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A Bibliometric Analysis to Explore the Role of Metaverse in Employee Training

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Abstract: *Purpose – The aim of this paper is to investigate the research landscape of metaverse in employee training by conducting a thorough bibliometric analysis and systematic review. This will help identify notable scholars, intellectual communities, and areas for future research in the field of metaverse and employee training.*

Design/methodology/approach – A comprehensive review and bibliometric analysis were conducted on the global body of literature pertaining to the subject of employee training and the metaverse from 2013 to April 29, 2024. From the Scopus database, 266 English-language documents were taken out. R studio and VOSviewer are the software used for bibliometric analysis.

Findings – The study revealed eminent writers and research teams making substantial contributions to the area of metaverse-based employee training. Gaining insight from their contributions and research paths can be very beneficial for joint projects and future study. The results show that many different businesses, including technology, healthcare, education, and retail, are implementing metaverse-based training approaches. This variety shows how adaptable metaverse platforms can be to meet different training requirements.

Practical implications – The study's practical implications underscore the potential advantages of integrating metaverse technology into employee training initiatives, which span from improved learning outcomes to greater competitiveness and skill enhancement. Organizations can use the study's findings to inform strategic decisions that will maximize the metaverse's transformative potential for workforce development.

Originality/value – The research is innovative since it examines a novel subject, using a bibliometric technique, adopts an interdisciplinary viewpoint, identifies important themes and trends, and offers stakeholders useful consequences. The research advances knowledge in the field of metaverse-based employee training by challenging the current situation system and providing fresh perspectives.

Keywords*: Metaverse, Employee training, virtual Reality, Augmented Reality, Online Training.*

1. INTRODUCTION:

In the rapidly changing environment of technology and its impact on various elements of society, the concept of the metaverse has evolved as a paradigm-shifting phenomena. The metaverse, which originated in science fiction and is now becoming a reality, represents a virtual, interconnected space in which users can interact with one another and with digital settings in real time. While its uses include entertainment, social networking, and commerce, one area that shows great promise is its potential to revolutionize employee training approaches.

The term "METAVERSE" refers to an artificially created environment with a continually set of values and an independent economic system linked to the outside world. It combines the initial "meta," which means the transcendent, with the ending "verse," which is abbreviation for the universe **(Wang et al., 2023).** The metaverse is a post-reality setting that is an ongoing, multiuser environment that combines digital virtuality and physical reality. The intersection of technologies such as virtual reality (VR) and augmented reality (AR), which enable multimodal interactions with digital items, people, and virtual surroundings, is its basis. In 2021–2022, the concept of the metaverse became quite popular, partly due to Facebook's decision to rebrand itself as "Meta." The term was first used in 1992 by science fiction writer Neal Stephenson for his book "Snow Crash." Creating a virtual environment that individuals from all over the

world can enter and live in is the aim of the metaverse. With this technology, business operations such as learning about human resources can be completely transformed. HRM has been through a revolution due to the demands of a workforce that is becoming more global and computerized. This study examines the effects of the growing metaverse-HRM interaction on talent acquisition, employee development, virtual teamwork, and corporate culture. HR specialists may create immersive learning environments with this new technology that are more engaging, transformative, and participatory than standard learning approaches **(Mehta, 2023).**

This study examines the intricate function that the metaverse plays in employee training through bibliometric analysis. The quantitative method of analyzing academic literature known as "bibliometrics" offers a methodical approach to examining the patterns, trends, and impact of research on a certain subject. By employing this tactic, we intend to offer a thorough understanding of the ways in which the metaverse is being incorporated into employee training, along with emerging themes and implications for further study and application. Businesses are reevaluating traditional methods of training and development in an effort to adapt to the evolving demands of the digital era. With immersive and engaging learning settings that transcend space and time, the metaverse presents itself as a potent tool. We intend to uncover the extent to which the metaverse is being utilized for training across a range of industries and businesses through our analysis. We also hope to pinpoint important figures, foundational works, and points where scholarly discourse is convergent or divergent.

