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MAPPING TRENDS AND HOTSPOTS OF ACCELERATING ECONOMIC TRANSFORMATION IN INDONESIA: UNCOVERING THE ROLE OF GREEN INTELLECTUAL CAPITAL, UNIVERSITY COMPETITIVE ADVANTAGE AND DIGITAL TRANSFORMATION

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Abstract
Over the past decade, Indonesia's economic transformation has progressed significantly. However, there is still little information about the underlying factors involved, and they need to be comprehensively identified. This study identifies the role of green intellectual capital, university competitive advantage, and digital transformation in accelerating economic transformation in Indonesia. This research used bibliometric analysis and a literature search with predetermined keywords and used the criteria of articles published in the Scopus database, in the range 2004–2023, in English and had topics that were in accordance with the research objectives. The selection of articles was guided by the Preferred Reporting Items for Systematic Reviews and

Meta-Analyses guidelines, and all the data were analyzed descriptively. A total of 1,271 articles were obtained, but only 109 met the inclusion and exclusion criteria. In accordance with the term mapping, 3,317 terms were generated, but only 64 terms matched the topic, resulting in six main clusters and 1,269 links with a total link strength of 12,681. Research on economic transformation in Indonesia is growing annually. The peak number of publications occurred in 2023 (n = 20 documents, 18.35%), and the highest number of citations occurred in 2017 (n = 234, 14.64%). Research related to economic transformation in Indonesia was conducted between 2008 and 2016. Research hotspots related to accelerating economic transformation in Indonesia include competitive advantage, intellectual capital (IC), economic development, and human capital. Strengthening green intellectual capital, competitive advantage in higher education, human capital, and intellectual capital are important parts of accelerating economic transformation in Indonesia, and the terms that fall into research coldspots include structural capital, innovation, green intellectual capital, production, competitiveness, quality, enterprise, investment, and service; these terms have not been widely discussed in research conducted in Indonesia. Therefore, further study is required in the future. In conclusion, the acceleration of economic transformation in Indonesia is carried out by strengthening green intellectual capital, increasing and strengthening elements of human capital and relational capital, enhancing the competitive advantage of universities, and optimizing the use of technology and automation.

Keywords: Green Intellectual Capital, Competitive Advantage, Digital Transformation, Indonesia, Economic Transformation.

1. Introduction

Indonesia is a developing country that continues to strive to realize sustainable economic transformation to be included in the ranks of developed countries. In the last decade, Indonesia has experienced rapid economic growth, in addition to the abundance of natural resources, increased infrastructure capacity, and an increase in the quality and capacity of human resources to accelerate economic transformation (Shehadeh et al., 2023; Susandya et al., 2019). Various elements have been optimized, starting from the household level to the government, with the aim of helping the community prosper. The acceleration of economic transformation in Indonesia is closely linked to the convergence of green intellectual capital, competitive advantage, and digital transformation. This is because these predispositions are important sources of economic growth (Alserhan, 2017).

Previous research has identified green intellectual capital, university competitive advantage, and digital transformation as the key drivers of economic growth in Indonesia (Astuti et al., 2019; Soetanto & Liem, 2019; Soewarno & Tjahjadi, 2020). Susandya et al. (2019) explained that green human capital, green relational capital, and green structural capital in intellectual capital affect competitive advantage and help accelerate economic transformation. Furthermore, Shehadeh et al. (2023) explain that digital transformation affects not only competitive advantage but also entrepreneurial orientation, leading to the creation of micro, small, and medium enterprises in a country and having implications for accelerating economic transformation. Niwash et al. (2022)

also explain that the aspects of human capital, structural capital, and relational capital can increase this competitive advantage characterized by the mediation mechanism of business intelligence, the speed of innovation that develops, and the quality of innovation that has an impact on society. Thus, studies related to the three predispositions of green intellectual capital, university competitive advantage, and digital transformation are important for revealing their role in accelerating economic transformation in Indonesia.

Green intellectual capital is an intangible asset owned by human resources and is divided into three components: relational capital (partnerships with stakeholders), human capital (knowledge, ideas, and other ideas), and structural capital (information and communication systems)(Astuti et al., 2019). Human resources refer to knowledge, skills, and experience that are inseparable from the owner and serve as the main engine for the performance and value development of the organization (Farsani et al., 2012; Wu et al., 2007). The term 'structural capital' refers to intangible assets and activities, including culture, structures, procedures, intellectual property, and information systems, that enable knowledge to be formalized and maintained within the organization (Jayabalan et al., 2021; Secundo et al., 2015; Vakhrushina & Vakhrushina, 2022). On the other hand, relational capital is the capacity to receive, use, and investigate new information from the environment to gain and maintain competitive advantage positions such as reputation, accreditation and others (Abdelrhman et al., 2014; Alserhan, 2017; Astuti et al., 2019; Mohamed Hashim et al., 2022).

Furthermore, the competitive advantage of universities is reflected in their ability to compete in the national and international arena, which is also an icon of a country in terms of increasing the capacity for industrialization, the transfer of science and technology, and innovation and sustainability for the benefit of society(Bueno et al., 2016; Haleem et al., 2022; Tjahjadi et al., 2022). Porter & Sölvell (1998) classified the improvement and strategy of universities' competitive advantage as reflected by excellence in cost efficiency, differentiation of various elements, and focus areas. The more these three components are fulfilled, the more competitive the university is at increasing its competitive advantage, which indirectly helps accelerate economic transformation. Finally, digital transformation and the use of technology play important roles in accelerating economic transformation through efficiency, innovation, affordability, and resilience (Adnyana & Sudaryati, 2022; Damayanti et al., 2023; Rahmat, 2022; Ramaditya et al., 2022).

With respect to this explanation, few studies have explored the interaction between these factors and their impact on accelerating economic transformation in Indonesia. Identifying trending topics and research hotspots related to the acceleration of economic transformation in Indonesia is important because it can provide insights into the predispositions and mechanisms underlying economic growth in Indonesia. The main objective of this study is to determine the role of green intellectual capital, university competitive advantage, and digital transformation in accelerating economic transformation in Indonesia. This study aims to fill this knowledge gap by identifying the role of green intellectual capital, university competitive advantage, and digital transformation in accelerating economic transformation in Indonesia. Bibliometric analysis is used to analyze

patterns in academic literature, citations, and publication trends, providing invaluable insights into the evolution of research themes, dissemination of knowledge, and identification of emerging trends. By utilizing bibliometric data, researchers can uncover the development of green intellectual capital, the growing competitive advantage of Indonesian universities, and the transformative impact of digital technology in the country's economic sphere. This research synthesis not only addresses the pressing challenges faced in accelerating Indonesia's economy but also paves the way for inclusive long-term development through comprehensive research on the accompanying predispositions. Hopefully, this research will illustrate and summarize the importance of current and future research related to accelerating Indonesia's economic transformation.

2. Method

2.1 Study design and approach

This study used a literature review approach and used previous articles that discussed topics related to the topic. (Paulus et al., 2023). The screening and article selection stages followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Adnyana, 2023; Adnyana et al., 2023). Bibliometric analysis was used to map the emerging terms, current research hotspots, emerging terms, future potential, and research topics that need to be developed to enhance and accelerate economic transformation in Indonesia. Understanding the role of green intellectual capital, the competitive advantage of universities, and digital transformation is highly important because these predispositions have been empirically proven individually but not comprehensively by combining the three. The presence of bibliometric analysis can map out the best strategies for implementation and future research, identify the evolution of publication subjects and the direction of scientifically relevant concepts, and network the strategies of green intellectual capital, economic transformation, and university competitiveness based on these terms.

2.2 Literature search strategy and study selection

A literature search was independently conducted by two authors from June to August 2023. Articles were collected using Publish or Perish (PoP) software. The articles screened were reputable journals published in the Scopus, DOAJ, EBSCO, Web of Science (WOS) and ScienceDirect databases. The keywords used to screen the literature included ((["intellectual capital AND competitive advantage AND higher education institutions AND economic transformation OR economic upturn])), (([green intellectual capital AND competitive advantage AND universities AND economic transformation, structural capital])), and (([intellectual capital OR green intellectual capital AND competitive advantage AND higher education institutions, "((([[green intellectual capital OR structural capital AND competitive advantage])). All the articles obtained were then analyzed for relevance, year of publication, topic studied, relevance to the purpose of this study, and comprehensive analysis of the article content.

