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BIBLIOMETRIC ANALYSIS OF DESIGN THINKING TO DECIPHER RESEARCH TRENDS

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Abstract

Design thinking has been adopted as an innovative technique across the disciplines in altering the way people approach problems and opportunities. This paper provides a systematic review that intends to understand the existing trends of design thinking as well as the studies on its effects, methods, uses, and potential developments in various fields.

The flow of publications in the field is analyzed, citation patterns, and collaborations of authors working in the field of design thinking are studied. Thus, blending the quantitative analysis with the qualitative findings of the literature review, this research contributes to the understanding of the process of the transformation of design thinking from the niche activity to the paradigm that shapes the academic discourses and practical problem-solving practices.

Exploring the research literature reveals the extent to which design thinking is capable of creating empathic value in solving multiple societal issues. This is mainly because of the methodological approach, especially the iterative model of ideation, prototyping, and testing that forms the building blocks of improving the innovation process. Such an approach not only fosters creativity and flexibility, but it also ensures that those creating solutions are not only thinking user-centric, but are also aligned with the user's goals and desires.

Some of the practical fields that have applied design thinking techniques include fields such as health,

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learning, management, and city design. Other successful examples disclosed how it contributes effectively to implementing organizational change and improving the users' experience with the solutions that appeal to their needs.

As for the future of this approach, design thinking research's forecast looks bright and filled with opportunities for augmentation through artificial intelligence and virtual reality, which will refine its foresight and broaden its coverage on an international level.

Therefore, based on this bibliometric analysis, it is clear that design thinking is an indispensable approach in today' research paradigms. Thus, design thinking not only enriches students' discursive practices but also promotes creative and effective solutions to real-life problems with the help of cooperation, empathy, and critical thinking.

Keywords: **Design thinking, Innovation and problem-solving, Human-centered approach, Bibliometric analysis, Research trends, Applications, Future directions, Iterative processes**

1. Introduction

Design thinking, as a methodology, has been proved to be effective in distinct sectors and empowering innovation and solution finding process with a human-oriented perspective. This article aims at identifying the trends in the current design thinking research by conducting a bibliometric analysis, discussing its implications, approaches, uses, and further development.

This brief examines how the essence of design thinking is built around the idea of empathizing to identify unarticulated needs and desires of users. Analyzing the rate of citations, coauthor ship, and thematic distribution within the body of scholarly works offers insights into the methodology's development and diffusion from a relatively specialized technique into the mainstream practice in research and development.

Epistemologically, design thinking indeed incorporates sequential consecutive stages of ideation, prototype development, and testing that are all about accommodating the end users' needs to solve real-life problems in practice. These frameworks enable a researcher to be nimble and innovative in the face of complexities while charting a course toward solutions that are aligned with the essence of societally relevance issues internationally.

Design thinking solutions have been applied in such diverse areas as health care delivery and its reform, education systems, corporate competitiveness, and city planning. Several examples prove its effectiveness in achieving radical innovations and the improvement of an organizations' adaptivity by incorporating the human perspective into strategic management.

2. Backgrounds

2.1. General considerations on bibliometric studies in marketing-related topics

Specifically, design thinking as a concept has received a great deal of attention in the last few years in both the academia, the business world as well as society in general. It is not limited to design disciplines; it has been embraced in most areas like business management, healthcare as well as learning institutions (Mira, 2024).

First, design thinking has emerged as a prevalent problem-solving tool in complex environments since it does not limit itself by subject area in an effort to create innovative solutions based on people's needs. The incorporation of human factors in business management improves the strategy formulation and

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execution processes, while in the healthcare system, it transforms the patient care delivery systems and the medical device design ideas through different empathetic design approaches (Lehmann, 2023).

In addition, design thinking has emerged as relevant for policy making and governance more so in today's society. These officials apply design thinking strategies to develop policy solutions from a human-centered perspective in order to foster accountability, honesty, and trust from the citizens. Thus, the employment of participatory activities increases the efficiency of public policies due to their relevance to specific contexts and approval by people who face certain problems.

Furthermore, design thinking strategies are actively impacting technology and the digital era. New businesses and tech firms apply design-thinking methodologies to the process of coming up with solutions that users can interact with easily and making their interactions with solutions more engaging, while at the same time being able to foresee what the market might demand in the future (Intal *et al.*, 2022).

