25	25-34	35-44	45-54	55 and above		
2	Which sector do you currently work in?	Banking	Finance (non-banking)	Others (Please specify)				
3	What is your current professional role?	Open-ended question						
4	At what level of management do you currently operate?	Entry-level/non-management	Middle Management	Senior Management	Executive Leadership			
5	Define design thinking.	Open-ended question						
6	To what extent do you believe design thinking generates original and imaginative solutions?	Not at all	Hardly	To a small extent	Somewhat	Moderately	Mostly	Extremely
7	How much do you agree that design thinking modifies the existing paradigm, enabling radical or transformational ideas?	Not at all	Hardly	To a small extent	Somewhat	Moderately	Mostly	Extremely

8	How crucial is design thinking in banking for creating innovative business models, developing, and introducing new financial products or services, and establishing unique banking brands?	Not at all crucial	Slightly crucial	Somewhat crucial	Neutral	Moderately crucial	Very crucial	Extremely crucial
9	Design thinking has significantly improved customer service in our bank.	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Some what Agree	Agree	Strongly Agree
10	How pivotal is design thinking in shaping a company's ethos to drive strategic innovation and gain a competitive edge?	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Some what Agree	Agree	Strongly Agree
11	How vital is design thinking in the banking sector for tackling	Not at all vital	Slightly vital	Somewhat vital	Neutral	Moderately vital	Very vital	Extremely vital

	specific problems and meeting unique customer needs?							
12	How would you rate the ease of implementing solutions generated through design thinking?	Not at all	Hardly	To a small extent	Somewhat	Moderately	Mostly	Extremely
13	How significant is the role of design thinking in transforming a company's ethos?	Not at all significant	Slightly significant	Somewhat significant	Neutral	Moderately significant	Very significant	Extremely significant
14	To what extent does design thinking contribute to enhancing an organization's structure?	Not at all significant	Slightly significant	Somewhat significant	Neutral	Moderately significant	Very significant	Extremely significant
15	How effectively does design thinking instill fresh values and attitudes within your organization?	Not at all significant	Slightly significant	Somewhat significant	Neutral	Moderately significant	Very significant	Extremely significant

16	To what degree does design thinking invigorate employee engagement and motivation?	Not at all significant	Slightly significant	Somewhat significant	Neutral	Moderately significant	Very significant	Extremely significant
17	To what extent do you agree that design thinking challenges existing assumptions in problem-solving and idea generation?	Not at all	Hardly	To a small extent	Somewhat	Moderately	Mostly	Extremely
18	Adopting design thinking has greatly benefited the banking services in my organization.	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Some what Agree	Agree	Strongly Agree
19	The use of design thinking has led to innovative financial products or services in my organization.	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Some what Agree	Agree	Strongly Agree

20	There are substantial organizational or cultural barriers to adopting design thinking in my bank.	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
21	Lack of understanding or training is a major barrier to design thinking adoption in the banking sector.	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
22	Resource constraints significantly hinder the application of design thinking in our bank.	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
23	Do you believe the absence of design thinking in the banking sector hinders addressing specific problems and meeting unique customer needs?	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree

24	Has difficulty in implementing solutions generated through design thinking deterred its adoption in your organization?	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Some what Agree	Agree	Strongly Agree
25	Do you believe that not adopting design thinking has resulted in missed opportunities for your organization?	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Some what Agree	Agree	Strongly Agree
26	Have you ever discovered post-facto opportunities that could have been capitalized on had design thinking been used earlier in the process?	Never	Very Rarely	Rarely	Occasionally	Some what Often	Often	Very Often
27	How often have you found innovative solutions that were	Never	Very Rarely	Rarely	Occasionally	Some what Often	Often	Very Often

	previously overlooked when reflecting on past projects or initiatives?							

Table 34: Questionnaire,Souce Authors Compilation