Articles Review

Bibliometric Analysis to A Future Research Direction on Agile Transformation

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Abstract

Agile transformation has become increasingly popular as a management approach to improve performance, but there has been limited research on its direction. This study aims to advance knowledge on agile transformation to help companies become faster, more flexible, and more responsive. The study employs a bibliometric approach to analyze 116 "Agile Transformation" papers published in the Scopus database over the past 20 years. The findings indicate an increasing number of publications in recent years, with the United States, Finland, and Germany being the top countries. However, the research connections are not yet consolidated, as only 22 authors out of 282 have co-authored papers. The research has also been mainly focused on software development and IT companies, using case studies, grounded theory, and surveys. The study reveals that the major research hotspots in the agile transformation are agile transformation, software development, software design, agile methods, agile transition, and agile adoption. The grand theories emerging in the Agile Transformation revolution emphasize the importance of collaboration, communication, continuous improvement, and customer value. Overall, this study provides a comprehensive understanding of the current state of research on agile transformation and offers insights for future research. The findings highlight the need for greater research diversity beyond software development and IT companies and an opportunity to use action research and ethnography strategies to understand agile transformation. Ultimately, this study contributes to the advancement of knowledge on agile transformation and its role in improving organizational performance.

Keywords: *Bibliometric Analysis; Agile Transformation; Scopus Database*

INTRODUCTION

Agile has grown in popularity over the last decade as a new management approach to performance. The term refers to the observation that the rate of business change was rapidly outpacing the traditional organization's ability to adapt (Harraf et al., 2015). Global businesses are accelerating their agile transformation in order to succeed in today's dynamic and complex business environment (Revutska & Antlová, 2022). Deploying agile methodology aims to transform a company into a faster, more flexible, and more responsive organization (Harraf et al., 2015). The evolution of agile methodologies refers to the iterative and incremental approach to software development that originated in the 1990s. It was a response to the traditional methods of software development that were often rigid and focused on processes rather than people and customer needs. The Agile Manifesto, which was created by a group of software developers, outlined the principles that underpin agile methodologies. The manifesto emphasized the importance of individuals and interactions over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation, and responding to change over following a plan (Flora & Chande, 2014; Mora et al., 2022).

Since the Agile Manifesto was published, various agile methodologies have been developed, each with its own unique approach to software development. These methodologies include Scrum, Extreme Programming (XP), and Lean-Agile, among others (Hazzan & Dubinsky, 2014). Scrum, for example, is a framework for managing and completing complex projects that emphasizes teamwork, accountability, and iterative progress. XP, on the other hand, focuses on the technical practices of software development, such as continuous integration, automated testing, and pair

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programming. Lean Agile, meanwhile, is a hybrid approach that combines the principles of agile methodologies with lean manufacturing principles. Agile methodologies have been successful in enabling software development teams to deliver high-quality software in a shorter time frame. By prioritizing customer needs and iterative development, agile teams can respond quickly to changes in requirements and deliver software that meets the customer's needs. This approach has led to increased productivity, better-quality software, and higher customer satisfaction (Pócsová et al., 2020).

Agile methodologies were initially intended for use in small, single-team projects (Boehm & Turner, 2005). However, their demonstrated and potential benefits have made them appealing outside of this context, particularly for larger projects and in larger corporations, even though they are more difficult to implement in larger projects (Dyba & Dingsoyr, 2009). In comparison to small projects, which are ideal for agile development, larger projects require more coordination. How to handle inter-team coordination is a particular issue when applying agile to larger projects. Interfacing with other organizational units, such as human resources, marketing and sales, and product management, adds another layer of complexity to large-scale agile. Furthermore, the large scale may cause users and other stakeholders to distance themselves from development teams. Despite these known issues with large-scale agile, there is an industry trend toward the widespread adoption of agile methodologies (Dingsøyr & Moe, 2014; Paasivaara et al., 2018).

Transformation into an agile organization is challenging because it necessitates fundamental shifts in many different areas, such as strategy, structure, culture, operations, and technology (Strode et al., 2022). Thus, the cultural context is an important factor in firms' agile transformation, and a new line of research can focus on the relationship between agility and cross-country cultural behavior. The findings can assist us in better understanding the cultural characteristics that lead to successful change. Another unfulfilled gap is related to the agility construct's path dependency. Because agility is a dynamic process, longitudinal studies could provide more information about how this changing adaptation process affects competitiveness and performance over time (Pinho et al., 2022). Leaders are obviously responsible for fostering organizational culture and performance (Wijaya & Wisesa, 2022).

The past and current agility transformation framework development were explored, and it was found that no specific research direction of agile transformation has been mentioned. Accordingly, most of the agile transformation studies have been done in the IT industry, software development, digital transformation, software design, and the Internet of Things. Hence, this study aims to answer the following research questions, as follows:

1. How has the trend of agile transformation research evolved over time?
2. What are the countries that majorly contribute to the agile transformation study?
3. Which authors contribute the most to the agile transformation study?
4. Which journal holds most of the collection of agile transformation publications?
5. What are the typical research strategies in agile transformation?
6. Which industries that the research covers the most in agile transformation?
7. What are the major research hotspots in the agile transformation field?