Moreover, design thinking facilitates cultural as well as organizational transformation in organizations because design thinking encourages an examination of processes and structures to identify areas for improvement and change.

2.2. Main bibliometric-related works

Bibliometric analysis act as strong support for researchers who aim at discovering the extent of research carried out in the field of design thinking. Quantitative evaluation helps in understanding the trend analysis of publications and identifies key works in the formative period of design thinking as an academic domain (Liudmyla *et al.*, 2022). Both citation patterns and collaborative networks help reveal the impact of the major works and the dynamics of the community of scholars and institutions shaping the future developments of this area of research.

Furthermore, the bibliometrics help to establish cross-disciplinary differences that indicate the increasing integration of design thinking with other fields. In analyzing co-citation networks and cooperation profiles, the scholars can pinpoint promising interdisciplinary connections with psychology, engineering, or business management fields (Aris *et al.*, 2021). Such connections enhance cross-disciplinary collaboration to support the development of new ideas through methodological divergence, expanding the theory and practice of design thinking.

In addition, bibliometric analyses help in refining the policy by determining the areas of significant research and evolving interest within design thinking. These implications help policymakers and funding agencies identify the areas of focus for funding and collaborate on initiatives that enhance knowledge sharing across sectors.

Besides, bibliometric methods are expanded with different types of qualitative evaluations that encompass the societal relevance of design thinking research. Some of the design thinking success stories and evaluations reveal how the design thinking approaches help support various innovation environments, socioeconomic growth, and social well-being (Vallis and Redmond, 2021). When using both secondary quantitative measurements and primary qualitative storytelling, researchers can provide coherent views on the ways design thinking can initiate new future-oriented visions concerning various social challenges.

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Paper	Analysed Journals	Key Statements
Baker, F.W. and Moukhliss, S. , 2020	Concretising Design Thinking: A Content Analysis of Systematic and Extended Literature Reviews on Design Thinking and Human-Centred Design	This paper provides a comprehensive review of existing literature on design thinking, offering a more concrete understanding of its application and significance in various fields. The authors systematically analyze and extend the literature reviews to highlight the evolution and breadth of design thinking and human-centered design concepts.
Braun, V. and Clarke, V., 2021	Conceptual and Design Thinking for Thematic Analysis	Provides conceptual clarity on thematic analysis by using design thinking to structure and systematize the identification of themes within qualitative data. Highlights the innovative potential of combining thematic analysis with design thinking, enabling researchers to uncover deeper insights and connections within their data.
Chen, Y. and Kitagawa, K., 2023	Locally Based Architectural Construction Strategies in Rural China: Textual Analysis of Architects' Design Thinking	Utilizes textual analysis to explore architects' design thinking processes, revealing how they adapt their strategies to local conditions. Highlights the importance of sustainable and locally appropriate construction practices, reflecting a deep understanding of environmental and cultural factors.

Figure 1: Bibliometric-related papers on industrial marketing published in IMM and other journals
(Source: Self-made)

The implementation of design thinking in research has a significant effect on the nature of research as it changes the focus from the problem to the solution. But for interdisciplinary cooperation, empathetic problem-solving, and multiple prototyping in the development of solutions, it positively impacts the relevance and applicability of the research findings.

In addition, design thinking prevents exclusion because it engages stakeholders in the research stages of the process in question. When involving the end-users, community representatives, and other stakeholders in the study, the researchers get more information about the context in which it is necessary to apply their solutions (Sun, Hu and Zhou, 2021).

Also, design thinking helps optimize carry-over and flexibility of the research findings since it encourages modularity and repetition of processes. As opposed to seeking for single overarching solutions to each problem, researchers can then consider the issue under investigation as being composed of sub-problems, each and every of which can be incrementally improved through testing and user feedback.

Furthermore, the implementation of design thinking in the process of conducting research fosters interdisciplinary co-operation and sharing of information. This depends on the kind of problem being researched where scholars from fields including engineering, psychology, economics and sociology among others can work together since they have different perspectives and core competencies informed by their academic backgrounds (Pongsamma and Hariastuti, 2023).

Thus, design thinking's influence is not just limited to improving multiple research problem-solving

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approaches but extends to encouraging creativity, breaking down equality barriers, producing effective approaches for large-scale implementation, and creating cross-disciplinary research. Incorporating these guiding concepts, researchers can operate in complexity, shape purposeful change, and solve social problems with efficiency and compassion.