2.3 Inclusion and exclusion criteria

Before conducting the study, the authors set inclusion and exclusion criteria to facilitate the process and to search and screen the literature. The inclusion criteria for articles that were screened and analyzed further included articles published in Scopus quartile one to four reputable indexed journals and/or indexed by Web of Science with core collection and articles published in the last 10 years, namely, 2004-2023. In English, important points of this research variable, including green intellectual capital; competitive advantage of universities; and digital transformation and economic transformation, especially in Indonesia. These articles, research articles and/or short reports or short communications, while the exclusion criteria of this study are articles that do not have implications for economic improvement in Indonesia and scientific journals that are not published in highly reputable journals and do not reflect scientific journals such as letters, letters to the editor, comments, books, or journals that are withdrawn from circulation.

2.4 Data analysis and visualization

The data were analyzed using VOSviewer software version 1.6.20 by creating a dataset stored in the research information systems (RIS) format beforehand. The keyword occurrence data, number of cooccurrences accompanied by the number of links, and total link strength are then interpreted based on the cluster of occurrence. All the data were descriptively analyzed and are presented in the form of narratives, tables, and figures. Mapping was performed by one author, and the results were interpreted by the other authors. At this stage, visualization is carried out based on the network of co-occurrence of keywords with network visualization, the journey and development of keywords from year to year with overlay visualization, and the depth of the keywords that have been studied using density visualization. In this study, we analyzed the number of publications each year (PY) and compared them with the number of citations obtained in the year (CY), as well as the journals and publishers that have the most publications throughout the year. We also analyzed current and future research hotspots to provide an overview of advanced research opportunities related to things that can accelerate economic transformation in Indonesia by mapping the role of green intellectual capital, the competitive advantage of universities, and digital transformation. The data are presented in the form of tables, figures, and visualizations generated using VOSviewer software.

3. Results

3.1 Search results and publication metrics

Based on the results of literature searches using Publish or Peris (PoP) software from 2004 to 2023, a total of 1,271 articles were obtained. At this stage, screening was performed according to the inclusion and exclusion criteria, and 109 articles that met the criteria were identified. In the next stage, article mapping was carried out each year, and the results revealed that the highest number of documents related to the research topic were reported in 2023 (n = 20, 18.35%), followed by 2019 (n = 11, 10.09%) and 2020 (n = 10, 9.17%). Similarly, in terms of the number of citations per year, the most citations were obtained in 2017 (n = 234, 14.64%), followed by

2010 (n = 149, 9.32%) and 2016 and 2020 (n = 134, 8.39%). The distribution of the number of documents and citations per year is shown in Figure 1.

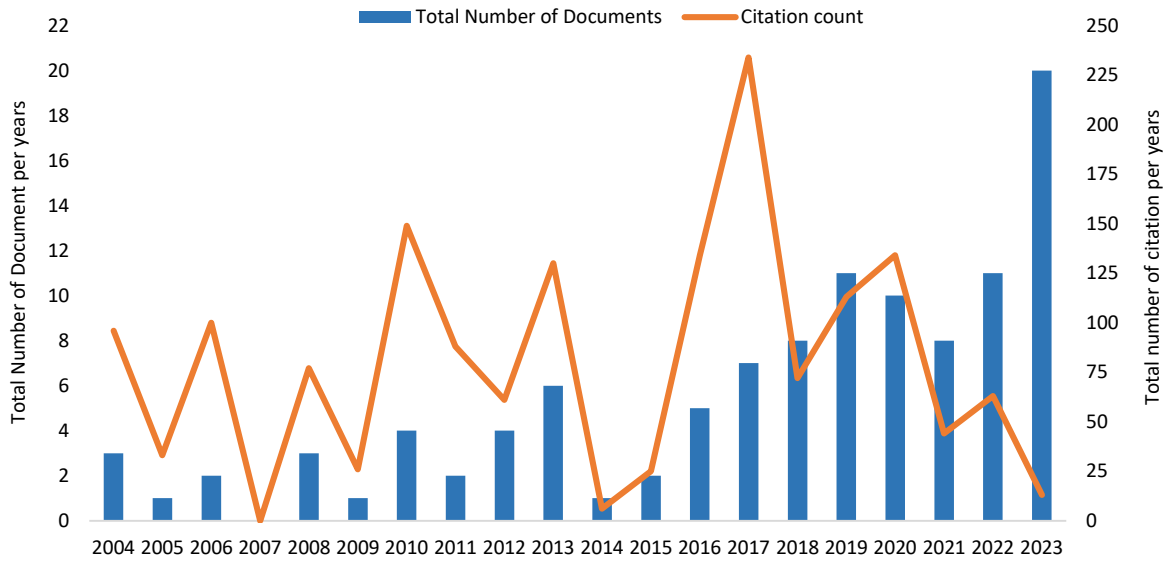

Figure 1. Distribution of documents and citations per year (2004-2023)

3.2 Reputation of publication article

According to the identification of the publication reputation of each article (n = 109), the articles were dominated by articles published in Scopus quartile 1 (n = 46, 50.14%), followed by Scopus quartile 3 (n = 27, 29.43%) and Scopus quartiles 2 and 4 (n = 18, 19.62%). This shows that the authors have a tendency to publish journals in high-impact iles in the range 75-99th; the better and higher the quartile is in terms of scope, and the better the originality, impact on science, and potential adoption are used as a reference. Furthermore, in terms of the number of documents in each journal, International Journal of Learning and Intellectual Capital (n = 18, 16.51%) was the most common journal for publishing articles related to intellectual capital, digital transformation, and competitive advantage, followed by Quality Access to Success (n = 8, 7.34%), Sustainability (n = 7, 6.42%), Advances in Social Sciences Research Journal, European Economic Review and Problems and Perspectives in Management (n = 3, 2.75% each) and Economic and Business Review, Economies, European Journal of Innovation Management, and Intangible Capital (n = 2, 1.83% each), while the remaining articles (n = 30, 27.52%) were published in other journals. Furthermore, in terms of publisher reputation, Emerald (n = 29, 26.61%) is the publisher that publishes the most articles on topics that match the research objectives, followed by inderscience publishers (n = 22, 20.18%), Multidisciplinary Digital Publishing Institute (MDPI) AG (n = 10, 9.17%), SRAC-Societatea Romana Pentru Asigurarea Calitatii (n = 8, 7.34%), Elsevier BV (n = 7, 6.42%), Wiley-Blackwell (n = 4, 3.67%), LLC CPC Business Perspectives and Scholar Publishing (n = 3, 2.75% each), Omnia Publisher SL and the School of Economics and Business University of Ljubljana (n = 2, 1.83% each) and other publishers (n = 17) with published documents (n = 19, 17.43%). These top ten publishers are classified as giant publishers that

publish open-access journals at a relatively high cost but are of good quality in terms of form and process. The reputations of the articles by journal and publisher are shown in Figure 2.