2. LITERATURE REVIEW:

This systematic review aims to close that gap by offering a comprehensive viewpoint on the use of the metaverse in education. Three key approaches are used to achieve this: creating a taxonomy of the factors influencing the acceptance of Metaverse in education, outlining a framework for Metaverse adoption, and suggesting future lines of inquiry for this field of study. Four categories are used by the review to group the important components: social issues, psychological and motivational aspects, quality concerns, and inhibiting factors. The review's conclusions are beneficial to academic institutions, decision-makers, developers, and researchers, substantially advancing the developing field of Metaverse adoption **(Maghaydah et al., 2024).** We use a variety of theoretical stances to present an extensive analysis of the traits of team virtuality as well as its advantages and disadvantages. We find that opinions on the concept of team virtuality are divided and that its scope is unclear. Moreover, we found that resource and information as well as desire and ability are the two processes via which team virtuality enhances individual and team performance. But it also negatively affects people through three different mechanisms: media and technology, emotion and connection, and cognition **(Zheng et al., 2024) .** This study aims to investigate and evaluate the variables that affect students' perceptions of and actions related to the use of the metaverse in the classroom. A survey was conducted to examine how students' understanding and use of resources, as well as their general interests and attitudes about the metaverse in education, were impacted by the metaverse. In the first phase, the collected data were submitted to a confirmatory factor analysis (CFA) in order to address the several validity parameters. In the second stage, structural equation modeling (SEM) was used to analyze the model's trajectory. The study investigated how learners intended to behave when utilizing the metaverse for educational purposes. People's views toward adopting metaverse technology are influenced by perceived usefulness and simplicity of use **(Chanda et al., 2024).** The purpose of this study is to identify the factors that affect people's inclination to use the metaverse to receive academic training. 251 respondents in Colombia completed an online survey for the study, and the partial least squares structural equation modeling approach was utilized to analyze the data. The results showed that self-efficacy for engaging in the metaverse was significantly enhanced by digital literacy. Additionally, it was discovered that people's intention to engage in the metaverse for both daily activities and academic training courses was positively correlated with their level of self-efficacy in participating in the metaverse **(Simbaqueba – Uribe et al., 2024).** The study covered in this chapter uses an e-capacity model methodology to evaluate how well schools and instructors can incorporate technology into a new curriculum. The chapter will cover a variety of topics, including effective strategies and policies for digital integration in education and training, societal issues (such as social inequality and the digital divide), legal and ethical issues (such as intellectual property legislation), the hybridization of training, simulations, artificial intelligence (AI) for training, the educational metaverse, and managing virtual worlds and the metaverse for enhanced e-learning **(Adade & Goosen, 2024).** The study's objective is to investigate the factors that affect SMEs' (small and medium-sized enterprises) decisions to use the Metaverse. It is advised to examine how the constructions' performance and effort expectations relate to the satisfaction of the company. A study was carried out on a sample of 182 technology-related SMEs in Spain using the PLS-SEM technique for development. According to the research, obtaining information, reducing uncertainty, and evaluating the competition are necessary for company happiness in this new virtual world. This research is one of the first to examine the role that corporate conduct plays in developing performance plans for Metaverse systems **(Gil – Cordero et al., 2024).** After providing an overview of the history and present advancements in augmented reality (AR), virtual reality (VR), mixed reality (MR), and spatial

computing, the technological aspects of AI and 6G are discussed. In order to ascertain the requirements of 6G in the Metaverse, we next investigate the role of artificial intelligence in the Metaverse by examining the most current advancements in deep learning, computer vision, and Edge AI. The possible advantages of B5G and 6G for the Metaverse are then discussed, along with the function of AI in 6G networks and how 6G networks can make AI available for Metaverse applications. Lastly, we talk about how sustainability in the Metaverse is essential **(Zawish et al., 2024)**. This article aims to facilitate the quick development of Aboleth, a smartphone app that serves as a digital character sheet for the Dungeons & Dragons fifth edition. We propose expanding an existing API framework with additional capabilities, like details on the overall design process and significant information regarding the specific execution of the project. Utilizing computer-aided designs and Xamarin, the prototype is developed. Software engineering is integrated into game design to enhance Human-Computer Interaction and eventually improve user experiences. Additionally, we discuss the value of using this technology to swiftly prototype enterprise mobile applications and the Metaverse, and we investigate methods to improve the project design **(Chang et al. ,2024).** In this article, we will discuss how to quickly prototype Aboleth, a smartphone app that serves as a digital character sheet for the fifth edition of Dungeons & Dragons. We propose expanding the functionality of an existing API framework with details on the project's specific execution as well as the general design process. The prototype is developed using computer-aided designs and Xamarin. Software engineering is combined with game design to improve user experiences by enhancing Human-Computer Interaction. We also examine how this technology may be used to swiftly prototype enterprise mobile applications and the Metaverse, and we discuss how to improve the project design **(Allam, 2024)**

