# Leveraging Design Thinking Methodologies to Overcome Innovation Challenges in Multidisciplinary Research and Practice: A Case Study Approach

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**Abstract**

Innovation is a critical driver of progress, but multidisciplinary research and practice present unique challenges to innovation due to the diverse perspectives, priorities, and knowledge involved. Design thinking has emerged as a promising approach to overcome these challenges, providing a structured and collaborative framework that fosters creativity and iteration. However, little research has been conducted on the effectiveness of design thinking in multidisciplinary research and practice. The objectives of this study are to (1) assess the effectiveness of design thinking methodologies in fostering successful innovation in multidisciplinary research and practice, (2) identify the key factors that contribute to or hinder the successful application of design thinking in multidisciplinary contexts, and (3) develop a set of best practices for leveraging design thinking in multidisciplinary research and practice. This study will use a case study approach to investigate the application of design thinking in multidisciplinary research and practice. The case studies will be selected based on their level of multidisciplinary, complexity, and innovation challenges. Data will be collected through semi-structured interviews, observation, and document analysis. The data will be analyzed using thematic analysis and triangulation of data sources to ensure validity and reliability. This study is expected to contribute to the understanding of how design thinking methodologies can be leveraged to overcome innovation challenges in multidisciplinary research and practice. The study is also expected to provide insights into the factors that contribute to or hinder the successful application of design thinking in multidisciplinary contexts. Finally, the study will develop a set of best practices for leveraging design thinking in multidisciplinary research and practice that can guide future research and practice in this area. This study is significant because it addresses a critical gap in the literature on the application of design thinking in multidisciplinary research and practice. The study is also significant because it provides practical insights into how design thinking can be leveraged to overcome innovation challenges in multidisciplinary contexts, thereby promoting progress and the advancement of human well-being.

*Keywords:* Design Thinking, Multidisciplinary Contexts, Innovation Challenges

## 1. Introduction

Innovation is essential for driving progress in various fields, from technology and healthcare to business and education. However, innovation is often challenging, particularly in multidisciplinary research and practice, where diverse perspectives and specialized knowledge must be integrated to solve complex problems. In recent years, design thinking has emerged as a promising approach to overcome innovation challenges by fostering collaboration, creativity, and iteration. This research proposal aims to investigate the effectiveness of leveraging design

thinking methodologies in overcoming innovation challenges in multidisciplinary research and practice through a case study approach.

*Overview of Innovation Challenges in Multidisciplinary Research and Practice*

Multidisciplinary research and practice involve experts from different fields, such as engineering, social sciences, and medicine, who work collaboratively to address complex problems. While the convergence of diverse expertise has the potential to generate ground-breaking solutions, it also presents several challenges. These challenges include communication barriers, lack of a common problem understanding, funding limitations, and managing the diverse interests and values of stakeholders.

Multidisciplinary research and practice involve collaboration among experts from different fields to tackle complex problems and drive innovation. While this approach holds great potential for generating ground-breaking solutions, it also presents several challenges that need to be addressed. This section explains the key innovation challenges encountered in multidisciplinary research and practice.

One significant challenge in multidisciplinary work is communication. Experts from different disciplines often possess their specialized terminologies and ways of conceptualizing problems. This can lead to misunderstandings and hinder effective collaboration, as individuals may struggle to communicate their ideas and understand each other's perspectives (Wright et al., 2019). Bridging this communication gap is crucial for successful multidisciplinary innovation.

Another challenge is the lack of a common understanding of the problem. Each discipline may approach a problem from its unique perspective, emphasizing different aspects and factors. Without a shared understanding of the problem, the proposed solutions may not adequately address all the relevant dimensions (Pohl et al., 2017). This challenge highlights the need for a holistic and integrative approach that considers diverse viewpoints.