Based on the literature review, it is possible to propose this study as the extended version of existing literature on agile transformation since there is a scarcity of similar work purposefully focusing on covering the whole aspects of agility while also addressing the research questions. Furthermore, the existing similar literature review studies related to agile transformation found on Scopus are different from this study to the extent of the breadth and depth of the analysis. Dikert et al. (2016) have done a similar analysis, yet in this particular study, the authors only used a single journal database around 2000 – 2016 (Scopus) specifically designed to discuss challenges and

success factors. Another paper on Agile adoption, Altuwaijri & Ferrario (2022), which was recently published and discussed the knowledge domain of agile management in the software industry, also found, yet again, the author only cultivates on factors affecting agile adoption. On the other hand, Akbar et al. (2020) reported the agile development activities on Global Software Development (GSD). Unfortunately, similar to the other studies, the author's focus identified the success factors from 75 selected primary studies on the software development industry. Moreover, the literature review paper by Pinton & Torres (2020) has brought differentiation to the agile transformation process core collection through the analysis of human aspects and demand of the large transformation of the organization and summarizes the existing literature into three categories: People, Management and Organization, yet it is only focused on agile transition in a traditional organization. Accordingly, the extension proposed in this study comes when recent sources of meta-data and bibliometric analysis comprehended the previous literature review papers on agile transformations.

The purpose of this study is to investigate and analyze the research publications pertaining to agile transformation over the past two decades. The research will address seven research questions in order to comprehend the context and future research in agile transformation. This research seeks to contribute to the advancement of knowledge on agile transformation in order to assist businesses in becoming faster, more flexible, and responsive organizations.

LITERATURE REVIEW

Agile Transformation

Agility is a crucial factor for businesses to thrive in a constantly changing market. According to (Dove & Palmer, 2004; Goldman et al., 1995), agility can be defined as the ability to respond appropriately and timely to changes that are expected or unexpected and take advantage of and capitalize on opportunities presented by change. Zhang & Sharifi (2000) highlighted four core capabilities required of an agile company, which are responsiveness, competency, flexibility, and speed. Responsiveness refers to the ability to recognize and respond to change quickly, reactively, or proactively, as well as recover from it. Competency is defined as the ability to provide productivity, efficiency, and effectiveness in achieving the company's objectives and goals. Flexibility is the ability to perform different tasks and achieve different goals while using the same resources, while speed is defined as the ability to complete tasks and operations in the shortest amount of time.

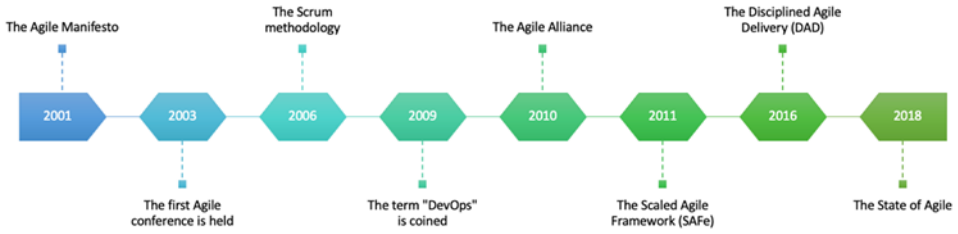

Figure 1. Agile transformation (source: Author analysis)

The Agile movement has undergone significant evolution over the past two decades, with several key milestones marking its progress. In 2001, the Agile Manifesto was developed by a group of software developers who sought to improve the software development process by emphasizing values such as individuals and interactions, working software, customer collaboration, and responding to change (Dikert et al., 2016; Klünder et al., 2019). Two years later, the first Agile

conference was held, providing a platform for practitioners and researchers to share their experiences and insights. In 2006, the Scrum methodology was formalized in a book by Ken Schwaber and Jeff Sutherland, becoming one of the most popular Agile frameworks. The term "DevOps" was coined by Patrick Debois in 2009, marking the beginning of a movement that emphasized the integration of development and operations teams to improve software delivery. In 2010, the Agile Alliance created the Agile Fluency model, providing a framework for organizations to become more proficient in Agile practices. In 2011, the Scaled Agile Framework (SAFe) was introduced, offering guidance on how to scale Agile methodologies to larger organizations and projects. The Disciplined Agile Delivery (DAD) framework was introduced in 2016, integrating Agile, Lean, and DevOps elements to provide a more comprehensive approach to software delivery (Hohl et al., 2018). Finally, the State of Agile report in 2018 indicated that Agile adoption had become widespread, with 97% of organizations surveyed using Agile in some form. These milestones and others have contributed to the growth and success of the Agile movement, shaping the understanding and application of Agile methodologies in software development (Mora et al., 2022).

Agile methods have an impact on management and other business functions. A significant challenge is that management must shift away from life-cycle models and toward iterative and feature-centric models, which necessitates a mental shift. As agile methods emphasize that planning is only meaningful for the near future, the emphasis must be shifted from long-term planning to shorter-term project planning (Dikert et al., 2016). However, a lack of planning can be problematic because business and customer relationships are often built on long-term planning. In order to enable operations with shorter-term planning, stakeholders must be educated and contracting practices in effective management like agile methods (Dikert et al., 2016). Hence, in order to profit from opportunities, agile methods focus on people, technology, and processes while collaborating with customers and adapting to change (Serrador & Pinto, 2015). It is a business model that enables companies to capitalize on profitable opportunities in a volatile market by leveraging market knowledge and partnerships.

Agile approaches emphasize people, good technology, collaboration with customers, and adaptability to change. It is difficult to successfully implement sustainability practices without a thorough understanding of, involvement in, and knowledge of customers and other stakeholders Geyi et al. (2020). Agile methods also encourage people to collaborate, participate, learn new skills, and grow in a flexible environment. Furthermore, the new management model forces businesses to think and act not only differently but also faster (Ragazou et al., 2022). Alignment and collaboration are crucial in agile organizations; collaboration with various other parties can be enhanced by assuring the process of aligning the perceptions of the organization's working team (Nugroho & Hermawan, 2022). In an agile organization, consideration must be given to those aspects of future human resource management that have an impact on increasing employee engagement and productivity, enhancing adaptability to changing work conditions and supporting and enhancing health and well-being (Ganegama, 2019). Human resources play a crucial role in the development and achievement of a company's objectives. A decrease in the quality and morale of the employees themselves results from a disregard for their needs and expectations. Agile organizations must be able to manage and cultivate their human resources (Nursiti et al., 2022).