3. METHODOLOGY

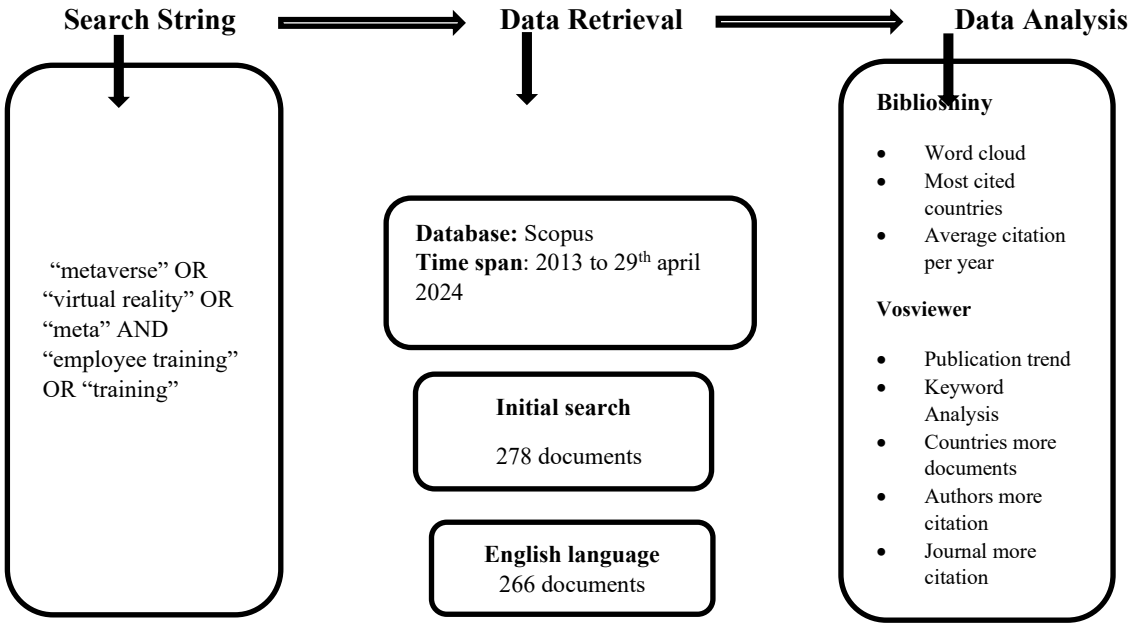
For the purposes of bibliometric analysis and a systematic assessment of the body of existing research, this paper examined a wide range of literature on the influence of Metaverse on Employee Training. The research publications on a certain topic are quantitatively and qualitatively examined in bibliometric analysis, and utilizing methods like citation, keyword, author citation count, and country citation, future study topics are suggested.

VOSviewer and Biblioshiny are the programs used for analysis in this study. Both programs are utilized, though, as Biblioshiny aids in data analysis related to many levels of analysis such as conceptual structure, thematic map, and document analysis, while VOSviewer just helps with network viewing.

DEFINING THE APPROPRIATE TERMS FOR SEARCH

Elsevier's Scopus database was used for this study's paper review since it is a large database with the highest number of indexed journals. In order to retrieve all the papers on metaverse and employee training, a panoptic and thorough search string with the greatest number of keywords was used to examine the global body of literature pertaining to the issue between 2013 and April 29, 2024.

The search string includes “metaverse” OR “virtual reality” OR “meta” AND “employee training” OR “training”.