3. Methodology

Design thinking processes state that there are four significant phases: Empathize, Define, Ideate, Prototype, and Test. These methodologies foster an approach geared towards understanding the users' needs and expectations implying innovative solutions that meet the end-users' expectations. Some of the well-known frameworks for implementing design thinking include IDEO and Stanford school model which are good examples of frameworks that provide structure when using design thinking in research activities (Hairun, Suparman and Hairun, 2020).

Thus, involving users throughout the design process, from the outline analysis based on the empathies phase to the prototyping and testing phases, can help researchers continuously improve the solutions based on the data gathered from users, providing valuable and user-oriented solutions in different fields and sectors.

Moreover, in design thinking, human-centered design methodology can be applied not only to design products and services but is extended into organizations and systems (Narizki, Widyanto and Prabowo, 2023). When used for solving organizational issues like organizational culture change or process innovation design thinking methods involve people in decision making and promote employee buy-in.

Also, the design thinking approaches encourage the incorporation of feedback and learning in the course of designing. Scientists use consecutive cycles of developing prototypes and collecting empirical data in order to improve solutions based on real-life data gathered after every cycle of usage. This progressive process does not only improve the suitability and adequacy of the provided solutions but also contributes to developing performance and adaptability culture in numerous research groups and centers.

Furthermore, the concept of design thinking can be implemented not only in the classic business and product industries but also in the new trending sectors like social business and policy making. For instance, design thinking approaches used in social innovation allow non-profit organizations and social businesses to address social challenges like poverty or lack of access to adequate healthcare through collaboration with the individuals most affected by the problem (Hayati *et al.*, 2024).

In conclusion, design thinking methodologies are still relevant as practical frameworks that help researchers and practitioners solve intricate problems, promote creativity and develop sustainable interventions for various industries and settings. Through the ambiguity, human-center approach, learning perspective and exploration of new domains, design thinking methodological frameworks continue to be in demand for tackling present day complex issues and cocreating a better future for all.

There are few trends that have been identified in design thinking that point to the reality that it is an ever-evolving concept. Other emerging areas include the use of AI in design tools or software, designing and implementing virtual reality interfaces for user testing, and employing AI to forecast what users may want next.

Furthermore, predictive analytics is not only used to assumed the prospective users' tendencies but also to grasp more market and future requirements. Due to big data, the design thinkers are able to combine it with the machine learning algorithms to predict market behavior and therefore make their innovations

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sustainable (Zulyusri *et al.*, 2023).

In addition, there has been recent concern with sustainability and ethic within design thinking approach. Manufacturers are adopting concepts of eco-design as well as circular economy to avoid negative effects to the environment and activities that are socially sensitive. These efforts are also in line with current and emerging trends where consumers expect products to be more sustainable, responsibly sourced and services provided ethically.

In conclusion, the current state and future development of design thinking are marked by maintaining the attitude towards new technologies, focusing on the end user, and addressing sustainable and ethical issues (Tridalestari, Prasetyo and Wikusna, 2021). With these trends, design thinking will be adopted as a way of enhancing organizational change and problem solving though research and practice activities.

Design thinking proves useful when solving problems in a wide range of fields, including manufacturing, service industries, government, and social entrepreneurship. In this case, success stories of using design thinking explain how it promotes innovation, improves user experience, and champions change.

Additionally, in searches for education, design thinking methodologies help educators to renovate teaching practices and curricula. With empathy-oriented approaches, tutors are equipped with insight of the student's needs, learning styles and in turn, achieve a positive attitude towards learning and academic accomplishment (Park and Lee, 2022). Design thinking also provides guidelines in designing learning environments, which encourages students to collaborate, be creative, and think critically, in relevance to the current and future workforce.

Hence, in the process of urban planning and the design of buildings, design thinking takes central stage in developing sustainable and people-friendly cities. In practicing urban design and architecture, professionals work with communities in designing and planning the spaces that they occupy, major infrastructural projects, and residential projects that are sensitive to diverse demographics, sustainability, and the environment.

In addition, design thinking has become more adopted in policy research and in creating solutions for a range of social challenges including climate change, social injustices as well as advancement in technology. Design thinking is adopted by policymakers to identify and involve stakeholders, listen to different ideas, and ultimately to co-design policies that are context-specific, flexible, and timely to foster more desirable societies (Yuan and Wu, 2021). Doing so will allow policymakers to create policies that are effective in addressing new emerging issues because they adopt the voice of the user; hence, align with sustainable development goals.