Bibliometric studies have been widely used by researchers to predict the themes of agile transformation research. For instance, Lechler & Yang (2017) conducted a bibliometric analysis to identify the research hotspots and trends of agile software development. Their findings revealed the interdisciplinary nature of the research field, highlighting the importance of collaboration among different disciplines in the agile transformation process. In another study, Iyengar & Bharathi (2018) analyzed the scientific production related to agile methodologies and identified

emerging topics and research trends, showcasing the evolution of research in the field. These studies showcase the usefulness of bibliometric analysis in identifying the most relevant research topics and trends in agile transformation research, which can aid future research in the field.

Organizational Transformation

Organizational transformation and agile transformation are closely related concepts. Organizational transformation refers to a comprehensive and fundamental change in an organization's structure, culture, and strategy aimed at improving its performance and competitiveness (Kovynyov et al., 2021). On the other hand, agile transformation refers to the process of adopting agile methodologies and principles to increase business agility and responsiveness to changes in the market. Agile transformation can be considered a type of organizational transformation that focuses on enhancing an organization's ability to deliver value to customers quickly and effectively (Stettina et al., 2021). In other words, agile transformation is a means to achieve organizational transformation by embracing a more adaptive and iterative approach to work.

The aspect of organizational transformation was interpreted in such a way that the primary study was required to present insights into the process of an agile transformation. Excluded topics include comparing traditional and agile development methods Petersen & Wohlin (2010), discussing the use of agile in a large enough organization but not describing how the new methods were implemented Mishra & Mishra (2011), and simply presenting agile tools in large-scale use (Kim & Ryoo, 2012). Agile practices have a positive and direct impact on financial and operational performance measures (Geyi et al., 2020). As a result, some progress has been made in terms of the links between agile practices and economic sustainability measures. Dikert et al. (2016) provide the challenge categories on agile transformation, namely: agile difficult to implement, integrating non-development functions, change resistance, and requirements engineering challenges. The most frequently mentioned success factor categories are selecting and customizing the agile approach, management support, mindset and alignment, and training and coaching.

One of the main challenges of organizational transformation is resistance to change, as employees may be resistant to changes in their work processes and culture (Lechler & Yang, 2017). Agile transformation can help address this challenge by fostering a culture of collaboration, experimentation, and continuous learning, which are core principles of agile methodologies (Jovanović et al., 2017). Furthermore, agile transformation can also help organizations address the growing complexity and uncertainty of the business environment by providing a more flexible and adaptable approach to work (Sommer, 2019). By adopting agile methodologies, organizations can respond more quickly to changes in customer needs and market trends, leading to increased innovation and competitiveness.

In conclusion, organizational transformation and agile transformation are interrelated concepts that can complement each other in achieving business success. By embracing agile transformation as a means to achieve organizational transformation, organizations can foster a culture of collaboration, experimentation, and continuous learning, leading to increased innovation and competitiveness in a rapidly changing business environment.

RESEARCH METHOD

This study analyzed articles that were retrieved from the Scopus Database. Scopus contains a wider range of publications and one of the most comprehensive databases of peer-reviewed journals. Besides, it is also the best fit for this research because it displays articles from various years. A literature search was conducted online in January 2023 with 6 keywords. Because there are so many diverse terms linked with agile transformation, it is vital to identify the criteria used

to choose city categories for bibliometric study. The keyword "Agile transformation" was chosen as the main focus of the literature review because it is a widely discussed topic in the field of project management and software development. The other keywords ("Agile transition", "Agile adoption", "Agility transformation", "Agility transition", and "Agility adoption") were also included to ensure a comprehensive search of relevant literature. The use of these additional keywords will allow for a more thorough examination of the various ways in which organizations may approach the adoption or implementation of Agile methodologies and the potential benefits and challenges associated with each approach. By including a range of related terms, the search results will provide a more complete picture of the current state of knowledge and practice in the area of Agile implementation and transformation. Searching these keywords in the Scopus database ensures access to high-quality, peer-reviewed literature from a range of disciplines. By using multiple related keywords, the search was able to capture a broad range of literature related to the topic of agile transformation. The use of Scopus also helps to ensure that the literature selected for the review is reliable and up to date, as Scopus is one of the largest databases of peer-reviewed literature. Overall, the chosen keywords and database ensure that the literature review is comprehensive and relevant to the topic at hand.

Analysis was limited to English language and article type of papers from 1995-2022. It found 116 studies with those keyword searches. The 116 studies will be bibliometric ally analyzed using Vos Viewer to understand the previous study trend and theme on agility transformation. Figure 1. describes the steps in the research methodology.

Search is used using search:

TITLE-ABS-KEY: ("Agile transformation" OR "Agile transition" OR "Agile adoption" OR "Agility transformation" OR "Agility transition" OR "Agility adoption") AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (SRCTYPE , "j"))