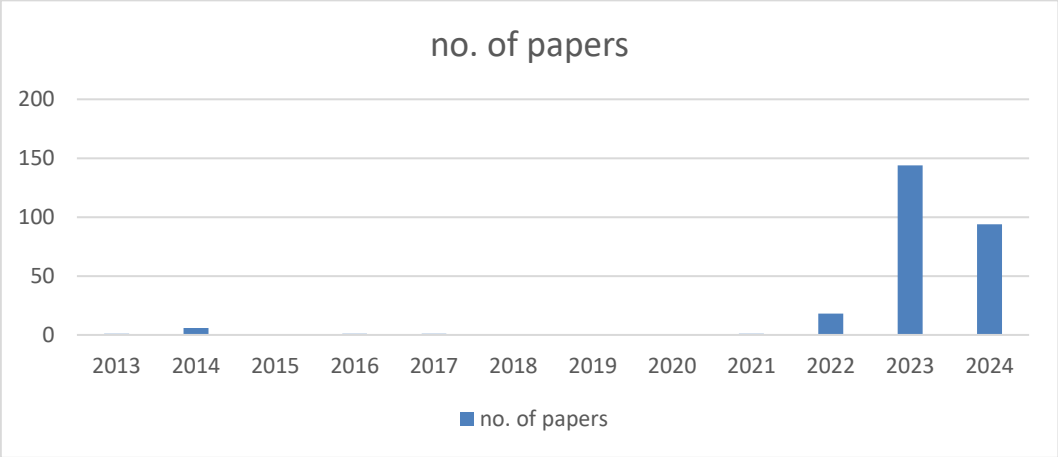
Source: Author

Figure 1: Design of study

4. DISCUSSION

Results of the bibliometric Analysis

Publication year trend



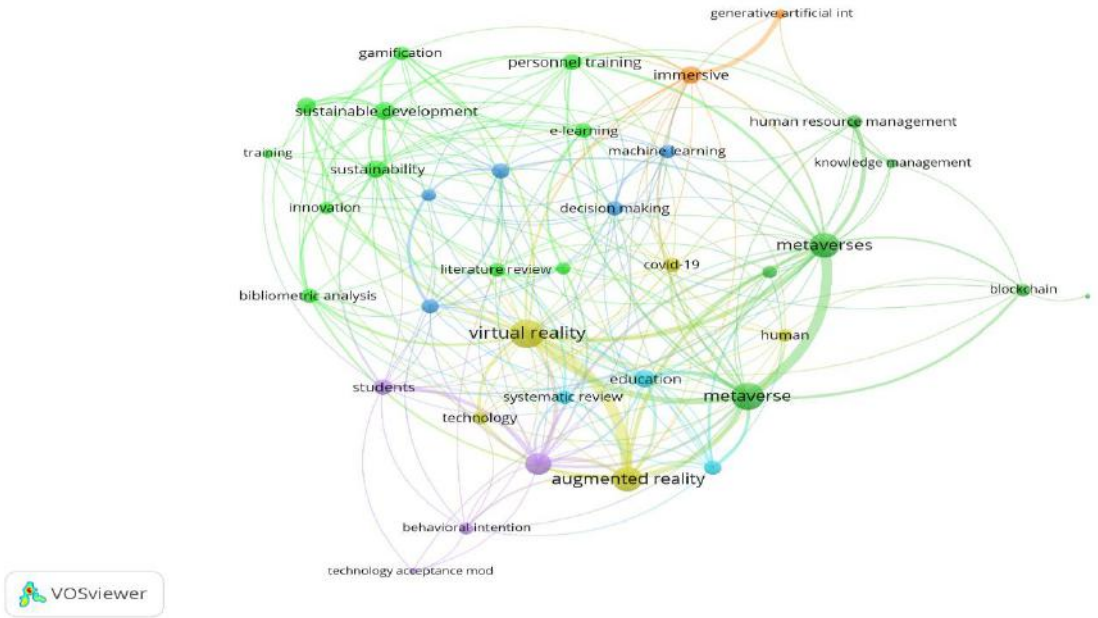
Source: Author

Figure 2: publication per year

Figure 2 displays the year-by-year publications of research articles on the function of metaverse in employee training. With 144 documents published, the year 2023 saw the highest amount of publications. After then, 94 and 18, respectively, were the number of documents published in the years 2024 and 2022. As of April 29, 2024, there have been 94 papers published.

5. KEYWORDS ANALYSIS

A programme called VOSviewer, which is used to create and display bibliometric networks, was used to map the author's keywords. Using colour, circle size, text size, and connecting line thickness to illustrate relationships with other keyword, Figure 3 displays a network visualisation of the author's keywords. Consider the usual listing of terms that were the same colour. Thus, the study's results indicate that certain keywords, such "metaverse," "blockchain," "innovation," "gamification," and "personnel training," are related to one other and frequently occur together.



Source: Vosviewer

Figure 3: keyword map

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After doing data cleaning on the author's keywords, the most often used keywords related to the role of metaverse in employee training were found to be virtual reality and metaverse. Table I displays the top ten keywords related to the metaverse's role in employee training studies.