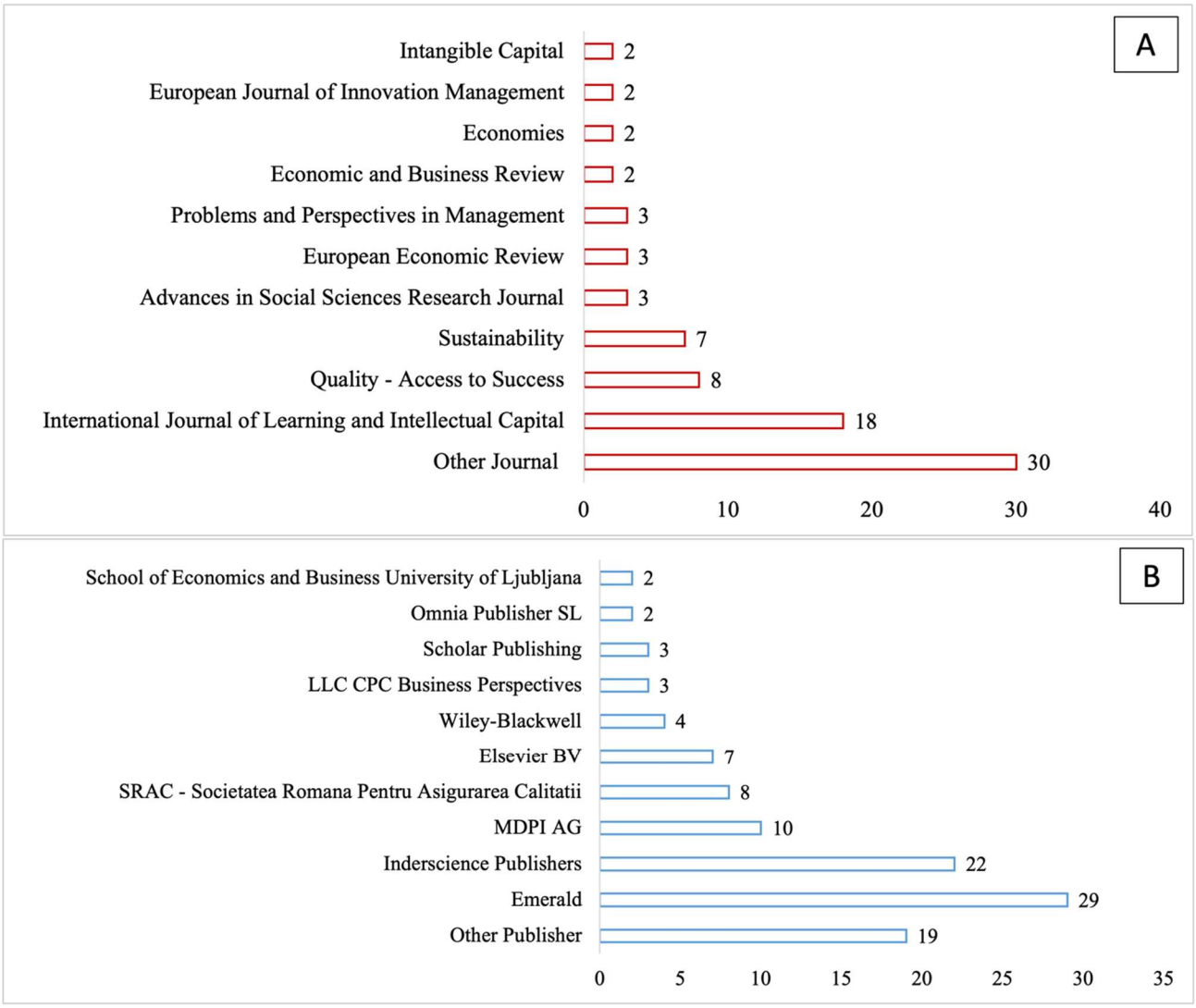

Figure 2. Article reputation based on journals and publishers. Abbreviations: (a) top ten journals that publish articles according to the research topic; (b) top ten publishers that publish highly reputable journals.

3.3 Network Visualization

In accordance with the screening of articles carried out based on the inclusion and exclusion criteria, 109 articles were further analyzed using VOSviewer software. In the mapping process, 3,317 terms were generated by all the articles (n=109), but the author set a minimum number of occurrences in each article of 10 terms so that 99 terms met the threshold. Subsequently, 65% of the keywords corresponding to the research topic were selected and manually reviewed by one author. Consequently, 64 terms were generated and spread into six main clusters, generating 1,269 links with a total link strength of 12,681. The findings of the network visualization analysis

showed that ten terms were dominant and became the center of research in previous studies from 2004 to 2023: "competitive advantage" (n = 491, link: 61, total link strength: 3,056, cluster 4), "intellectual capital (n = 470, link: 61, total link strength: 2,842, cluster 2), "university" (n = 351, link: 63, total link strength: 2,123, cluster 1), "human capital" (n = 286, link: 62, total link strength: 1.384, cluster 5), "development" (n = 280, link: 63, total link strength: 1.478, cluster 5), "economic development" (n = 250, link: 61, total link strength: 1.119, cluster 1), "knowledge" (n = 145, link: 58, total link strength: 883, cluster 1), "Indonesia" (n = 137, link: 58, total link strength: 811, cluster 2), "economy" (n = 90, link: 53, total link strength: 488, cluster 1), and "sustainable competitive advantage" (n = 74, link In the network visualization, lines and nodes with the same color indicate terms that are in the same cluster, whereas nodes and lines with different colors indicate terms that are in different clusters. The thickness of each line indicates that the phrase or term that appears in each article increases, and nodes or terms that are far apart indicate a relationship that is not strong, whereas nodes that are close together indicate a stronger influence between one node and another.

This finding indicates that the increase and acceleration of economic transformation in Indonesia has been associated with a high number of topics or articles discussing the influence, associations, or comparisons of the roles of intellectual capital, universities, human capital, and sustainable competitive advantage in accelerating economic transformation in Indonesia. Furthermore, to accelerate economic transformation in Indonesia, various elements utilize the important role of universities as the main milestone of scientific development and their usefulness in society. This is indicated by the high number of studies that discuss "economic development", which is associated with the role of "competitive advantage" (n = 491), "intellectual capital" (n = 470), "human capital" (n = 286), "comparative advantage" (n = 59), "knowledge" (n = 145), "intellectual property right" (n = 37), "intellectual property" (n = 78) and "sustainable competitive advantage" (n = 74). Human resource management, knowledge, practices, and digital transformation help to accelerate economic transformation in regions, including Indonesia. This variable is measured through several appropriate terms, namely, "transformation" (n = 50), "performance" (n = 116), "evidence" (n = 32), "growth" (n = 36), and "financial performance" (n = 46). These terms serve as measures of the role of each term in relation to the research and/or variables under study. The results of the network visualization for each cluster are presented in Figure 3, and the details of the occurrence and associated terms are presented in Table 1.

Table 1. Terms based on research clusters

Cluster (Items) - Color	Terms [co-occurance]	Focus of research
Cluster 1 (21 items) – Red	Advantage [16], asset [39], change [73], collage [25], comparative advantage [59], competition [19], economic development [250], economy [90], intellectual property	Accelerating regional economic transition and development by utilizing technology-based assets and

	[78], intellectual property law [13], intellectual property right [37], knowledge [145], knowledge asset [30], knowledge economy [25], production [12], regional economic development [14], research [63], science [17], technology [14], transition [13], university [351]	competitive advantages (knowledge, intellectual property rights, research).
Cluster 2 (12 items) – Green	Company [97], competitive edge [27], economic change [15], evidence [32], financial performance [46], green intellectual capital [12], growth [36], indonesia [137], industry [58], intellectual capital [470], performance [116], dan wealth [12]	Intellectual capital and competitive advantage in improving economic performance and transformation in Indonesia
Cluster 3 (11 items) – Blue	Bussiness [21], competitive [20], higher education [14], higher education institution [21], institution [27], intangable asset [15], intellectual capital management [17], knowledge management [24], management [39], strategy [56], sustainable competitive advantage [74]	Utilization of intangible assets, knowledge management and competitive strategy to realize sustainable competitive advantage in higher education institutions.
Cluster 4 (8 items) – Light Green	Capital [66], competitive advantage [491], innovation [57], private university [23], quality [18], service [14], social capital [12], structural capital [16]	Utilization of competitive advantage, intellectual capital, social capital and structural capital in improving service and quality of higher education.
Cluster 5 (7 items) – Purple	Development [280], economic growth [18], enterprise [26], human capital [286], human capital formation [11], investment [25], organization [31]	Development and acceleration of economic growth by leveraging human capital, investment and organizational strengthening
Cluster 6 (5 items) – Light Blue	Education [25], human capital development [28], human resource [13], practice [20], transformation [50]	Accelerating economic transformation by developing human capital and education