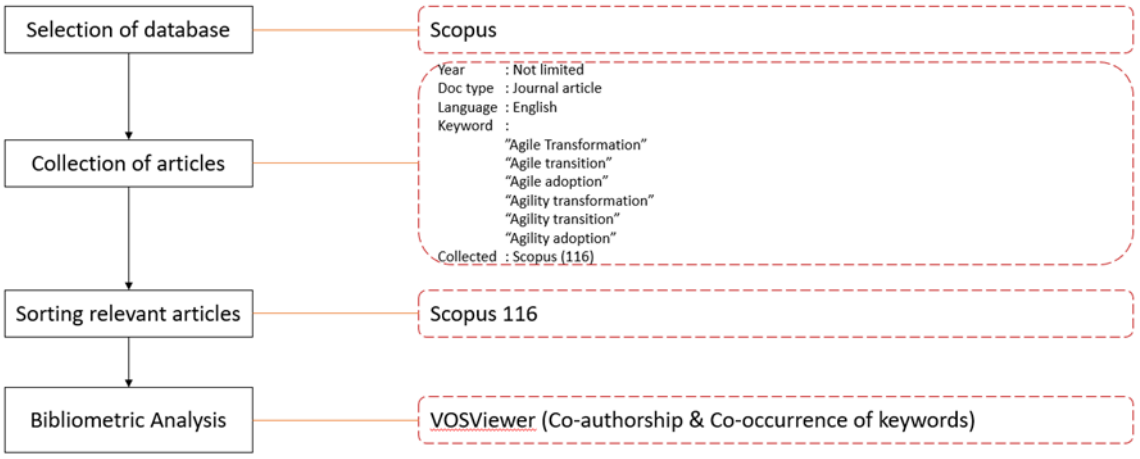

Figure 2. Research Methodology

This study employs bibliometric and social network analysis to analyze the meta-data. Bibliometric analysis is a widely used approach to identify current trends in publications and guide future research directions (Su et al., 2019). To conduct bibliometric analysis, we generated a RIS format file from the Scopus database. The interpretation of bibliometric analysis focuses on visualizing the growth of research on agile transformation over the years, identifying the most contributing countries, and listing the most contributing authors in the field of agile transformation studies.

To further elaborate, social network analysis is a powerful tool that allows researchers to

visualize and analyze complex relationships and patterns within a dataset. In this study, we used VOSviewer, a software that is widely used in bibliometric analysis and social network analysis, to construct a network of co-occurring keywords within our RIS file of agile transformation studies. The software uses various algorithms to cluster related keywords and identify key themes and clusters within the network.

By conducting social network analysis, we aimed to gain insights into the underlying structure of the research field of agile transformation and identify emerging topics and research patterns. This analysis allowed us to identify the most prominent themes and clusters within the field and the relationships between them.

FINDINGS AND DISCUSSION

We were able to visualize the growth of research on agile transformation over time, as demonstrated in Figure 3. Overall, social network analysis using VOSviewer was a valuable tool in guiding our study and providing us with a comprehensive understanding of the agile transformation research field. The insights gained from this analysis helped us identify key research gaps and future research directions.

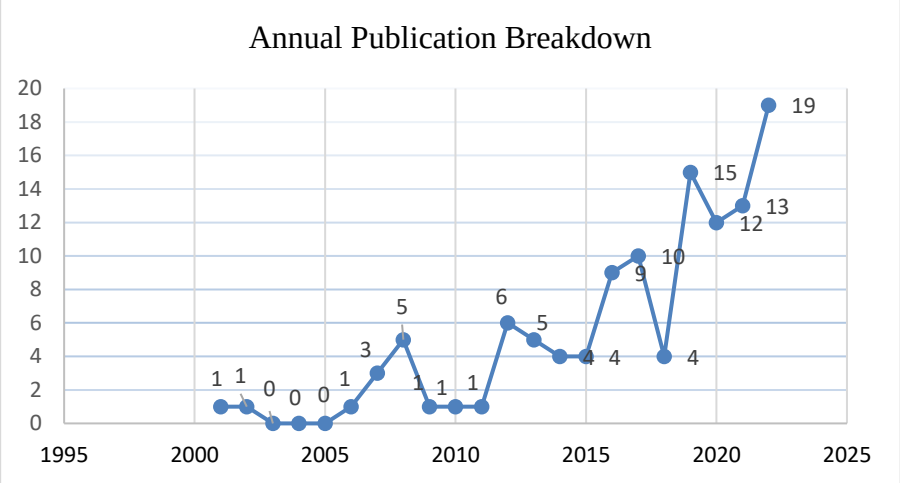

Figure 3. The Trend of Study in Agile Transformation

According to the interpretation of the meta-data set depicted in Figure 3, it is apparent that the study of agile transformation was first carried out in 2000 and gradually increased starting at the beginning of 2006 throughout the year 2019. Interestingly, after two years periods, this field of study gained a dramatic surge of attention which reflects by the surge in 2022 onwards. To that extent, the increased scholars' interest in the past ten years helps to address RQ1 in revealing the development of agile transformation studies over time. Based on this finding, the progress of agile transformation research is predicted to stay incline and will still be relevant as the initial transformation in the management process penetrates more in many industrial sectors.

Agile transformation in business and management research has been a popular topic in recent years, as it reflects a paradigm shift in how organizations manage their projects, products, and services. While some studies suggest that agile is a short-term trend, others show that it is deeply embedded in an organization's processes and culture (Cram & Newell, 2016). The shift towards agile models and methods signals a larger transformation in the workplace towards the organization of the 21st century (Levine, 2005). The concept of agile transformation encompasses many activities and steps, such as prerequisites, facilitators, framework, assessment, coaching, and more (Gandomani et al., 2014). These activities aim to help organizations adopt and implement an agile approach, which has been shown to lead to better business outcomes and customer

satisfaction. Furthermore, the certainty of positive growth in agile transformation research is also supported by the ideation unfolded in a prior study that highlights how potential is this field of interest in creating more value for the organizational sectors (Dikert et al., 2016; Pinton & Torres, 2020).

The second aspect of the bibliometric that this study means to unfold is the most contributing countries. In order to conduct and identify the most contributing countries, this study identified the cases as well as the samples by country used in each of the selected papers within our data collection. There were 15 countries that were used either as the case or sample for agile transformation studies. Fig. 4 depicts the statistic of the top 15 most contributing countries, corresponding to 95% of the total paper generated.