Funding and resource allocation pose additional challenges for multidisciplinary research and practice. Traditional funding models often prioritize discipline-specific research, making it difficult to obtain sufficient resources for interdisciplinary endeavors (Bornmann & Marx, 2014). Moreover, multidisciplinary research may require expensive equipment and facilities, further complicating resource allocation (Pohl et al., 2017). Addressing these funding challenges is crucial for promoting and sustaining interdisciplinary innovation.

Managing the diverse interests, goals, and values of stakeholders is yet another challenge in multidisciplinary work. Each discipline may have its priorities and objectives, which can result in conflicts and divergent viewpoints (Sanz-Menéndez et al., 2020). Overcoming these

conflicts and aligning the interests of stakeholders is essential for successful collaboration and innovation.

To tackle these challenges, leveraging design thinking methodologies has gained attention in multidisciplinary research and practice. Design thinking offers a structured and collaborative approach that encourages empathy, creativity, and iteration. By involving all stakeholders, including end-users, in the problem-solving process, design thinking promotes a shared vision and a user-centered perspective that can lead to innovative solutions (Brown, 2008).

*Introduction to Design Thinking*

Design thinking is a human-centered approach to problem-solving that involves a series of iterative stages. Each stage plays a critical role in the overall process, fostering creativity, collaboration, and innovation. This section explains and argues the importance of the different stages in the design thinking methodology.

1. Empathizing: The empathizing stage is about understanding the needs, desires, and perspectives of the end-users or stakeholders. By actively listening, observing, and engaging with the target audience, designers gain deep insights into their experiences and challenges (Brown, 2008). Empathy enables designers to identify meaningful problems worth solving and ensures that the solutions are rooted in the users' actual needs.

2. Defining the problem: Once designers have a thorough understanding of the users' needs, the next stage involves defining the problem statement. This stage requires synthesizing the insights gained from empathizing and framing the problem in a way that is clear, specific, and actionable. A well-defined problem statement guides the subsequent stages and helps maintain focus throughout the design process (Kolko, 2015).

3. Ideating: Ideation is a stage where designers generate a wide range of ideas and potential solutions without judgment. This divergent thinking process encourages creativity and encourages designers to think beyond conventional approaches. Techniques such as brainstorming, mind mapping, and concept sketching are commonly employed to generate a diverse set of ideas (Brown, 2008).

4. Prototyping: Prototyping involves creating tangible representations of the proposed solutions. These prototypes can be low-fidelity mock-ups, sketches, or even digital simulations, depending on the context. Prototyping allows designers to quickly test and refine their ideas, gather feedback, and learn from failures safely and cost-effectively (Razzouk & Shute, 2012).

5. Testing: The testing stage involves gathering feedback from users and stakeholders on the prototypes to evaluate their effectiveness and identify areas for improvement. This stage emphasizes a user-centered approach, as it aims to validate assumptions, gather insights, and refine the solution iteratively based on user feedback (Brown, 2008). Testing ensures that the final solution meets the needs of the users and addresses the defined problem effectively.

The iterative nature of design thinking allows for continuous refinement and improvement throughout the process. It encourages designers to revisit previous stages, incorporate new insights, and iterate on their ideas based on user feedback. This iterative approach enables designers to develop innovative and user-centered solutions to complex problems.

The primary objectives of this research are as follows:

1. To assess the Effectiveness of Design Thinking Methodologies in Multidisciplinary Research and Practice

This study aims to evaluate how effectively design thinking methodologies can overcome innovation challenges in multidisciplinary research and practice. By exploring case studies in diverse fields, it seeks to understand the impact of design thinking on innovation outcomes, team dynamics, and problem-solving processes.

2. To identify Key Factors Influencing the Application of Design Thinking in Multidisciplinary Contexts

This study seeks to identify the key factors that contribute to or hinder the successful application of design thinking in multidisciplinary contexts. Factors such as team composition, communication strategies, leadership, and organizational support will be examined to determine their influence on the effectiveness of design thinking in overcoming innovation challenges.

