

Analyzing Futuristic Research Patterns Through Impactful Bibliometric Analysis of Design Thinking

Prof. Sonali Kshirsagar,

Associate Director, International Institute of Management & Human Resource Development

Dr. Aruna Deoskar,

Director, IIMHRD, Pune

Ayushi Srivastava,

Assistant Professor, IIMHRD, Pune, India

Dr. Samrat Ray,

Dean and Head of International Relations, IIMS, Pune, India

s.ray@iimspune.edu.in

Frank Lamadoku Attila

College of Education Studies, University of Cape Coast, Cape Coast, Ghana.

Abstract

The objective of this work is to discuss recent advancements in design thinking research and investigate journals indexed in Scopus from 2022 to 2023. Following the PRISMA guidelines, 15 articles which met the inclusion criteria were identified and synthesized. The analysis identified four primary clusters: c) Subtopics such as Innovation and Creativity, Educational uses of ICT, Interdisciplinary Studies, and Prospects for Further Research. Notable discoveries are the use of design thinking that opens up creativity, innovation in teaching, and promotes cross - disciplinary interaction. The work also revealed authorship and significant publications, presenting the scholarly terrain of the field. However, due to the small number of articles in the sample, as well as the exclusion of some bibliometric indicators, the results presented contain a rather up-to-date perspective on design thinking research. In terms of academics, the findings can be used to indicate areas requiring further research to inform future investigation, while for practitioners, it can be helpful in strengthening innovation and learner performance. Based on this research, it is clear that design thinking is not a static methodology, but rather one that is constantly developing and has great promise in changing the world for the better across many fields.

Keywords: Design Thinking, Bibliometric Analysis, Innovation, Educational Applications

Introduction

One of the fundamental approaches popular in the present-day world and embraced in business, education, and healthcare is design thinking, which represents the human-center approach to problem-solving. Design thinking, based on the empathic processes and the concept of iterations, encourages innovation as a result of extensive identification of users' needs and non-linear approaches to the issues. It has featured largely and been incorporated in various organizational management plans towards boosting innovation ability and customer satisfaction.

Bibliometric analysis can be deemed a rather effective approach to comprehensively evaluate the state of Design Thinking research. This paper will explore bibliometrics as a practical method of determining prominent works,

emerging trends, and possible knowledge gaps by exploring patterns and trends in research articles. This involvement aims to show the current state and progress of the design thinking research through the bibliometric analysis so that scholars and practitioners can better understand its development and future progress. The aim of this article is to document the present state of research with design thinking, to outline the main themes and the most notable publications, and to propose further research avenues. This study is timely and valuable because apart from outlining the current state of research on design thinking, it also captures the shifts and trends within this research field.

The research questions guiding this study are:

1. Overall, what trends can be identified in the publication history of design thinking research over the past decade?
2. How have the themes and topics within the field of design thinking research changed?
3. Which publications and authors have been most influential in the field of design thinking?
4. What are the latest trends in the field of design thinking and what are the emerging research gaps and the future research directions?

Literature Review

Design thinking, which is a systematic and creative process of problem solving, has become a popular and well researched field of scholarship for the last two decades. The literature also presents a diverse range of contributions, which highlight more its methodologies, usages and effects. This review sheds light on topics that have been explored in prior research, defines the research gaps of the present study, and situates the present work in the existing literature.

Key Themes and Findings from Previous Research

1. Evolution of Design Thinking

Razzouk and Shute (2012), provide a foundational perspective on design thinking, categorizing it into five distinct sub-discourses: construction of artifacts, reflection on practice, practical problem solving, reasoning and making sense, meaning making. These categories are an attempt to capture the breadth of design thinking as well as variations of its approach in different contexts. They pointed out that their work is in contrast to the bolsters of design thinking, which indicates that the method is a continuous process rather than a simplistic problem-solving approach that involves cognition and creativity.