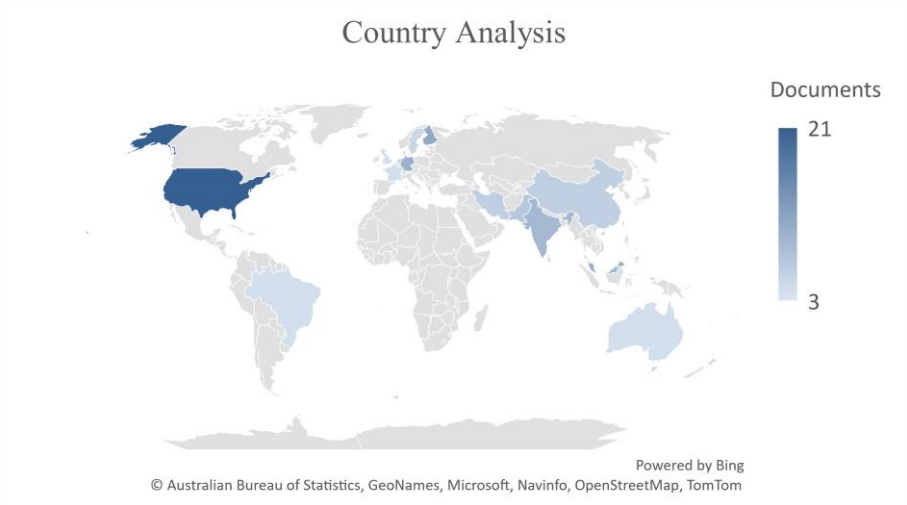

Figure 4. Country Analysis

The details of 15 countries with the most research in agile transformation can be seen in below Table 1. Among these 15 countries, it is evident that the United States and Finland were the two countries that have been studied rigorously. The dominance of these two countries has addressed RQ2. With such a fact, the readiness level of agile transformation in both countries should be more advanced, and the merit of its practice is expected to provide the example of a case study of a successful organization in implementing agile transformation in this region.

Table 1. Top 15 Countries with The Most Documents in The Field of Agile Transformation

Country	**Number of Documents**
United States	21
Finland	11
Germany	10
Australia	4
Malaysia	10
India	9
Pakistan	7
China	6
Iran	6
Netherlands	6
Sweden	5
Brazil	4
France	4

Country	Number of Documents
United Kingdom	4
Australia	3
Others	6
Total	116

It is important to note that the United States and Finland are known for their significant contribution to technology and innovation. The availability of advanced infrastructure, resources, and technology in these countries may have encouraged organizations to adopt agile methodologies and undergo agile transformation. The USA has always been at the forefront of technological innovation, and this leadership position has made it a fertile ground for agile practices to flourish, especially in software development and related industries (Lee & Yong, 2013; Sun et al., 2021). Similarly, Finland has a reputation for being a leader in technology, particularly in mobile and gaming industries, and this expertise has spilled over to the agile community as well, with many Finnish companies and organizations embracing agile principles and methods (De Jong et al., 2015). It is important to note that the United States and Finland are known for their significant contribution to technology and innovation. The availability of advanced infrastructure, resources, and technology in these countries may have encouraged organizations to adopt agile methodologies and undergo agile transformation. Additionally, these countries have a strong culture of entrepreneurship, which may have contributed to the popularity of agile transformation as a way to increase business agility and respond quickly to changes in the market. Finally, the high number of universities and research institutions in these countries may have also played a role in the large number of publications related to agile transformation.

Besides publication by country, the second aspect of bibliometric analysis that can address RQ3 and is also worth discussing is the most productive authors within agile transformation studies. In order to get the list of the most contributing authors, this study generated the authors' names from the RIS format file consisting of 116 kinds of literature. Based on the extraction, there are approximately 282 authors that were identified. Then, this study counted the number of publications from each author. Fig. 5 illustrates the top 10 productive authors based on the counts of their publications on the agile transformation field incorporated in this. Upon that chart, author Gandomani with seven publications on agile transformation studies, became the most productive author. According to our analysis, his study on the agile software development method first appeared in 2013. Since then, he has largely studied to generate insights regarding the practice of agile transformation. Gandomani et al. (2013) stated that strategy should consider all aspects of changing approach and underpinning of achievement in the agile transformation process through substantive transformation experiences. A recent publication in 2022 is about agile consolidation in agile software development (Gahroee et al., 2022). Following Gandomani, the second place is occupied by Zulzalil, with five publications. Zulzalil has specialized in his research on agility ranging from analyzing the risks and challenges in implementing agile transformation and agile adoption in the software development company. Besides, it is also worth mentioning all of the publications Zulzalil are with Gondamani.