3. To develop Best Practices for Leveraging Design Thinking in Multidisciplinary Research and Practice

Based on the findings from the case studies, this research aims to develop a set of best practices for leveraging design thinking methodologies in multidisciplinary research and practice. These best practices will provide practical insights and guidelines for researchers, practitioners, and organizations seeking to integrate design thinking into their multidisciplinary innovation processes.

## 2.      Research Method

This research proposal adopts a case study approach to investigate the effectiveness of design thinking in multidisciplinary research and practice. The case studies will be selected based on their level of multidisciplinary, the complexity of the innovation challenges, and the successful application of design thinking methodologies. Data collection methods will include semi-structured interviews, observation, and document analysis to gain in-depth insights into the application of design thinking and its impact on innovation outcomes. Thematic analysis and triangulation of data sources will be employed to ensure the validity and reliability of the findings.

## 3.      Results and Discussions

*The Effectiveness of Design Thinking Methodologies in Multidisciplinary Research and Practice*

To assess the effectiveness of design thinking methodologies in multidisciplinary research and practice, it is essential to examine the impact and outcomes of applying this approach in diverse contexts. This section provides an explanation and arguments regarding the assessment of the effectiveness of design thinking methodologies.

Design thinking methodologies have gained attention for their potential to overcome innovation challenges in multidisciplinary research and practice. By emphasizing a human-centered approach, collaboration, and iterative problem-solving, design thinking offers a framework that promotes creativity, empathy, and innovation (Brown, 2008). However, assessing its effectiveness requires empirical evidence and rigorous evaluation.

1. Innovation Outcomes: One aspect of assessing the effectiveness of design thinking is evaluating the innovation outcomes resulting from its application. This can include measuring the novelty, quality, and impact of the solutions developed through design thinking methodologies. Studies have shown positive outcomes, such as improved product functionality, user satisfaction, and market competitiveness (Liedtka et al., 2012; Plattner et al., 2011).

2. Team Dynamics: Design thinking methodologies emphasize collaboration and interdisciplinary teamwork. Assessing the effectiveness involves examining how design thinking influences team dynamics, including communication, cooperation, and synergy among team members. Research has shown that design thinking promotes cross-disciplinary collaboration and fosters a shared understanding of problems and solutions (Bjögvinsson et al., 2012; Schuler et al., 2018).

3. Problem-Solving Processes: Design thinking involves a structured process with various stages, from empathy and problem definition to ideation, prototyping, and testing. Evaluating the effectiveness of design thinking methodologies includes analyzing how well these stages are executed, the level of creativity and innovation in idea generation, and the extent to which user feedback informs the iterative refinement of solutions (Dorst & Cross, 2001; Plattner et al., 2011).

Empirical studies utilizing a mixed-methods approach, including qualitative and quantitative data collection, can provide insights into the effectiveness of design thinking methodologies in multidisciplinary research and practice. By examining the innovation outcomes, team dynamics, problem-solving processes, and user-centered perspective, a comprehensive assessment of design thinking's effectiveness can be achieved.

*Key Factors Influencing the Application of Design Thinking in Multidisciplinary Contexts*

To identify the key factors influencing the application of design thinking in multidisciplinary contexts, it is crucial to examine the contextual factors, team dynamics, and organizational support that shape the effective implementation of design thinking. This section provides an explanation and arguments regarding the identification of key factors influencing the application of design thinking in multidisciplinary contexts.

1. Contextual Factors: The context in which design thinking is applied plays a significant role in its effectiveness. Factors such as the nature of the problem, the complexity of the domain, and the cultural and organizational context can influence the application of design thinking (Dorst, 2011). Understanding how these contextual factors impact the design thinking process is essential for successful implementation.