Description: [N]: the value of terms used together with a number of N values

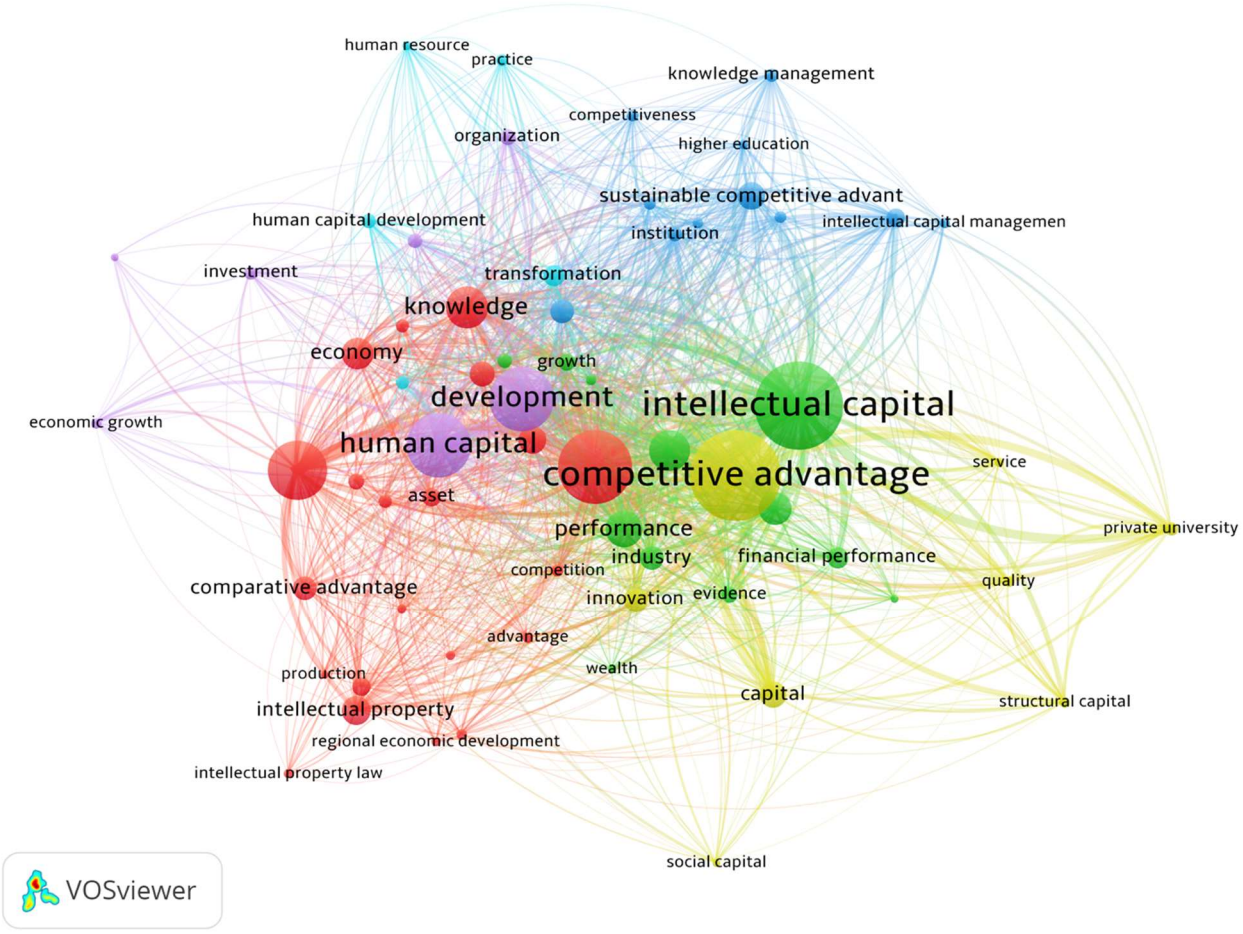

Figure 3. Network visualization by cluster (n=6). Information: Nodes and lines that are the same indicate being in the same cluster, and the closeness of nodes and terms indicates a strong influence on the term, whereas nodes and terms that are far apart indicate a nonstrong influence on each other.

3.4 Overlay Visualization

Mapping the research journey from year to year used overlay analysis to observe the trend of the term, which was subsequently used to map research hotspots and coldspots, especially related to research trends in accelerating economic transformation in Indonesia by identifying the role of green intellectual capital, the competitive advantage of universities, and digital transformation, especially in Indonesia. The results showed that research related to 'economic development' developed from 2008 to 2016. The results vary, especially regarding the use of variables in each year. A look at the overlay visualization map shows that the phrases "intellectual property" (n = 78, links: 47, total link strength: 335 with average publications in 2008), "economic development" (n = 250, links: 61, total link strength: 1,119 with average publications in 2009), "human capital" (n = 286, links: 62, total link strength: 1,384 with average publications in 2010), "university" (n = 351, links: 63, total link strength: 1,123 with average publications in 2011), and "knowledge" (n

= 145, links: 58, total link strength: 883, with average publications in 2011) became the five terms that developed from 2008 to 2012, especially emphasizing the role of intellectual property rights, including legal intellectual property, copyright, education, science, knowledge assets, human capital formation and investment, to be important parts of efforts to accelerate the transformation and development of the economy formed in universities or educational institutions.

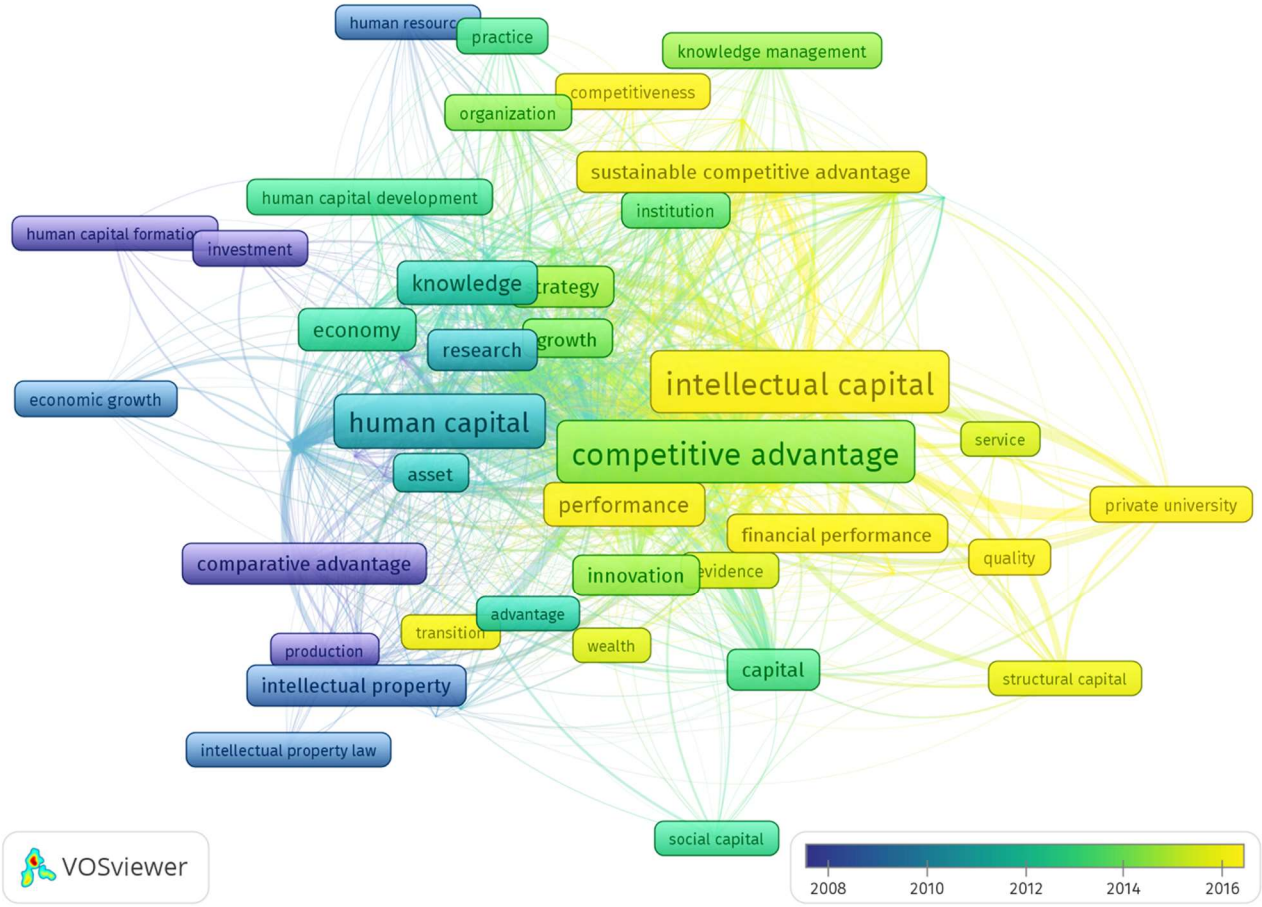

Figure 4. Research developments related to accelerating economic transformation in Indonesia.