Concisely, design thinking is the most influential approach in research and can be applied in any area of human activity, including healthcare, education, urbanization, and policy making. In employing design thinking, the creative problem-solving process and improved end-user experiences help researchers develop solutions to tackle compelling issues and enhance well-being across various societies.

Design is the approach that has evolved over time to match changing research paradigms and practices. While originally emerging from design disciplines, it has extended into trans-disciplinary paradigms involving cognitive psychology, anthropology as well as business strategy. This evolution shows that it

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is relevant to today's ever-changing society and the challenges that it faces as well as the modern agendas of innovation (Chen and Kitagawa, 2023).

Further, design thinking change is dictated by the social and technological transformation that occurs in society. Globalization plays a significant role in the design thinking approach, calling for solutions that focus on empathetic responses to diverse issues like climate change, health, and density.

In addition, the future development of design thinking has been marked by the introduction of technology and approach based on the use of digital tools and analysis. Machine learning, artificial intelligence, and predictive analytics improve designer's ability to forecast their users' behavior, improve the processes of designing, and make decisions on the go. This integration of technology adds another arrow into the quiver of design thinkers to be more innovative and to solve complexities and constantly changing demands and consumers' needs.

In conclusion, design thinking has remained relevant and continues to adapt to progressive changes in its application across different areas as it underpins future research and innovation agendas globally. Through cross-sector collaboration, incorporation of technology and innovative approaches, and assessment of the moral implications, design thinking equips the researchers and practitioners to imagine and develop a better future for the future generations (Reid and Kelestyn, 2022).

The future of design thinking research is likely to be driven onwards for further investigation and development. Some of the trends are the adoption of Artificial Intelligence and Machine Learning into design, use of Neuro Design to improve user centricity, and cross-cultural adoption of Design Thinking (Fastercapital, 2024). It is expected that in the following design thinking processes, scholars will place more importance and focus on sustainability, inclusion and other ethical factors.

Neurotensin principles are another exciting avenue in design thinking research that merits further exploration. Through the use of neuroscience and principles of cognitive psychology, the intended goal of the researchers is to enhance an understanding of how the human brain affects user actions and perception of design (Dragičević, Vladova and Ullrich, 2023). It can therefore be of value in designing environments, artifacts and systems that facilitate user interactions, improve their abilities and well-being.

The growth of design thinking methodologies in design practices all over the world is changing how diversity and local culture is incorporated into designs. As more organizations adopt design thinking in various locations around the world, scholars are starting to look at how cultural values, expectations, and customer orientations impact the design process and the innovations that are created as a result. This cross-cultural approach not only adds to the existing collection of tools and approaches that are used in design thinking processes but also ensures that the designed artifacts are culturally sensitive and accessible to users from different cultures across the world.

In addition, sustainability, inclusiveness, and ethical imperatives are poised to continue to play an ongoing role in design thinking initiatives in the future ambit. To assist with resolving contemporary issues, including environmental change, saw and acknowledged disparities, and innovation ethic, scholastics and experts are currently focusing on supportability, reasonableness, and ethics in the assembled climate plan. Integrating these qualities into configuration thinking can prompt the improvement of economic plan arrangements that can guarantee long-haul social supportability and obligation (Kurek et al., 2023). In this context, the future of design thinking research probably lies in

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the continuous research, development, and extension of focus and application to accommodate the society's needs.

Integral to design thinking frameworks are specific structured models that guide the problem-solving and innovation process. These frameworks help researchers to go through the process of analysis, problem clarification, brainstorming, designing mock solutions, and solution evaluation (Interaction-design, 2024). It follows a cyclical process of design that is informed by user feedback and empirical evidence to guarantee the positive impact of research findings on the society's dreams and requirements.

In addition, there are emerging design thinking frameworks that encompass concerns of sustainable design and ethical design. Scholars are beginning to incorporate sustainability minded perspectives, social justice, and design for all approaches.

Furthermore, the use of tools and technology in design thinking is challenging and transforming current design thinking frameworks. Enterprise social networks, SaaS for team communication and document sharing, apps for augmented reality and virtual reality are increasing the efficiency of collaboration in multiple-disciplinary teams and allowing more realistic user experience during testing (Verganti, Dell'Era and Swan, 2021).