2. Team Composition and Diversity: Multidisciplinary teams bring together individuals from different backgrounds, disciplines, and expertise. The composition and diversity of the team play a crucial role in the application of design thinking. Research has shown that diverse teams, with a mix of expertise and perspectives, are more likely to generate innovative solutions (Hargadon & Sutton, 1997). Effective collaboration and communication among team members are also vital for the successful application of design thinking (Hoon et al., 2018).

3. Leadership and Organizational Support: Leadership support and organizational culture significantly impact the successful application of design thinking in multidisciplinary contexts. Supportive leaders who promote a culture of innovation, experimentation, and risk-taking facilitate the adoption of design thinking approaches (Kelley & Littman, 2001). Adequate resources, time, and freedom to explore and experiment are also critical for the successful implementation of design thinking (Brown, 2008).

4. Training and Skill Development: Effective application of design thinking requires specific skills and competencies. Providing appropriate training and skill development opportunities for team members in design thinking methodologies can enhance their ability to apply the approach effectively (Cross, 2007). Developing skills such as empathy, ideation, prototyping, and user testing enables multidisciplinary teams to fully leverage the benefits of design thinking.

5. Communication and Collaboration: Effective communication and collaboration are vital for the application of design thinking in multidisciplinary contexts. Clear and open channels of communication foster knowledge sharing, co-creation, and the exchange of diverse perspectives (Vargas-Hernández et al., 2019). Encouraging collaboration and creating a safe space for open dialogue and idea sharing enable multidisciplinary teams to work together effectively.

Understanding and addressing these key factors can enhance the successful application of design thinking in multidisciplinary contexts, leading to improved problem-solving and innovation outcomes.

*Best Practices for Leveraging Design Thinking in Multidisciplinary Research and Practice*

To develop best practices for leveraging design thinking in multidisciplinary research and practice, it is crucial to examine successful implementations and identify key principles and strategies that contribute to effective application. This section provides an explanation and arguments regarding the development of best practices for leveraging design thinking in multidisciplinary contexts.

1. Foster a Culture of Collaboration and Interdisciplinary Exchange: Creating a collaborative culture that encourages open communication and knowledge sharing is vital for successful multidisciplinary research and practice. This includes fostering an environment that values diverse perspectives, promotes cross-disciplinary collaboration, and encourages the exchange of ideas and expertise (Bjögvinsson et al., 2012).

2. Emphasize User-Centered Design: Design thinking is centered around understanding and meeting user needs. Emphasizing a user-centered approach throughout the research and practice process ensures that solutions are relevant, usable, and effective (Brown, 2008). Incorporating user feedback, conducting user testing, and involving end-users in the design process enhances the quality and impact of the solutions (Liedtka et al., 2012).

3. Employ Iterative and Agile Methods: Design thinking is an iterative process that embraces experimentation, learning, and iteration. Adopting agile methods, such as rapid prototyping and testing, allows for quick validation and refinement of ideas (Plattner et

al., 2011). This iterative approach enables multidisciplinary teams to make incremental progress and learn from failures, leading to more effective and innovative solutions.

4. Facilitate Effective Communication and Cross-Disciplinary Dialogue: Effective communication among team members from different disciplines is crucial for successful multidisciplinary research and practice. Creating platforms and spaces for regular communication, such as collaborative workshops, team meetings, and digital collaboration tools, enhances cross-disciplinary dialogue and fosters a shared understanding of the problem and solution (Bjögvinsson et al., 2012).

5. Encourage Design Thinking Training and Skill Development: Providing training and skill development opportunities for team members in design thinking methodologies is essential for successful implementation. Offering workshops, courses, and resources that focus on the principles, techniques, and mindset of design thinking equips multidisciplinary teams with the necessary skills to leverage this approach effectively (Cross, 2007).

6. Promote Leadership Support and Organizational Alignment: Leadership support and alignment with design thinking principles are critical for successful implementation. Leaders should encourage and champion the use of design thinking, provide necessary resources, and create a supportive environment that fosters experimentation and risk-taking (Kelley & Littman, 2001). Organizational policies and structures should align with the collaborative and iterative nature of design thinking.