Information: Wights based on occurrence and scores based on average publications per year. The overlay visualization results in the development of research from 2008 to 2016, where the colors of the nodes and dark lines (blue to purple) indicate research topics classified as past, whereas the nodes and bright lines (green to yellow) indicate emerging research topics. A thicker/wider line connecting the nodes indicates that the productivity of the term is used in a highly and mutually influential category, while a thinner and less wide line indicates that the topic has not been widely researched. The strength and novelty of the topic can be observed from the distance between the nodes.

Furthermore, there was a shift in research topics related to economic transformation from 2013 to 2016. The identification results show that there have been developments in research related to the

predisposition to accelerate economic transformation in Indonesia. The phrases "Transformation" (n = 50, links: 45, total link strength: 263, with average publications in 2013), "growth" (n = 36, links: 40, total link strength: 211, with an average publication year of 2013), "strategy" (n = 56, links: 49, total link strength: 340, with an average publication year of 2014), "innovation" (n = 57, links: 53, total link strength: 373, with an average publication year of 2014), and "industry" (n = 58, links: 53, total link strength: 356, with an average publication in 2014) indicate that the economic transformation launched focuses on strengthening strategies and policies related to economic development and increasing innovation and accelerating industrialization; this is certainly one of the keys to success in accelerating and increasing the ability of regions or countries to grow and transform to become more advanced and better in the future.

Since 2014, research related to the predisposition to accelerate economic transformation in Indonesia has increased, and complexity can be seen from the relationship lines that connect one node to another. The thickness of the nodes is an indicator of the productivity of the terms and the occurrence of phrases in the research. This finding provides information that many new terms and indicators have been applied and tested in accelerating economic transformation, especially in Indonesia, on a national and international research scale. In the term analysis conducted, the phrase 'competitive advantage' (n = 491, links: 61, total link strength: 3,056, with average publications in 2014) is a research topic used to measure the acceleration of economic transformation. This is seen in the role of universities, higher education institutions, and/or other educational institutions in supporting the government's efforts to realize a sustainable economy.

Economic transformation with a primary focus on competitive advantage extended to other predispositions in the following year, such as "higher education" (n = 14, links: 31, total link strength: 109, with average publications in 2015), "intellectual capital" (n = 470, links: 61, total link strength: 2,842, with average publications in 2016), "performance" (n = 116, links: 53, total link strength: 650, with average publications in 2016), "company" (n = 97, links: 50, total link strength: 581, with average publications in 2016), and "sustainable competitive advantage" (n = 74, links: 50, total link strength: 508, with an average publication year in 2016). These results indicate that the focus of economic transformation is based on the competitive advantage of the government through university resources as a creator of people who provide benefits to the country. Thus, intellectual capital is a factor that correlates with other factors in realizing economic transformation and a sustainable competitive advantage. Since 2018, the phrase "Indonesia" (n = 137, links: 58, total link strength: 811, with an average publication year of 2018) has emerged as the main topic in accelerating economic transformation, followed by other phrases such as "competitiveness" (n = 20, links: 38, total link strength: 136), "transition" (n = 13, links: 25, total link strength: 63), "green intellectual capital" (n = 12, links: 21, total link strength: 65), "quality" (n = 18, links: 37, total link strength: 213), "private university" (n = 23, links: 28, total link strength: 400), "structural capital (n = 16, links: 28, total link strength: 233) and "service" (n = 14, links: 37, total link strength: 194). The overlay visualization (2008–2016) is presented in Figure 4.

3.5 Density Visualization

At this stage, term depth mapping was performed using density visualization analysis. The depth of the term is indicated by the appearance of terms with a density that expands and tends to yellow; a brighter color indicates that the topic has been discussed extensively by various other researchers in the past; on the other hand, terms that are not interrelated and tend to be far apart indicate that the topic is unique and tends to be little researched, so that it becomes an opportunity for future research. The results show that the terms "competitive advantage" (n=491), "intellectual capital" (n=470), "human capital" (n=286), "development" (n=280) and "economic development" (n=250) are the most frequently cited and discussed terms in studies related to economic transformation. Moreover, research related to "social capital" (n = 12), "structural capital" (n = 16), "green intellectual capital" (n = 12), "service" (n = 14), "competitiveness" (n = 20), "human capital development" (n = 28), "investment" (n = 5), "higher education institution" (n = 21), "technology" (n = 14), "intellectual property law" (n = 13) and "transformation" (n = 50) are rare research topics related to efforts to accelerate economic transformation in Indonesia (frequency of co-occurrence < 200 times).

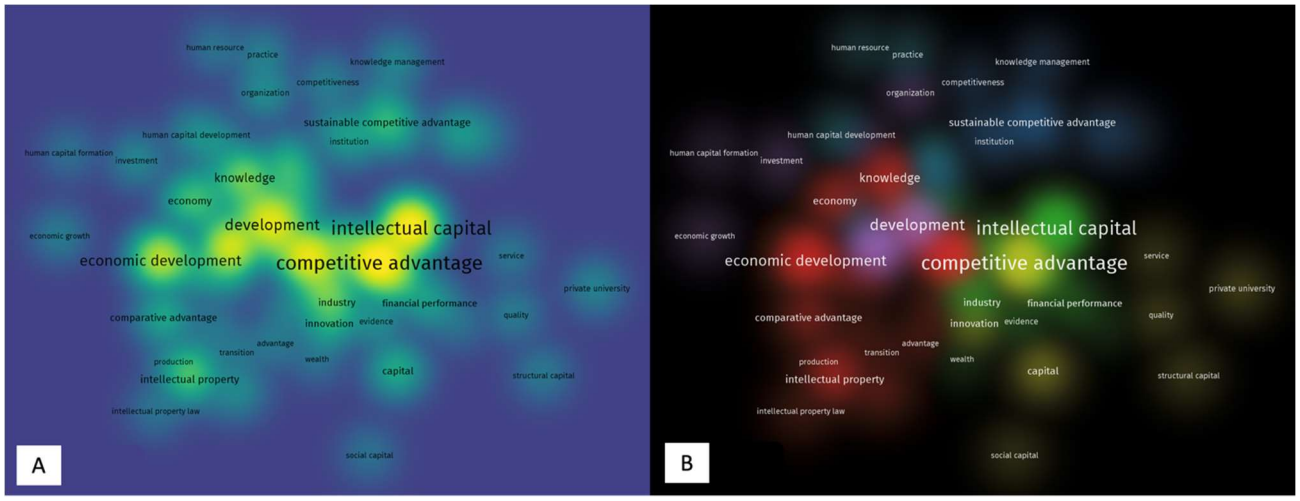

Figure 5. Visualization of density and depth using terms (A) and (B). Notes: (a) A gradation toward yellow indicates a strong correlation between term nodes and lines, a dark color toward green indicates a weak correlation between term nodes and lines, and (b) a color difference indicates that terms are in different clusters.

Figure 5 shows that, based on the kernel density, most of the terms have a spread pattern and are not related to each other. This indicates that research related to this topic in Indonesia has focused only on one or two variables used simultaneously, and comprehensive analysis has not been conducted. The central topic related to the acceleration of economic transformation in Indonesia focuses on the role of 'intellectual capital', competitive advantage', 'human capital', 'development' OR 'economic development', 'capital' and 'Indonesia' but has not yet penetrated into other predispositions that can encourage the acceleration of economic transformation in a region; therefore, further research is needed to fill and confirm the predispositions that have been mapped.