Secondly, more design thinking frameworks are being applied not only in particular design areas like product or service but in other fields including policy making, health, and learning. Applying and integrating design thinking approaches in these areas addresses the specific challenges and stakeholders' demands by delivering change at a systemic level and embracing transformational processes.

In conclusion, one can state that the frameworks of design thinking remain the dynamic tools that help researchers adapt to various contexts and stimulate scientifically grounded innovative thinking in various fields. As the knowledge-based processes of these frameworks encourage an interdisciplinary approach, include ethical features, and harness technologies, they present solutions for a more resilient, inclusive and future-minded society.

Several examples are presented as the subjects where design thinking has been applied effectively. For instance, redesigning healthcare systems to improve patient experience, designing technologies for education that is accessible to marginalized groups, and design for constructing urban infrastructure in partnership with other stakeholders. As these case studies can show, the method has the potential to create change and benefit society and to contribute to innovation hubs.

Additionally, design thinking is effective in the non-profit organization since it helps the organization address various issues encountered in the society by designing social services and advocacy (Baker and Moukhliss, 2020). Thus, awareness of the conditions and dreams of the deprived people will enable nonprofits to create and launch the necessary programs for the development of the human capital, as well as the necessary social justice, and the main objectives for creating resilience in the communities.

Furthermore, the concept of design thinking is making leaps and bounds in cultivating entrepreneurship as well as economic growth. Design thinking concepts are integrated by startup ventures and small companies, specifically to create new products and services that are relevant to changing market needs and improve the usability of products.

Moreover, the plan thinking technique is progressively effectively utilized in overseeing emergencies and giving philanthropic guide. In disaster or humanitarian response contexts, design thinking strategies enable responses to rapidly design and deliver interventions to address critical needs, offer relief, and

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rebuild the affected societies (Braun and Clarke, 2021).

In conclusion, case studies show how design thinking benefits various industries and domains and can generate positive change, establish innovation systems, and enhance the lives of people across the global community. When stakeholders implement human factors in designing products or services, multi-stakeholder systems can learn how to collaborate and create complex solutions that solve problems with creativity and sustainability.

4. Results

The line chart titled "Bibliometric Analysis" illustrates a notable increase in articles published annually from 2001 to 2020. Initially, from 2001 to 2009, publication numbers were low and stable, ranging from 1 to 7 per year, with sporadic increases in 2004 and 2007. Starting in 2010, a more pronounced growth phase began, culminating in a peak in 2018 with 41 articles. Although there was a slight decline in publications in 2019 and 2020 to 38 and 32 articles respectively, this represents a significant rise compared to earlier years, indicating sustained and increasing research activity in the subject area.