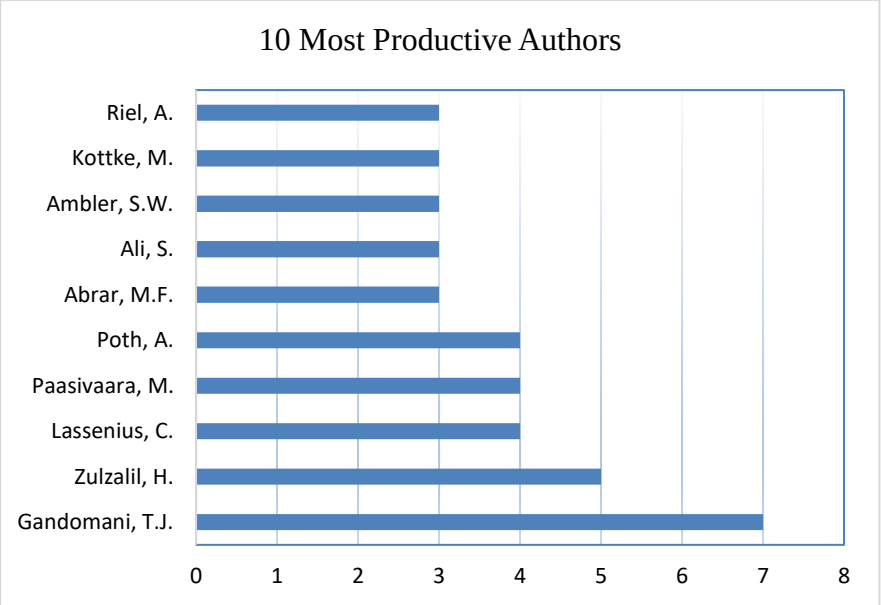

Figure 5. Most Productive Authors

For each of these journals, Fig. 6 depicts the top 10 journals in the agile transformation field while simultaneously addressing the RQ4. Journal of Systems and Software has covered nine articles that match our research focus. The same condition goes for the Journal of Software Evolution and Process, which placed in second place with a total of 6 articles. This study digs deeper into the background of these journals and compares this to the core focus of the current study. As mentioned since the beginning of this study, agile transformation is a broad field of study that can cover every sector and organization; meanwhile, most of the study only covers agile software development. To that extent, this study suggests the suitability of the journal title with the focus on the agile transformation study and related topic to be published in a high-quality journal that influences the organizational operation that is not only about software development but performance management in general.

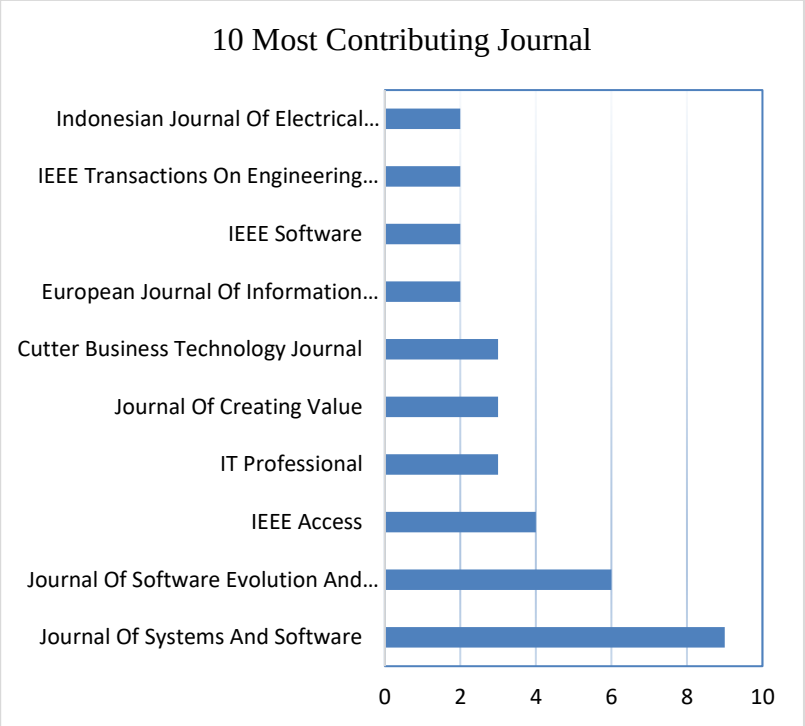

Figure 6. Most Contributing Journal

In the field of agile transformation study shown in Table 2, several research strategies have been utilized, mostly case studies, grounded theories, and surveys. While systematic literature review has been used in 18 studies conducted in the field, there has been limited use of other strategies, such as action research and ethnography, suggesting potential opportunities for further research. The case study has been widely used in agile transformation research, exploring its application in diverse industries, such as banking, small and medium enterprises, the air force, IT, and software development. Grounded theory has been predominantly used in the study of IT and software companies, with Gandomani and Zulzali being prominent researchers in this area. This table answers RQ5 on the most research strategy used in agile transformation.

Table 2. Research Methods in The Field of Agile Transformation Study

Research Method	Amount
Action research	1
Case Study	53
Ethnography	1
Grounded Theory	10
Structured Literature Review	18
Survey	17
Not known / Not specified	16
Total	116

In all of the clusters, most studies examined the challenges and risks of agile transformation implementation (Poth et al., 2021; Strode et al., 2022). Besides, the industries that are often studied are digital technology and IT companies that consider needing the most agility in the company. Accordingly, only a small number of studies describe other sectors, namely financial service, banking, automotive, manufacturing company, air force, public sector, transport, logistics, academic or university. Hence, it scarcely mentions agile transformation in the energy sectors, for example,

the oil and gas industry. The scarcity of industry variations appears in the cluster in Table 3. It opens opportunities for future studies to complement agile transformation research through its analysis of the various other industries while at the same time strengthening the existing industry that started to emerge on its body of knowledge. It also answers RQ 6 regarding industries the research covers the most in agile transformation.

Table 3. Industry Type in The Field of Agile Transformation Study

Specific company/industry implementation	Amount
Software Development Company	43
IT/ Digital Company	16
Air Force	1
Public Sector	3
Banking/ Financial Services	5
Academic Education	5
Automotive/ Manufacturing Company	2
Transformation/logistic	1
Others or not specified	40
Total	116

According to the illustration of Fig. 7, there are 4 clusters that were formed based on the co-occurrence of keywords obtained from the articles. The keywords that are widely discussed among the available articles within the meta-data set are agile transformation, agile adoption, and agile transition itself. In such a way, the answer for RQ7 regarding the major research hotspot in the agile transformation field is agile transformation, agile software development, software design, agile methods, agile transition, and agile adoption. Furthermore, these findings also confirmed that almost all cluster has the same size. Here, the general concept of study related to agile transformation takes industries such as software development, financial services, digital industry, SMEs, and the automotive industry as its research interest (Poth et al., 2020; Prange & Hennig, 2019; Vejseli & Rossmann, 2018; Winkelhake, 2017).