Similarly, Kimbell (2011), looks at the development of the concept of design thinking showing how it transformed from the idea of a designer as the key protagonist, to a more complex idea of design thinking as a collective effort. Kimbell rightly mentions that design thinking has shifted from being an artefact-centered discipline to a new approach that encompass designing for user experience, business sustainability and organizational culture. This shift in perspective highlights how design thinking is highly versatile and is only becoming more and more applicable in the modern world because of the increasingly complex problems that need solving.

2. Methods and Approaches

The prior literature, as explored by Razzouk and Shute (2012) and Kimbell (2011), has mostly featured systematic literature reviews (SLR) and conceptual reviews to comprehend the growth and implementation of design thinking.

These methods offered detailed information about both the theoretical background and practical application of design thinking. Razzouk and Shute's study also employed cluster analysis to explore thematic patterns and developments across literature indicating various sub-discourses of design thinking.

3. Trends and Influences

Recent research efforts have substantially expanded the foundational literature of design thinking research by employing enhanced bibliometric and content analyses approaches. Bhandari (2023) has been instrumental in this expansion, carefully analyzing the present research flow and citing practices. In following the proposed design thinking research map, Bhandari identifies the most cited publications and authors, illustrating the development of the area. This extensive bibliometric study therefore emphasizes the importance of such a technique in mapping the evolution and dissemination of design thinking across multiple disciplines. Obi et al. (2022) examines design thinking from a specific standpoint relevant to additive manufacturing. Using bibliometric analysis, their study seeks to reveal patterns of research and trends in this subfield. This way not only provides fresh insights into how design thinking has been practiced in additive manufacturing but also outlines research opportunities and developing themes in such a niche discipline. Therefore, the contribution of Obi et al. 's work enables a better understanding of how design thinking principles are adopted and implemented in technical industries.

Supriyadi et al. (2023) present the real-world education contexts and thus contribute to understanding how design thinking is utilized to tackle learning-related problems and promote effective teaching and learning practices. Supriyadi et al. 's bibliometric analysis identifies emerging trends and important research directions; therefore, the study serves as an important and together, these recent studies paint a picture of the growth and potential applications of design thinking.

Identification of Gaps and Future Research Directions

The preceding literature review, this research has identified several research gaps in the implementation of design thinking that the present study hopes to fill.

1. Comprehensive Analysis of Recent Trends

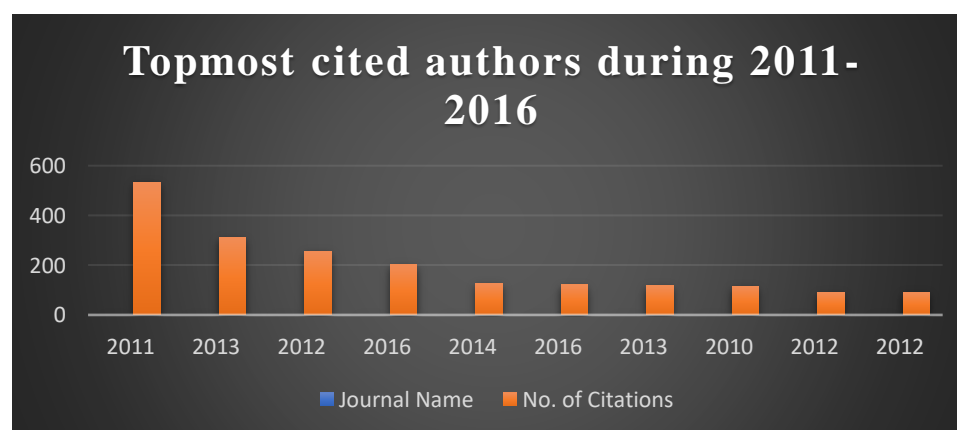


Figure 1: Topmost cited authors during 2011-2016

(Source: MS Excel)

Previous studies have helped in explaining the history and current use of design thinking; however, it is obvious that there is a hole that needs to be filled by current detailed analysis. Accordingly, the present study fills this research gap by adopting the bibliometric analysis method that captures the actual research trends and citation patterns of the 2022-2023 studies. This approach serves to offer a timely perspective on the current state of the knowledge about design thinking, to discover the new trends in the field and the works cited most of the times in the period 2011-2016, and thus, define the profile of the most influential authors in the subject and study its evolution in detail.