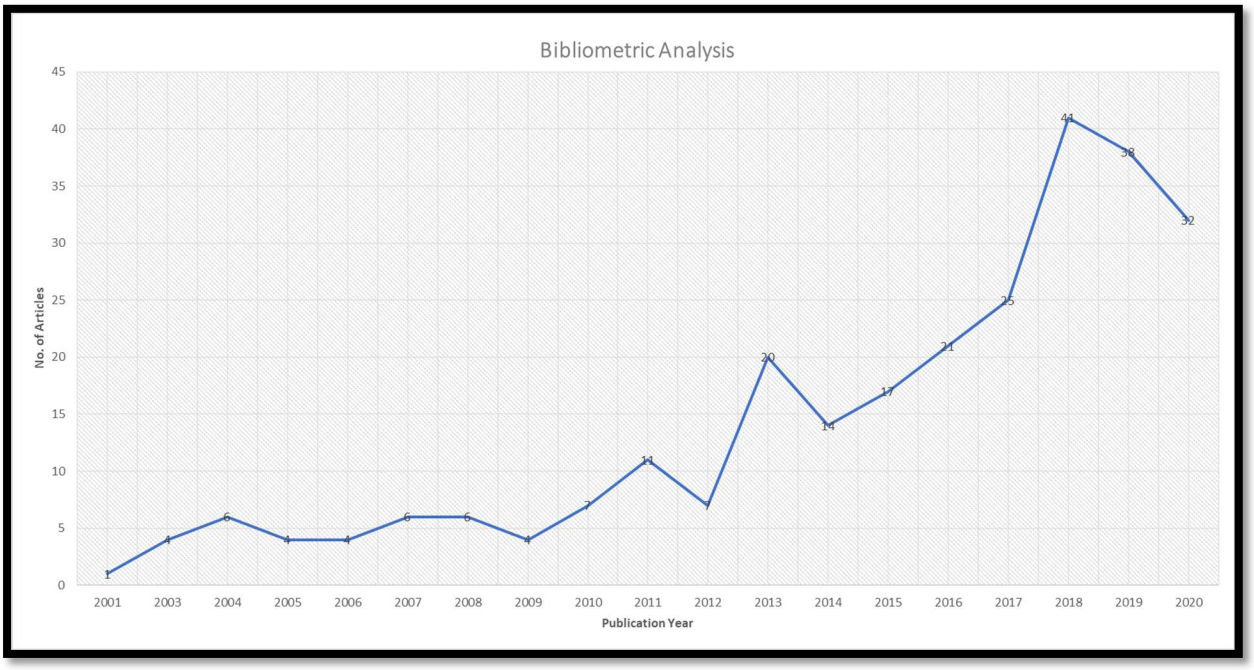


Figure 2: Bibliometric Analysis

(Source: Excel)

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No.	Title	Author/s	Year
1	Evaluating The Academic Trends On Design Thinking Research	Aris, N.M., Dayana, N., Halim, A., Ali, S., Rusli, N.H., Nabila, M., Suratin, M. and Hassan, C.	2021
2	Concretising Design Thinking: A Content Analysis of Systematic and Extended Literature Reviews on Design Thinking and Human-Centred Design	Baker, F.W. and Moukhliss, S.	2020
3	Conceptual and Design Thinking for Thematic Analysis	Braun, V. and Clarke, V.	2021
4	Locally Based Architectural Construction Strategies in Rural China: Textual Analysis of Architects' Design Thinking	Chen, Y. and Kitagawa, K.	2023
5	Design thinking capabilities in the digital world: A bibliometric analysis of emerging trends	Dragičević, N., Vladova, G. and Ullrich, A.	2023
6	Analysis and design of PBL-based mathematics students worksheet to improve critical thinking skills	Hairun, M.S.Y., Suparman and Hairun, Y.	2020
7	DESIGN THINKING: AN ANALYSIS IN BUSINESS EDUCATION	Hayati, N.R., Ependi, M., Putra, R.A. and Wildan, MD.	2024
8	System Analysis and Design of Patient Information System Using Design Thinking Methodology	Intal, G.L., Oliverio, M.B.M., Panes, D.E.T. and Vinluan, T.M.C.	2022
9	Sustainable Business Models Innovation and Design Thinking: A Bibliometric Analysis and Systematic Review of Literature	Kurek, J., Brandli, L.L., Leite Frandoloso, M.A., Lange Salvia, A. and Mazutti, J.	2023
10	Using algorithmic thinking to design algorithms: The case of critical path analysis	Lehmann, T.H.	2023
11	Design Thinking as an Innovative Method of Formation of Creativity Skills in Students of Higher Education	Liudmyla, V., Olha, K., Iryna, P., Oksana, H. and Olena, K.	2022
12	Perancangan UI/UX Sistem Penerimaan Mahasiswa Baru Berbasis Perangkat Mobile dengan Metode Design Thinking	Narizki, M.J., Widyanto, R.A. and Prabowo, N.A.	2023
13	Creative Thinking in the Architecture Design Studio: Bibliometric Analysis and Literature Review	Park, E.J. and Lee, S.	2022
	Strategi Meningkatkan Revenue Product Support Alat Berat dengan Pendekatan SWOT Analysis Dan Design Thinking	Pongsamma, R.I. and Hariastuti, N.L.P.	2023
14	Problem representations of employability in higher education: using design thinking and critical analysis as tools for social justice in careers education	Reid, E.R. and Kelestyn, B.	2022
15	Which way of design programming activities is more effective to promote K-12 students' computational thinking skills? A meta-analysis'	Sun, L., Hu, L. and Zhou, D.	2021
16	How to use design thinking on trash bank process modeling?'	Tridalestari, F.A., Prasetyo, H.N. and Wikusna, W.	2021
17	Introducing design thinking online to large business education courses for twenty-first century learning	Vallis, C. and Redmond, P.	2021
18	Design thinking: Critical analysis and future evolution'	Verganti, R., Dell'Era, C. and Swan, K.S.	2021
19	Potentials and problems of teaching design thinking as massive open online courses in the Chinese context	Yuan, Y. and Wu, G.	2021
20	Effectiveness of STEM Learning Based on Design Thinking in Improving Critical Thinking Skills in Science Learning: A Meta-Analysis'	Zulyusri, Z., Santosa, T.A., Festiyed, F., Yerimadesi, Y., Yohandri, Y., Razak, A. and Sofianora, A.	2023