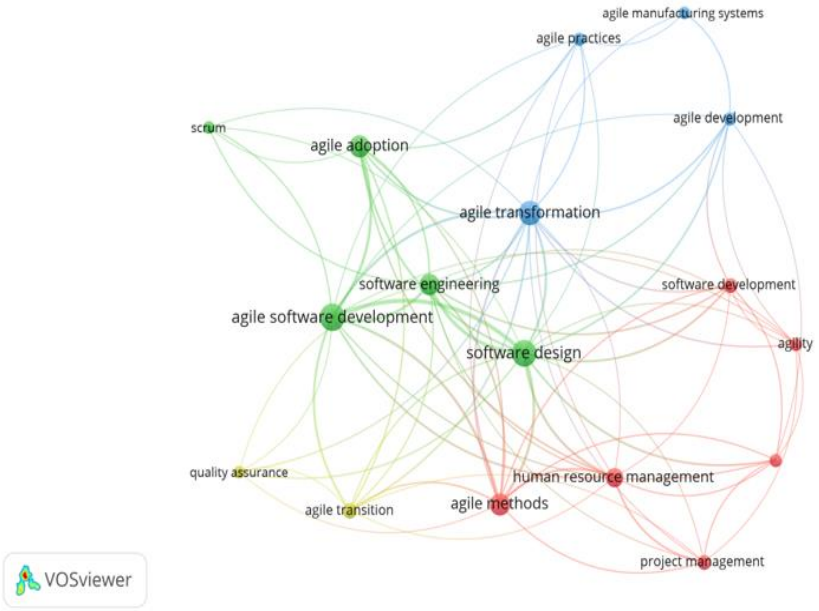

Figure 7. Network Visualization of Keyword Co-occurrence

Co-authorship measures the most efficient set of documents and those with a maximum degree of mutual publications. The bibliometric map of co-authorship from the VOSviewer using author names showed four clusters, as indicated in Figure 8. There are 282 authors from 116 documents article and only 22 authors that have a relationship of co-authorship.

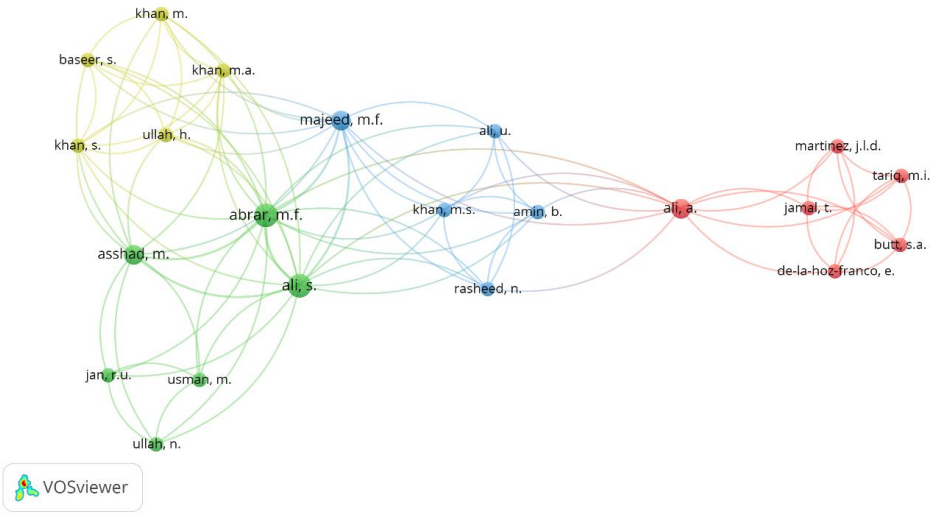

Figure 8. Network Visualization of Co-authorship

To analyze the contribution of papers that are accepted by other authors, the VOSviewer was to determine the most cited articles. The distribution of the most influential publications in the agile transformation field can be seen in Table 4. There are the top 10 articles with the most citations collected based on the results of the analysis. The most cited article, which was published in 2016, shows that this field has developed rapidly in the last five years. The subjects of the top three studies investigated agile transformation in software development. Articles with the most citations are

obtained from (Dikert et al., 2016), where the research discusses the review of the various articles related to the challenges and success factors of agile transformation.

Table 4. Top 10 Most Cited Documents in the Field of agile transformation

No	Document Title	Authors and Year	Cited by	Findings
1	Challenges and success factors for large-scale agile transformations: A systematic literature review	(Dikert et al., 2016)	413	The results include findings from 52 primary studies discussing how software organizations introduced large-scale agile transformation methods, challenges, and success factors.
2	Agile methods rapidly replacing traditional methods at Nokia: A survey of opinions on agile transformation	(Laanti et al., 2011)	144	The results showed that most respondents agreed on the benefits of agile methods, such as higher satisfaction and increased quality. 60% of the respondents would not like to return to the old way of working. The study concludes that based on the positive perception, agile methods are here to stay.
3	A framework to support the evaluation, adoption, and improvement of agile methods in practice	(Qumer & Henderson-Sellers, 2008)	140	The paper discusses the challenges in adopting agile methods in software development and presents the Agile Software Solution Framework (ASSF) and the Agile Adoption and Improvement Model (AAIM) as ways to assist in the transition.
4	A disciplined approach to adopting agile practices: The agile adoption framework	(Sidky et al., 2007)	129	This study presents an agile adoption framework to help organizations adopt agile processes and reap its benefits like faster ROI, improved software quality, and higher customer satisfaction. The framework consists of two components: the Sidky Agile Measurement Index (SAMI) and a four-stage process.
5	Communities of practice in a large distributed agile software development organization - Case Ericsson	(Paasivaara & Lassenius, 2014)	96	The study concludes that well-functioning CoPs are essential to a successful agile transformation and highlights the importance of a supportive atmosphere and infrastructure provided by the organization.
6	Large-scale agile transformation at Ericsson: a case study	(Paasivaara et al., 2018)	72	The lessons learned include the importance of an experimental approach, step-wise implementation, specialization, and the use of a common agile framework. The authors suggest that further in-depth case studies are needed on large-scale agile transformations.
7	Mindful revolution or mindless trend? Examining agile development as a management fashion	(Cram & Newell, 2016)	58	The results of the study show that there are different patterns of fashion in agile adoption, and it can encourage managerial awareness of the link between fashions and agile development