Furthermore, a cluster depth analysis was conducted after analyzing the depth of the research. The results show that predisposition research is dominated by clusters that are red, green, yellow, and purple in color, with their respective terms. However, some terms form a distinct map network characterized by a darker background than the density of other terms. This indicates that the strength of the term-based research network tends to form a block (clustered), which means that there is a relationship between terms and is considered significant in accelerating economic transformation in Indonesia but does not apply to terms that are far apart, which tend to have less correlation between nodes and terms. Future research can focus on terms that have low density and have not been associated with other terms, thus providing new evidence of the importance of these variables (terms) in accelerating economic transformation in Indonesia. The density and cluster visualizations are shown in Figure 5.

3.6 Research hotspots and coldspots

The identification of research hotspots and coldspots is useful for mapping terms that are trending and/or have not been extensively researched. Like density visualization methods, hotspot and coldspot analyses are characterized by the frequency with which networks within a term appear together and by the strength of the relationships between networks. These results provide information on the role of each term in mapping information related to the study variables. The findings show that from 2004 to 2023, hot spots and cold spots will develop throughout the year. The research hotspot terms (Figure 6a-c) related to accelerating economic transformation in Indonesia include "competitive advantage" (n= 61, total link strength= 3,056), "intellectual capital" (n= 61, total link strength= 2,842), "economic development" (n= 61, total link strength= 1,119), "human capital" (n= 62, total link strength= 1.384), "development" (n= 63, total link strength= 1,478), and "knowledge" (n= 58, total link strength= 883), indicating that the strengthening of competitive advantages in higher education, human capital, and intellectual capital, which includes knowledge, is an important part of accelerating economic transformation in a region including Indonesia. This indicates that strong, reliable, and knowledgeable intellectual capital and human capital are able to generate innovative and visionary ideas for improving a country's economy through the transfer of knowledge in the form of products, services, and other services.

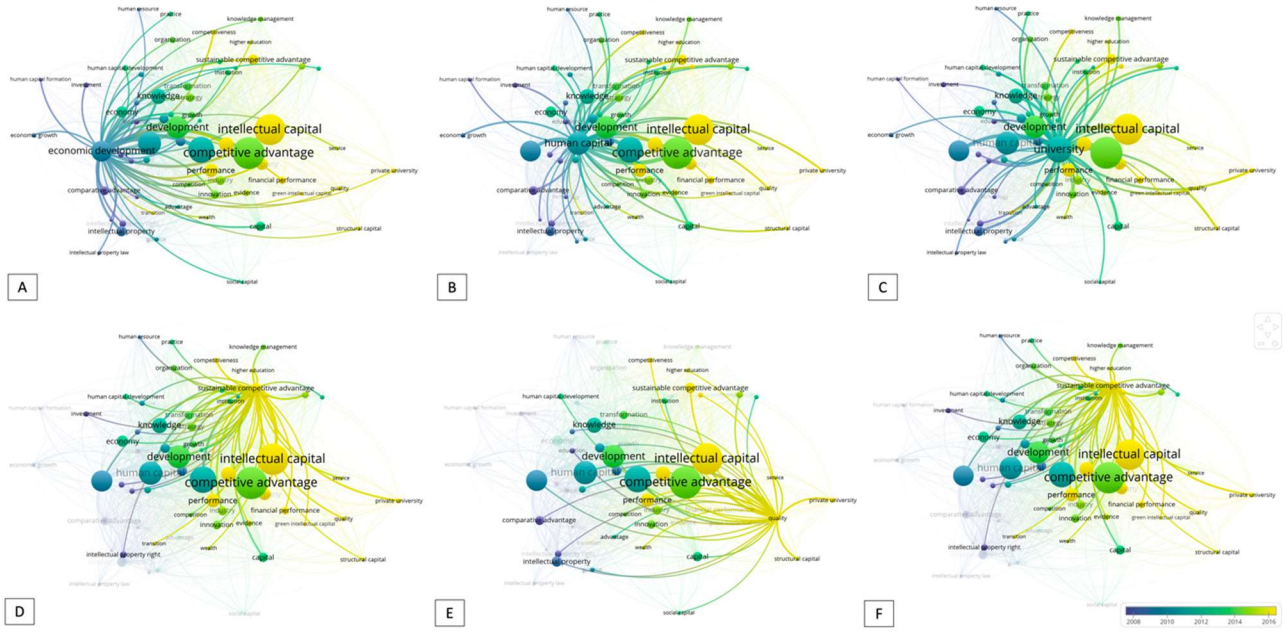

Figure 6. Hotspots (a-c) and coldspots (d-f) from 2004 to 2023. Description: Research hotspots are characterized by dark central nodes and garus and have high links and high network strength, whereas cold spots are characterized by small central nodes coupled with fewer links and lower network strength. Nodes classified as hotspots tend to be close to the central node, while nodes in coldspots tend to be far apart, which indicates that the occurrence of these terms is relatively rare.

Intellectual property sourced from the results of human thought contributes significantly to the development of a region from upstream to downstream of any innovations, products, or other products resulting from evidence-based research activities. The term emerging as a research hotspot has provided the insight that every progress and transformation of a country comes from human resources that have competence, always innovate sustainably, are competitive and have qualified quality. Indicators involved in efforts to accelerate economic transformation, especially in Indonesia, must be guided by improving human resource skills, mastering technology, and increasing the spirit of entrepreneurship among the younger generation, all of which are fully supported through investment. Economic transformation must shift the structure of the commodity economy to an investment-based economy, production, and services that have high added value to increase the competitiveness of the economy in Indonesia.

Furthermore, the terms that fall into the research coldspots (Figure 6 d-f) include "structural capital" (n= 28, total link strength: 233), "innovation" (n= 53, total link strength: 373), "green intellectual capital" (n= 21, total link strength: 65), "technology" (n= 29, total link strength: 64), "production" (n= 25, total link strength: 65), "competitiveness" (n= 38, total link strength: 136), "quality" (n= 37, total link strength: 213), "enterprise" (n= 44, total link strength: 175), "investment" (n= 33, total link strength: 133), and "service" (n= 37, total link strength: 194); these terms have not been widely discussed in research conducted in Indonesia, so research that leads

to this topic content is needed in the future. Terms that appear in coldspots and are directly related to the acceleration of economic transformation in Indonesia tend to be under researched, and there is still a research gap that focuses only on theoretical aspects rather than implications and results in the field. This is evident from the low production, service, and quality indicators in the research network and the low strength of the relationships between networks. Fixing these elements is a benchmark, as is accelerating economic transformation in Indonesia. Thus, it appears that research related to green intellectual capital, the competitive advantage of universities, and digital transformation, especially the mastery and use of technology in Indonesia, tends to be limited and has not reported on its direct impact on economic transformation in Indonesia.

According to the economic transformation policy in Indonesia, five pillars must be fulfilled as a real step toward strengthening the economy of advanced Indonesia. This includes optimizing infrastructure development, strengthening the implementation of economic equity policies, minimizing dependence on short-term foreign capital and labor market efficiency, improving the quality of human resources (HR), and configuring investment to support growth. Reviewing the five main pillars of Indonesia's economic transformation efforts, it appears that only one of the four pillars—the point component for improving the quality of human resources—has been researched by paying attention to the competitive advantage of universities, human capital, and structural capital. Thus, there is a need for research that emphasizes the five main aspects of this pillar to strengthen and provide a comprehensive report on these results.

3.7 Author collaboration

In this study, we mapped the collaboration of authors who have published articles related to the acceleration of economic transformation in developing countries, including Indonesia, in which there are at least 1,244 authors who have published related articles; however, we believe that the author published a maximum of 50 documents. As a result, only 28 authors were filtered to form 7 author clusters, 47 links, and a total link strength of 52. The findings include "Bontis, N" (n= 11 documents, links: 15, total link strength: 16), "Edvinsson, I" (n= 7 documents, links: 7, total link strength: 9) and "Roos, G" (n= 4 documents, links: 7, total link strength: 8), which provide evidence that each author maintains the linearity of research topics related to the topic studied, especially economic transformation. These two authors are relatively new in producing this article in the range of 2004–2015. The lines in the nodules that are far apart indicate that the topics raised based on the terms tend to be fewer, whereas those with adjacent nodes indicate the cross-publication exchange of authors between countries. The results of visualization mapping are shown in Figure 7.