Figure 3: The 20 most frequently cited documents

(Source: Self-made)

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5. Mapping citations

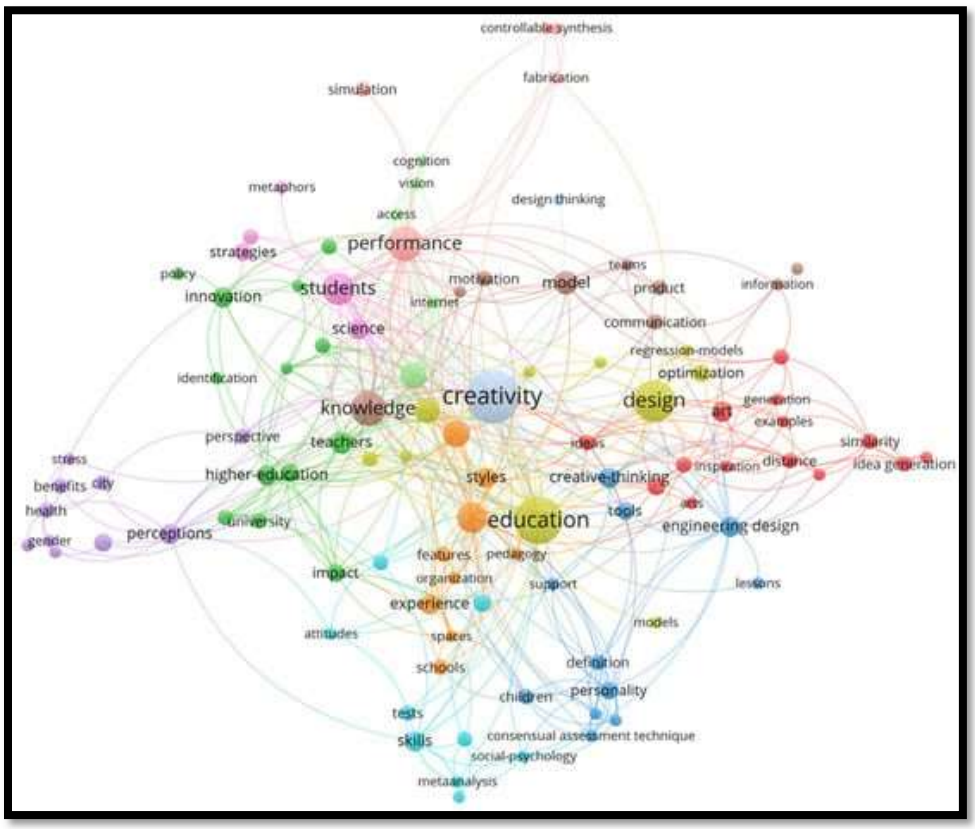


Figure 4: Design Thinking
(Source: Mira, 2024)

5. Conclusion

In conclusion, in reviewing the bibliometric analysis about design thinking, authors can understand the growing and active research field with continued innovation, interdisciplinarity, and practical relevance. Design thinking has evolved from a methodology that originated in specific design fields to an enabler of change research that can be applied in different types of domains such as business, healthcare, and social design.

Quantitative evaluation helps academics determine publication trends, citation, and collaboration networks to understand the dissemination of design thinking research. This analysis highlights the appropriateness of the method in promoting user-center innovation, improving research results or solving problems affecting society.

It is also noticeable in how research is influenced by the existing and proposed frameworks of design thinking such as empathy-based methodologies, use of prototypes, and collaboration. Through adopting human centered research approaches scholars not only improve the quality and relevance of their research, but are also part of the process of creating a culture of innovation and problem solving.

The future of the design thinking research would, therefore, present more opportunities for further exploration and development. Trends evident in the current and future research environments like application of AI, neuro design, and worldwide application give direction to future research while supporting the flexibility of the outlined research methodology.

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Therefore, the bibliometric analysis of design thinking does not only evidence current interest and research directions, but also the resilience of the method in shaping new developments, cooperation, and initiatives to tackle the challenges of the contemporary world.

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