No	Document Title	Authors and Year	Cited by	Findings
				to enhance mindfulness and avoid pitfalls of mindlessness.
8	Group development and group maturity when building agile teams: A qualitative and quantitative investigation at eight large companies	(Gren et al., 2017)	58	The study concludes that incorporating psychological aspects into the description of an "agile team" could enhance understanding of agility and help define an "agile team."
9	Agile transition and adoption human-related challenges and issues: A Grounded Theory approach	(Javdani Gandomani & Ziaei Nafchi, 2016)	53	This study focuses on exploring the human-related challenges in the transition from traditional to Agile software development methods. The study used Grounded Theory to gather data from 49 Agile practitioners in 13 different countries and found that the root cause of challenges during the transition is people's perceptions of the Agile transition.
10	An empirically-developed framework for Agile transition and adoption: A Grounded Theory approach	(Javdani Gandomani & Ziaei Nafchi, 2015)	52	This paper presents the results of a large-scale empirical study using the Grounded Theory approach with 49 Agile experts from 13 countries. The study aimed to develop a substantive Agile transition and adoption framework that is simple and flexible to address the challenges faced by small and medium-sized companies in adopting Agile methodologies.

To further analyze the grand theories involved in the Agile Transformation revolution process, we conducted a bibliometric analysis to identify the most influential theories and their evolution over time. By examining the publication trends and citation patterns of key articles and authors in this field, we aim to provide a comprehensive understanding of the major grand theories that have emerged in the Agile community and how they have shaped the development and adoption of Agile methodologies in software development. Some of the major grand theories that have emerged include:

- The Agile Manifesto: The Agile Manifesto, developed in 2001, is the foundational document for Agile methodologies. It emphasizes the value of individuals and interactions, working software, customer collaboration, and responding to change. This grand theory focuses on the importance of adapting to changing requirements and customer needs and emphasizes the importance of collaboration and communication among team members (Hazzan & Dubinsky, 2014; Hohl et al., 2018; Krehbiel et al., 2017).
- Lean Thinking: Lean thinking is a grand theory that emphasizes the elimination of waste and the optimization of value streams. It originated in the manufacturing industry but has been applied to software development with great success. This theory emphasizes the importance of continuous improvement and the reduction of cycle time and encourages teams to focus on delivering value to customers (Ben Naylor et al., 1999; Kaushik et al., 2016; Larman & Vodde, 2009; Leal et al., 2021).

- DevOps: DevOps is a grand theory that emphasizes the importance of collaboration between development and operations teams. It emphasizes the need for continuous delivery, automation, and feedback loops to ensure that software is delivered quickly and with high quality. This grand theory focuses on the entire software delivery pipeline and encourages teams to work together to deliver software more efficiently and effectively (Almeida et al., 2022; Ghantous & Gill, 2019; Hemon et al., 2020).
- Agile Scaling: Agile Scaling is a grand theory that focuses on how to apply Agile methodologies to larger organizations and complex projects. It emphasizes the need for coordination and collaboration among multiple teams and encourages the use of Agile frameworks such as Scrum and Kanban to manage large-scale projects. This grand theory focuses on the challenges of implementing Agile at scale and provides guidance on how to overcome these challenges (Beecham et al., 2021; Putta et al., 2021; Uludağ et al., 2021).

Overall, the grand theories that have emerged in the Agile Transformation revolution process emphasize the importance of collaboration, communication, continuous improvement, and customer value. These theories provide a framework for organizations to follow as they adopt Agile methodologies and seek to transform their software development processes.

CONCLUSIONS

From the findings and analysis, this study has addressed RQ1 to RQ7. This discussion is designed to put all of the findings and, further, the investigation to alleviate more insights. First, the analysis of the annual publication rate on agile transformation studies signals that research growth in this field will continue to grow. However, this study is still in its infancy when we dissect the body of knowledge of agile transformation. Following that, plenty of areas have not yet been touched by recent studies. This gesture calls researchers with agile transformation interest to combine prior findings and cover more industries in future research. In order to augment the analysis, our findings suggest taking another country that has not been mentioned in the research field along with the industry that is scarcely being studied. Consequently, this study involves the practice of agile transformation and related comprehensive analysis in order to grab the future study of agile transformation studies.

In this study, we have conducted a systematic literature review using bibliometric and network analysis to generate insights on the agile transformation research field from a broad view, discussing the application of agile transformation in multiple industries. The overall analysis comprised the evaluation of 116 articles that has been growing from 2001 to 2022. This positive development demonstrates a growing interest of researchers in the field of agile transformation studies to further examine the related research. Research-wise, our findings exhibit a proper technique that can be beneficial in increasing the utilization of VOSviewer tools in order to generate a bibliometric systematic literature review study with comprehensive output. The software also proved favorable for normalizing the generated meta-data so that social network analysis can be easier to perform. Hence, this study has defined the research hotspots and the take-home key that may ease future researchers and practitioners to immediately understand the growing interest as well as the potential of the agile transformation field. Accordingly, the novelty of this study is in order to guide future studies to develop research on agile transformation.

LIMITATION & FURTHER RESEARCH

Since the purpose of this study is to investigate the use of agile transformation research over time, there is a good chance that our queries will fall short. To that extent, adding additional relevant keywords or modifying the queries may enrich future research repositories of articles while also

altering the research output. This research only takes one database. To that extent, adding additional relevant keywords, expanding with other databases, or modifying the queries may enrich future research repositories of articles while also altering the research output.

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