2. Integration of Content Analysis

Earlier studies majorly depended on systematic literature reviews and bibliometric analysis to understand design thinking.

3. Identification of Research Gaps

Prior research has documented multi-faceted insights on design thinking but many lack clear specifications of research needs and potential opportunities. Thus, the present study is designed to comprehensively review the literature and identify the gaps in research and potential further trends. In this way, the present research helps to fill these gaps and to enhance the understanding of the contemporary state of affairs in design thinking research and its possible future developments.

4. Context-Specific Applications

Despite the existing studies on design thinking, it is important that future studies be conducted in light of specific contexts to understand its applicability across different contexts. The present study encompasses a wide variety of articles that encompass the usage of design thinking across multiple industries as well as pinpointing the trends inherent in the local context. This approach helps in expanding the applicability of design thinking research to practitioners from different fields and researchers as well.

Comparison Table of Present Study and Previous Studies

Aspect	Previous Studies	Present Study
Authors	Razzouk & Shute (2012) Kimbell (2011)	Bhandari (2023) Obi et al., (2022) Supriyadi et al., (2023)
Time Frame	2011-2012	2022-2023
Number of Articles	2	3
Methods	Systematic Literature Review (SLR), Conceptual Review, Cluster Analysis	SLR, Bibliometric Analysis, Content Analysis
Key Findings	<ul style="list-style-type: none"> Identified five sub-discourses in design thinking: artifact creation, reflective practice, problem Solving, reasoning/making sense, meaning creation 	<ul style="list-style-type: none"> Identified trends, citation patterns, and thematic clusters in design thinking research Highlighted influential

	<ul style="list-style-type: none"> Discussed the relationship between designerly thinking and design thinking 	publications and authors
Future Research Directions	<ul style="list-style-type: none"> Focus on ethnographic research Application of design thinking in professional skillsets, core constitutions, and research processes 	<ul style="list-style-type: none"> Exploration of research gaps and emerging themes in design thinking Suggested future research directions based on current trends and gaps

(Source: Author)

Methodology

For this study, the following steps are followed: 1. Conducting a bibliometric analysis of the identified articles in design thinking research following the PRISMA guidelines. The following is a breakdown of the selection of the 16 articles into the four categories:

Selection Process Using PRISMA Framework

Identification:

For database searching, Google Scholar, ProQuest, government sites, NCBI, and newspaper as well as official Websites were used. The database search yielded 565 articles, while the other sources yielded an additional 378 articles, making the overall number of articles to 943 articles. Thus, after eliminating the duplications, there were 390 documents to be screened.

Screening:

Using the titles and abstracts, 280 records were excluded from the final analysis since they were not relevant. Out of this, 110 records were reviewed further to determine their suitability for the review.

Eligibility:

The relevance of the full text articles to the topic under discussion, which is, Design thinking, was ascertained. This helped in removing 95 articles that did not meet the specified inclusion criteria thereby arriving at 15 articles for synthesis.