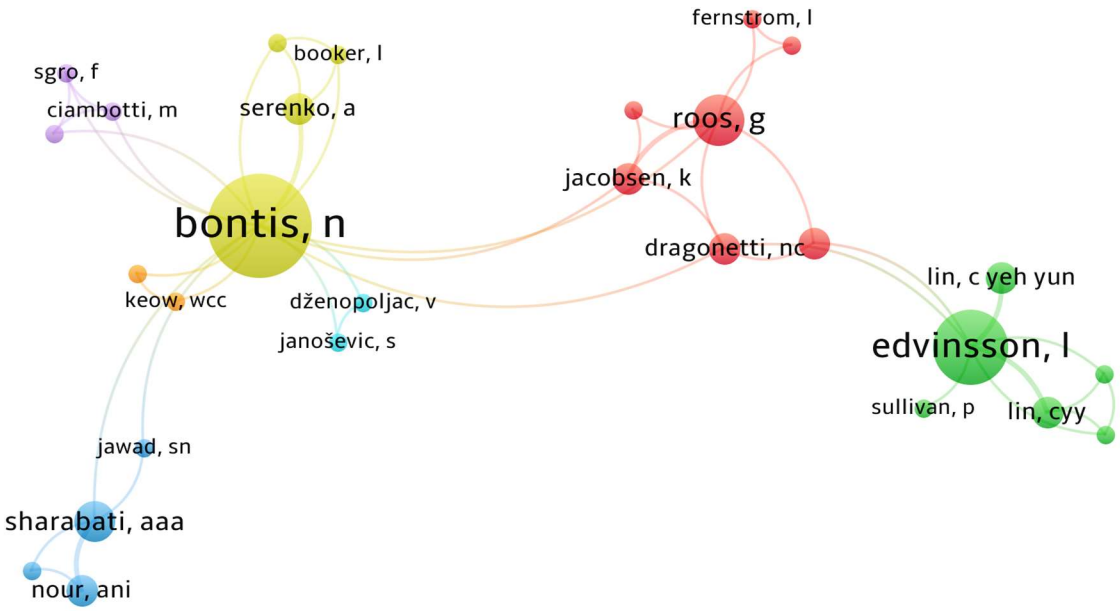

Figure 7. Visualization of the network of authors publishing research related to economic transformation, especially in Indonesia. Description: The same node color indicates that the authors are in the same cluster or collaborate with each other. The closeness of the lines and nodes indicates a strong relationship between the authors.

3.8 Publication related to accelerating economic transformation

At this stage, mapping was carried out with regard to publications related to economic transformation in developing countries, including Indonesia. The top ten articles are presented in Table 2.

Table 2. Top ten articles related to accelerating economic transformation

Authors	Title	Source	Publisher	Rank	ECC	CY	CA
(Minbaeva, 2018)	Building credible human capital analytics for organizational competitive advantage	Human Resource Management	Wiley-Blackwell	Q1	111	15.86	111
(Lengnick-Hall et al., 2004)	The role of social and intellectual capital in achieving competitive advantage through enterprise resource planning (ERP) systems	Journal of Engineering and Technology Management	Elsevier BV	Q1	90	4.5	30

(Chahal & Bakshi, 2015)	Examining intellectual capital and competitive advantage relationship	International Journal of Bank Marketing	Emerald	Q2	90	10	45
(Kamukama et al., 2011)	Competitive advantage: mediator of intellectual capital and performance	Journal of Intellectual Capital	Emerald	Q1	85	6.54	28
(Liu, 2017)	Creating competitive advantage: Linking perspectives of organization learning, innovation behavior and intellectual capital	International Journal of Hospitality Management	Elsevier BV	Q1	81	11.57	81
(Martín-de-Castro et al., 2006)	Organizational capital as competitive advantage of the firm	Journal of Intellectual Capital	Emerald	Q1	72	4	18
(Cheng et al., 2010)	Invested resource, competitive intellectual capital, and corporate performance	Journal of Intellectual Capital	Emerald	Q1	71	5.07	18
(Soewarno & Tjahjadi, 2020)	Measures that matter: an empirical investigation of intellectual capital and financial performance of banking firms in Indonesia	Journal of Intellectual Capital	Emerald	Q1	69	17.25	35
(Rehman et al., 2022)	Intellectual capital, knowledge management and competitive advantage: a resource orchestration perspective	Journal of Knowledge Management	Emerald	Q1	58	19.33	15
(Torres et al., 2018)	The impact of knowledge management factors in organizational sustainable competitive advantage	Journal of Intellectual Capital	Emerald	Q1	50	8.33	17

Description: Q1: Quartile 1, Q2: Quartile 2, Q3: Quartile 3, Q4: Quartile 4, ECC: Estimated citation count, CY: Citations per year, CA: Citations per author.

4. Discussion

The acceleration of economic transformation in a region cannot be separated into several technical aspects, such as human capital, intellectual capital, competitive advantages, and the adoption and application of technology in each element. According to the results of mapping the terms that bridge the acceleration of economic transformation, especially in Indonesia, the development and acceleration of current economic transformation must prioritize and pay attention to environmental issues. In this case, green intellectual capital is a form of predisposition that supports this condition. Green intellectual capital refers to an organization's intangible assets and resources, such as knowledge, skills, human resources, and innovations geared toward sustainable and environmentally friendly practices (Antosova & Csikosov, 2011; Niwash et al., 2022; Pucar, 2012; Quintero et al., 2021).

Green intellectual capital has a very important role in efforts to accelerate economic transformation in Indonesia through several predispositions, such as sustainable innovation, industrial transition, and improving global competitiveness data. In terms of sustainable innovation, the government, society, and universities should strive to develop research domains and business practices geared toward environmental awareness. This should also be supported by human, structural, and relational capital to enhance competitive advantage in innovation (Hama & Cavusoglu, 2023; Howaniec et al., 2022; Mohammed et al., 2019). In line with the results of the mapping carried out, these findings show that "human capital," "structural capital," "relational capital" and intellectual capital are interrelated and have direct and indirect impacts on the economy in a country (Abiwu & Martins, 2022; Barroso-Méndez et al., 2020; Pangidoan & Nawangsari, 2022; Yuwanda et al., 2023). In terms of industry transition, by emphasizing green intellectual capital, Indonesia can facilitate industry transition toward more sustainable operations. This shift is essential for meeting global environmental standards and addressing the growing demand for green products and services. This will certainly lead Indonesia to the transition gate and undergo transformation in various sectors. Finally, in terms of global competitiveness, investing in green intellectual capital will improve Indonesia's global competitiveness. Countries and markets are increasingly recognizing the importance of sustainable practices, making products and services derived from green intellectual capital more attractive internationally (Habiba & Ahmed, 2021; Moghtadaie & Taji, 2016).

The practical mechanisms behind the role of green intellectuals in accelerating economic transformation in Indonesia include research equity and academic collaboration. Universities play an important role in generating green intellectual capital. Research initiatives that focus on sustainable technologies, environmental science, and green business practices contribute to the development of a knowledge base that can be applied to various industries. This can be done by strengthening the elements of lecturers and education personnel through training, workshops, etc., as well as through certification so that the quality and reputation of universities can encourage a sustainable climate and growing innovation, which will help industry in terms of implementation in the field (Panda et al., 2019). Furthermore, collaboration between academia and industry is essential for translating green intellectual capital into practical applications. Universities can act

as knowledge hubs by transferring their expertise to businesses through partnerships, consultancies, and collaborative projects (Net & Hassan, 2023; Rawashdeh, 2022; Uriguen Aguirre & Avolio Alecchi, 2023). It has been implemented in Indonesia today in the form of the *Merdeka Belajar Kampus Merdeka* (MBKM) Program, which has facilitated the implementation and transfer of knowledge in two or more directions that provide better experience and skills for students, including lecturers and educators. This will strengthen various elements of the industry and the contribution of universities in terms of services to society to accelerate economic transformation (Hermawan et al., 2022; Mukaro et al., 2023; Tarighi et al., 2022; Vo & Tran, 2023). Finally, supportive government policies and incentives create an environment that enables green intellectual capital growth. Incentives for businesses that implement sustainable practices, funding for green research projects, and regulatory frameworks that encourage environmental responsibility contribute to accelerating economic transformations. (Ashiq et al., 2021; Habiba & Ahmed, 2021).