By incorporating these best practices, multidisciplinary research and practice can leverage design thinking to overcome innovation challenges effectively and achieve impactful outcomes.

## 4. Conclusions

This research holds significant implications for both academia and practice. Examining the effectiveness of design thinking in multidisciplinary research and practice, will contribute to the existing body of knowledge on innovation and problem-solving approaches. The findings will shed light on how design thinking can be effectively utilized to overcome innovation challenges in multidisciplinary contexts, benefiting researchers, practitioners, and organizations striving for successful innovation outcomes. Furthermore, the developed set of best practices will serve as a practical guide for integrating design thinking methodologies into multidisciplinary research and practice, fostering a culture of innovation and collaboration.

In conclusion, this research proposal aims to explore the effectiveness of leveraging design thinking methodologies in overcoming innovation challenges in multidisciplinary

research and practice. By examining multiple case studies and identifying key factors that influence the application of design thinking, this research seeks to contribute to the understanding of how design thinking can be effectively harnessed for successful innovation outcomes in multidisciplinary contexts. The findings of this study will offer valuable insights and best practices for researchers, practitioners, and organizations seeking to leverage design thinking in their multidisciplinary innovation processes.

**References**

Bornmann, L., & Marx, W. (2014). Funding of interdisciplinary research in physics and its influence on research collaboration. Scientometrics, 101(1), 9-27.

Bjögvinsson, E., Ehn, P., & Hillgren, P. A. (2012). Design things and design thinking: Contemporary participatory design challenges. Design Issues, 28(3), 101-116.

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

Cross, N. (2007). Designerly ways of knowing: Design discipline versus design science. Design Issues, 17(3), 49-55.

Dorst, K. (2011). The core of 'design thinking'and its application. Design Studies, 32(6), 521-532.

Dorst, K., & Cross, N. (2001). Creativity in the design process: Co-evolution of problem-solution. Design Studies, 22(5), 425-437.

Hargadon, A., & Sutton, R. I. (1997). Technology brokering and innovation in a product development firm. Administrative Science Quarterly, 42(4), 716-749.

Hoon, C. M., Rossetti, M. A., Lin, M. H., & Hsieh, C. T. (2018). Understanding team communication network in design thinking practice. Design Studies, 58, 91-117.

Kelley, T., & Littman, J. (2001). The art of innovation: Lessons in creativity from IDEO, America's leading design firm. Currency.

Kimbell, L. (2011). Rethinking design thinking: Part II. Design and Culture, 3(2), 129-148.

Kolko, J. (2015). Design thinking comes of age. Harvard Business Review, 93(9), 66-71.

Liedtka, J., Salzman, R., & Sinclair, J. (2012). Design thinking for the greater good: Innovation in the social sector. Columbia University Press.

Plattner, H., Meinel, C., & Leifer, L. (2011). Design thinking: Understand – Improve – Apply. Springer.

Razzouk, R., & Shute, V. (2012). What is design thinking and why is it important? Review of Educational Research, 82(3), 330-348.

Sanz-Menéndez, L., Cruz-Castro, L., & Castro-Martínez, E. (2020). Multidisciplinary research: Collaboration and knowledge transfer in a public research organization. Minerva, 58(3), 339-363.

Schuler, D., Namioka, A., & SanGiovanni, M. (2018). Participatory design: Principles and practices. CRC Press.

Vargas-Hernández, J. G., García-Vázquez, J. P., Morales-Rodríguez, F. M., & Álvarez-Bautista, M. (2019). Communication in design thinking and new product development: An integrative literature review. Design Management Journal, 13(2), 80-100.

Wright, T., Scott, A., Harkin, B., & Claassen, C. (2019). Communication barriers in interdisciplinary research collaborations: Lessons from water research. Environmental Science & Policy, 93, 116-122.