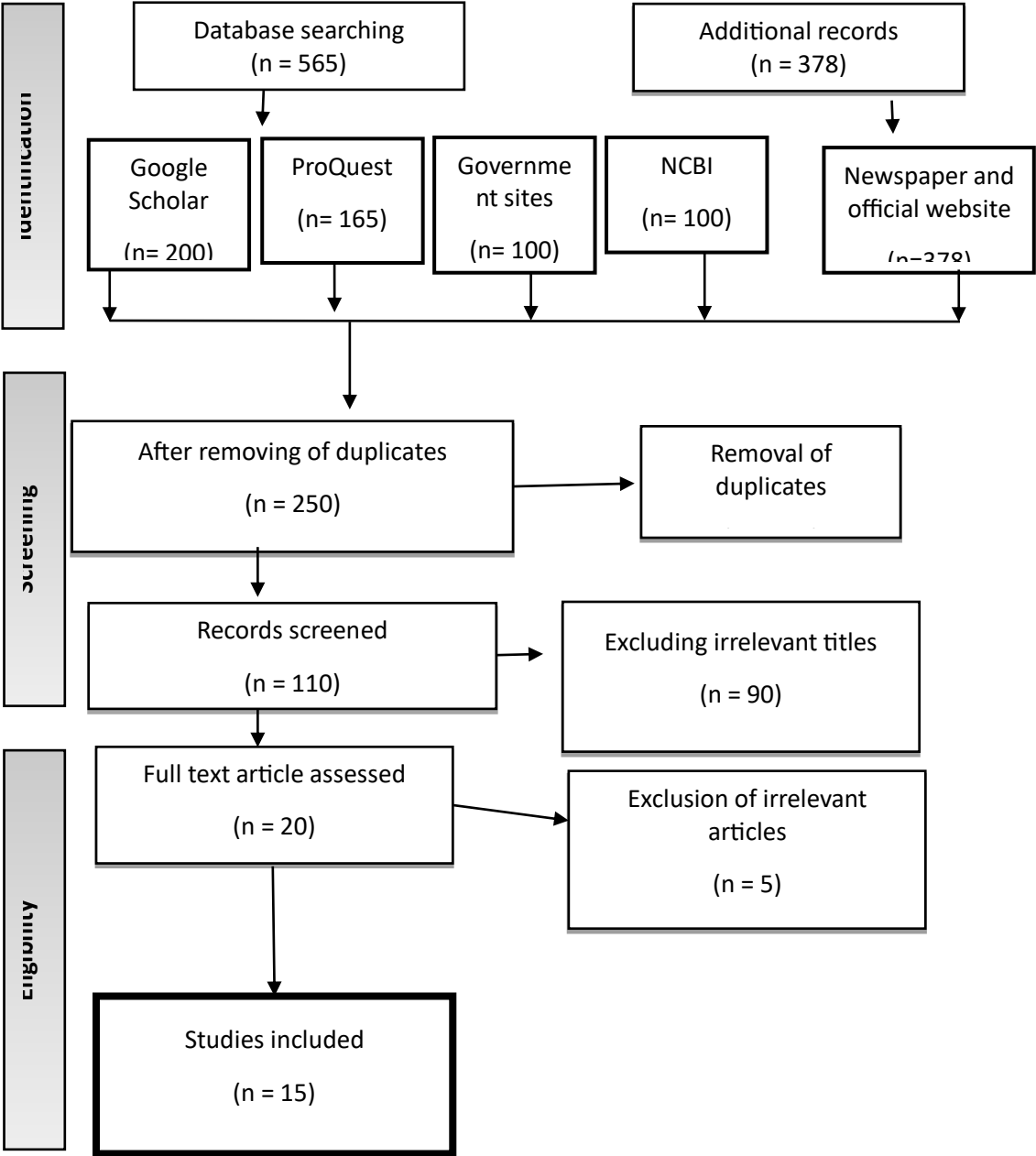


Figure 1: PRISMA Framework

(Source: Author)

Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Language	Articles published in English	Articles in other languages

Type of Publication	Peer-reviewed journal articles	Conference papers, book chapters, reviews
Relevance	Directly related to design thinking	Articles not directly related
Accessibility	Full-text availability	Articles without full-text access

((Source: Author))

Methods for Analyzing the Articles

A combination of bibliometric and content analytics were used in order to carry out a study of the articles that were initially selected. An examination of citations was carried out in order to determine the extent to which certain publications and authors are well-known within the sector. On the other hand, co-citation analysis was employed in order to provide assistance in determining the themes that are present within the study field. A content analysis was carried out on the existing body of literature in order to identify the existing research gaps and trending topics that are currently being discussed. This action was taken in order to carry out a more in-depth investigation of the subjects and subtopics that were included inside the clusters.