On the other hand, higher education plays an important role in driving economic transformation by equipping individuals with the necessary skills, encouraging innovation, and increasing workforce competitiveness. Higher education's competitive advantage is the driving force behind Indonesia's economic transformation. This is because the elements that become the starting point of economic transformation are clearly reflected in the productivity, achievements, and ability of higher education to compete at the international level. In the relational capital element of the partnership network, reputation, brand, and alumni engagement are important parts of intellectual capital that support the achievement of competitive advantage in higher education(Barroso-Méndez et al., 2020; Zhang & Phromphitakkul, 2021). Based on this, several predispositions, including the importance of skilled workforce development, contribute to the acceleration of economic transformation in Indonesia. Higher education institutions contribute to economic transformation by helping individuals develop a skilled and adaptable workforce that includes the possession of entrepreneurial skills that can create new ventures, stimulate economic development, and create jobs. Through a variety of academic and training programs, they ensure that graduates possess the competencies required by emerging industries. The speed at which the alumni find jobs or establish businesses independently indicates that this predisposition is considered successful. This is also reflected in the low unemployment rate of higher education (Jayabalan et al., 2021; Panda et al., 2019).

In addition, to realize competitive advantage, universities need to build relationships with industry, other educational institutions, alumni, and the community to open up opportunities for collaboration, funding, and knowledge exchange in an interdisciplinary, transdisciplinary, and multidisciplinary manner. It can also attract and enhance the reputation and brand of a college. This can be enhanced through the performance and engagement of alumni, who support and contribute to the financial well-being and reputation of the institution. Previous research has revealed that universities that actively foster relationships and networks tend to have competitive advantages. Collaborative initiatives, joint research projects, and alum engagement have been linked to an increased competitive advantage (Hu et al., 2019; Mohammed et al., 2019).

Furthermore, universities are generating continuous innovation and research. Universities are centers of innovation and research that generate new ideas, technologies, and solutions. The competitive advantage of higher education lies in its capacity to drive research that addresses societal challenges, provides practical solutions for industry, and fosters innovation-driven economic growth. In particular, the effective management and utilization of intellectual capital enables universities to efficiently use their resources. This includes knowledge exchange, interdisciplinary collaboration, and the development of commercializable intellectual property (patents and copyrights). It will support the transformation and shift of future educational trends, leading to the advancement of education, research, and community services, with key points to enhancing reputation and maintaining the institution's brand to gain a competitive advantage (Lintang Prakoso et al., 2022; Panda et al., 2019).

This element certainly has a positive impact, especially on global recognition through competition, institutional accreditation, or the production of researchers and educators who are included in the world's top, which will open up opportunities for universities to obtain funding, research contacts, and cooperation globally and open up opportunities for international students to study at the university. Good intellectual capital allows universities to establish partnerships and collaborations with other academic institutions, industry players, and global organizations. These collaborations can result in joint research projects, technology transfers, and faculty and student exchange opportunities that support economic transformation (Antosova & Csikosov, 2011; Rahmat, 2022). Universities with good intellectual capital track records are likely to secure more and larger competitive research grants and contracts. Funding agencies and organizations tend to invest in institutions with a proven track record of research and innovation that impacts society (Awwad & Qtaishat, 2023; Uriguen Aguirre & Avolio Alecchi, 2023; Yuwanda et al., 2023).

In today's global landscape, digital transformation and technology utilization are also important for driving economic growth in a region. Digital transformation and technology utilization have emerged as dynamic forces that drive the process toward accelerating economic transformation (Do et al., 2022; Linda Sutanto et al., 2023; Nhon et al., 2020; Obeidat et al., 2021; Yaseen et al., 2023). The presence of digital transformation makes elements more practical, efficient, and effective; thus, digital transformation can increase productivity, leading to increased global competitiveness. The role of digital and technological transformation is an integral part of realizing the acceleration of economic transformation in Indonesia. This is because technology provides various benefits, including increasing efficiency and productivity, innovation and research competitiveness, and inclusive and sustainable development.

Digital transformation simplifies processes, reduces inefficiencies, and increases productivity across industries and societies. Automation, data analytics, and advanced technologies optimize operations, resulting in increased production efficiency and improved service delivery(Fathi, 2013; Giesenbauer & Müller-Christ, 2020). In addition, embracing digital technology will drive innovation and research and make the industry more globally competitive. The integration of technologies such as artificial intelligence, blockchain, and the Internet of Things (IoT) paves the way for new products, services, and business models, placing Indonesia at the forefront of the

global market (Nanik et al., 2023; Mohammed, 2021). With the adoption of artificial intelligence-based technology or other methods, it will be possible to introduce a new direction to the development of a country that makes people technologically literate and advanced as a whole. Thus, the existence of technology will always increase innovation in the field of research and competitiveness to achieve digital-based economic transformation (Awwad & Qtaishat, 2023; Quintero-Quintero et al., 2021; Rahmat, 2022). Finally, digital transformation drives inclusive economic growth by providing equal access to various opportunities. Through digital platforms, businesses of all sizes, including small and medium enterprises (SMEs), can participate in the digital economy, thereby driving a more inclusive and diverse economic landscape (Hu et al., 2019; Linda Sutanto et al., 2023; Todericiu & Şerban, 2015). The existence of e-commerce, as it is today, is proof that the development of research coupled with the adoption of technology has led to an increase in new business development, employment, and high efficiency, increasing the direction of economic transformation in Indonesia.

The mechanism that can accelerate economic transformation in Indonesia is through the establishment and improvement of digital infrastructure, including high-speed Internet and connectivity, which is the backbone of digital transformation. A strong infrastructure facilitates the seamless integration of digital technologies across sectors. Furthermore, the implementation of digital literacy programs ensures that the workforce is equipped with the skills required to navigate and utilize digital technologies. Educational initiatives and training programs contribute to a digitally proficient workforce, encouraging innovation and adaptation. Finally, government-led digital initiatives simplify administrative processes, improve public services, and create a conducive business environment. E-government programs contribute to the efficiency of governance and provide the foundation for a digitally inclusive society as well as a measure of the country's success in transforming from conventional methods to technology-based automation methods (Li et al., 2020). Thus, as Indonesia faces complexities in economic development and in optimizing the role of green intellectual capital, the competitive advantage of universities and digital transformation becomes essential for sustainable growth.

4.1 Research Limitations

The limitation of this research is that it has not been able to provide a comprehensive picture of how much and how the effectiveness of each predisposition, including green intellectual capital, university competitive advantage, and digital transformation, influences the acceleration of economic transformation in Indonesia. Furthermore, this study maps only the developments, research trends, and research hotspots related to the topic of economic transformation in Indonesia, and no research has discussed these three predispositions simultaneously.

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5. Conclusion

This research mapped and studied trends and research hotspots and coldspots related to the acceleration of economic transformation in Indonesia. Predispositions that accompany this condition include the role of green intellectual capital, the competitive advantage of universities, and digital transformation. This research used bibliometric analysis to study 109 articles that met the inclusion criteria. The results revealed 3,317 terms generated by all the articles; however, only 64 terms were related to the topic, and six main clusters and 1,269 links were produced, for a total link strength of 12,681. Research related to economic transformation in Indonesia grew from 2004 to 2023, peaking between 2008 and 2016. Research hotspots related to accelerating economic transformation in Indonesia include competitive advantage, intellectual capital (IC), economic development, and human capital. Strengthening green intellectual capital, competitive advantage in higher education, human capital, and intellectual capital are important parts of accelerating economic transformation in Indonesia, and terms that fall into research coldspots include structural capital, innovation, green intellectual capital, production, competitiveness, quality, enterprise, investment, and service; these terms have not been widely discussed in research conducted in Indonesia. However, further research is needed to determine the content of this topic. In conclusion, the acceleration of economic transformation in Indonesia is carried out through several actions, such as strengthening green intellectual capital, increasing and strengthening elements of human capital and capital capital, enhancing the competitive advantage of universities, and optimizing the use of technology and automation. Further research is needed regarding the magnitude of the impact generated from the implementation of this predisposition to accelerate economic transformation in the future.

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