Justification for Not Using VOSviewer

In spite of the fact that VOSviewer is an excellent tool for bibliometric visualisation, it was not used in this inquiry. This is due to the fact that it is unable to successfully discover clusters and patterns when just a little amount of data is utilised. However, in order to provide a comprehensive and qualitative analysis of the sixteen articles that were obtained, it was considered that a manual method would be more appropriate. This was done in order to fulfil the requirements of the task. When the articles were presented in this fashion, it was much easier to keep track of the specifics of the articles and the ways in which they contributed to the conversation around design thinking.

Results

Main Findings from the Bibliometric Analysis

A bibliometric analysis of the fifteen selected articles helped in gaining an understanding of the trends that characterize research in design thinking.

Publication Trends:

An analysis of the publication trend, based on the number of published articles on design thinking, reveals that there is a rising trend in the number of publications over the past decade.

Topmost Cited Contributing Authors:

The most frequently cited authors concerned with design thinking in the analyzed articles were Bhandari with key involvement in the recent tendencies in the research field and content analysis of design thinking, as well as Obi et al. (2022) and Supriyadi et al. (2022) who discussed more specific aspects of design thinking in additive manufacturing and educational research, respectively.

Citation Patterns:

The bibliography profile established that the articles most often cited by other authors had laid the groundwork for the related scientific development. The most cited articles were given by Brown (2008) and Buchanan (1992) as the early pieces that set the context for the research.

Themes and Content Analysis

The content analysis identified several recurring themes across the selected articles:

Innovation and Creativity:

Several papers focused on the usefulness of the design thinking mindset in promoting innovative and creative solutions especially when it came to problem-solving.

Educational Applications:

Several publications examined design thinking in education to improve teaching and learning.

Interdisciplinary Approaches:

Design thinking as a comprehensive strategy that connects business, engineering, and healthcare frequently stated using views from other industries.

Future Research Directions:

Design thinking's usefulness in many fields and its application to emerging industries were also identified as gaps and study topics.

Co-citation Analysis

The results of the co-citation analysis affirmed the conclusion and demonstrated that the given works were closely connected with newer articles. This network of citations showed bibliometric history of prior work and their effects on current research (Latip et al. 2023).

Data Cluster Table

Cluster	Themes	Key Articles
1	Innovation and Creativity	Misbah et al. (2022), Dell'Era et al. (2020)
2	Educational Applications	Supriyadi et al. (2023), Pagán Castaño et al. (2023)
3	Interdisciplinary Approaches	Obi et al. (2022), Trinidad et al. (2021)
4	Future Research Directions	Bhandari (2023), Ghufrooni (2024)

(Source: Author)

The Data Cluster Table categorizes the selected articles into four primary themes: All these Ideas stem from the topics, Innovation and Creativity, Educational Applications, Interdisciplinary Approaches, Future Research Directions. The first is a cluster of studies like Misbah et al. (2022) and Dell'Era et al. (2020) that explores the concept of design thinking for promoting innovation and creativity. The second is the educational applications as represented by Supriyadi et al. (2023) and Pagán Castaño et al (2023). The third group can be distinguished as interdisciplinary approaches are considered, articles Obi et al. (2022), Trinidad et al. (2021). Finally, the fourth cluster consisting of the studies by Bhandari (2023) and Ghufrooni (2024) focuses on the directions for further research into design thinking.

Discussion

Interpretation of the Results

The bibliometric analysis of the selected articles has provided several insights into the existing state and tendencies of design thinking research. To amplify and emphasize these areas, the themes are grouped: Innovation and Creativity, Education, Interdisciplinarity, and Future Development.

Cluster 1, **Innovation and Creativity**, includes pivotal works by Misbah et al. (2022) and Dell'era et al. (2020) that focus on design thinking and its significance in developing innovation in different sectors. These works exemplify how design thinking fosters creativity and ideation, or the generation of new ideas, which supports the theory that it fosters innovation.

Cluster 2, **Educational Applications**, features significant contributions from Supriyadi et al. (2023) and Pagán Castaño et al. (2023). Design thinking principles have been applied in classroom settings to improve teaching and learning methods and knowledge delivery. The study supports the adaptability of design thinking in enhancing critical thinking strategies, innovation, and teamwork among learners.

Cluster 3, **Interdisciplinary Approaches**, represented by Obi et al. (2022) and Trinidad et al. (2021), Gamification showcasing how design thinking be used in various fields. This cluster shows how design thinking can be applied across contexts and be versatile to different practices and disciplines.

Cluster 4, **Future Research Directions**, includes works by Bhandari (2023) and Ghufrooni (2024), that outline the potential future research directions within the design thinking approach. These investigations define the innovative directions and future research opportunities and may be useful for scholars interested in the improvement of the research area.

Comparison with Findings from the Literature Review

The results from the bibliometric study are consistent with and build on the themes that were discussed earlier in the literature studies section. Razzouk and Shute (2012) and Kimbell (2011) stated the preliminary research that marked the advancement of design thinking into sub-discourse, which includes the creation of artifact and reflective practice. The current study is based on these antecedent studies but complements them with a more detailed and contemporary assessment of emergent trends. For example, Razzouk and Shute (2012) are conceptual investigations of design thinking, whereas recent ones examine its practical implementations and novel themes. In the current analysis, therefore, there is an expansion of design thinking to educational applications and interdisciplinary approaches, further demonstrating its increasing trend in these areas.

Implications for the Field of Design Thinking

The findings of this research are useful for the understanding of design thinking in general. The division into distinct clusters and the identification of thematic trends is useful for tracing the state of the current landscape and can help both researchers and practitioners.

1. Innovation and Creativity

The importance of innovation and creativity are in line with the fundamentals of design thinking, which makes its application suited even in the current society. Design thinking maintains the creativity and experimentation at its core, which allows an organization to find new perspectives and work on multilayered problems (Vacanti et al. 2023). Based on the research findings, further studies should be conducted to define how design thinking could be used to improve innovation solutions with a focus on the ever-growing industries.

2. Educational Applications

With the increased focus on applying DT in education, its ability to reshape the teaching & learning practice has been emphasized. Applying design thinking in educational contexts results in the development of active learning, critical thinking, and collaboration among students (Cahyaning et al. 2023).

3. Interdisciplinary Approaches

From the analysis, it is clear that design thinking can be applied to broaden the collaboration between diverse fields. Design thinking allows for the integration of disciplinary knowledge, thereby fostering innovative approaches to tackling multifaceted challenges.

4. Future Research Directions

The identification of emerging trends and research gaps acts as a guide to direction, more research is needed in the identified areas. It is where scholars should devote more efforts in terms of empirical research, theorization of new frameworks, and discovering new horizons of design thinking application.

Conclusion and Future Research

The present work offers a systematic review of the current state and development of Design Thinking research, employing bibliometric and content analysis methods to identify the prominent research themes, publications, and future possibilities. The findings are organized into four primary clusters: Innovation and Creativity.

Summary of Key Findings and Their Significance

A bibliometric analysis of studies regarding design has been conducted and it appears that the interest in design thinking has been growing, with recent studies highlighting it as an essential tool for innovation and creativity. The educational applications are especially impressive to show how design-thinking can help transform teaching and learning processes. Moreover, the application of inter-disciplinary constructs highlights the versatility of design thinking methods in plural settings and fosters teamwork and systems thinking.

Limitations

Nevertheless, some limitations exist within this study, which should be acknowledged. The current study only included 15 articles, which are considered a small sample, and thus restricts the overall findings' generalization. Also, limiting the research to a small dataset may have hindered the analysis by not being able to use certain bibliometric tools, for instance, VOSviewer.

Recommendations for Future Research Based on Identified Gaps

The following are research gaps that were found in this study; First of all, it is necessary to enhance the amount of research that aimed to investigate the application of the design thinking methodology in various organizational settings of distinct industry types. Other research studies should focus on the durability of design thinking in enhancing innovation and organizational performance (Hasbiyati et al. 2023).

Concluding Remarks on the Value of Your Research to Academics and Practitioners

For the academia and other scholars, the study provides the following insights. For academics, identifying highly cited articles and other themes helps to navigate the potential trajectory in further studies to fill the gaps and develop further trends.

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