Table I keywords

Serial no.	keywords	occurance
1	Metaverse	31
2	Virtual reality	31
3	Metaverses	20
4	Artificial Intelligence	20
5	Augmented Reality	19
6	Education	9
7	Immersive	9
8	Sustainability	8
9	Sustainable Development	7
10	Personnel training	6

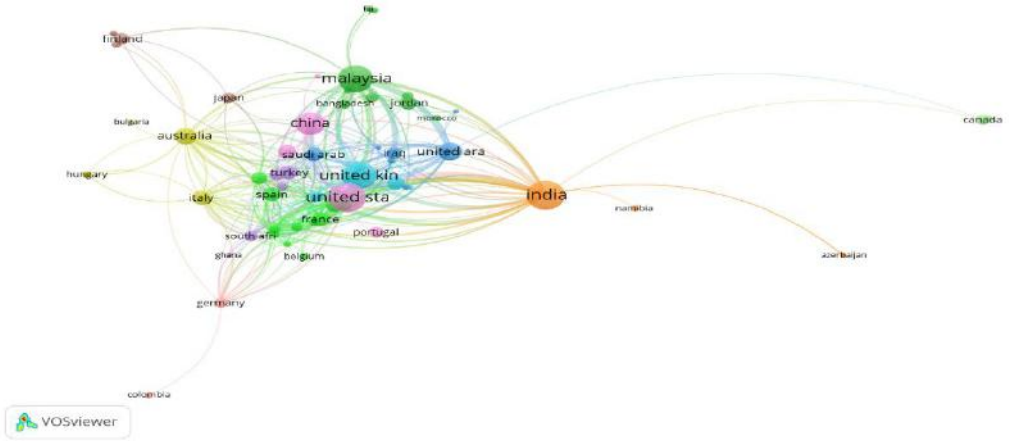
Source: Vosviewer

Source: Biblioshiny

Figure 4: word cloud

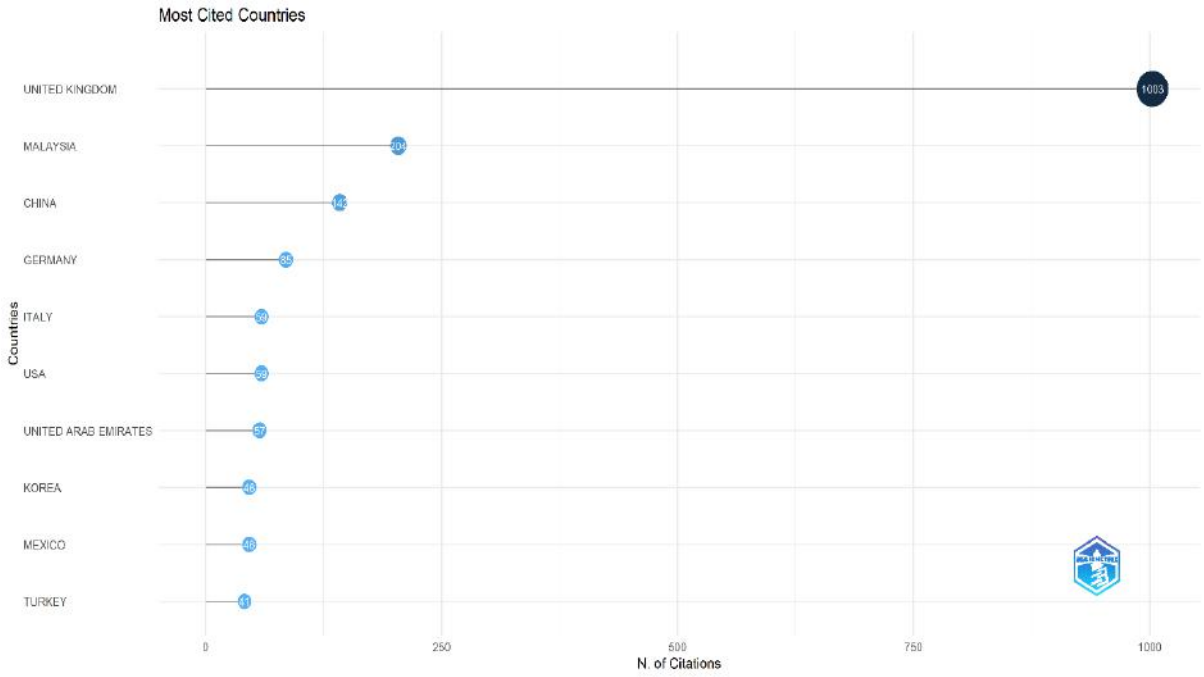
Each word's magnitude in a word cloud, a visual representation of text data, indicates how common or significant the term is in the dataset. It is often used to highlight the terms in a body of work that are the most notable. This data indicates that the term "metaverse" was most commonly used, followed by "virtual reality" in terms of frequency.

Countries having more document



Source: Vosviewer **Figure 4** – countries with more documents

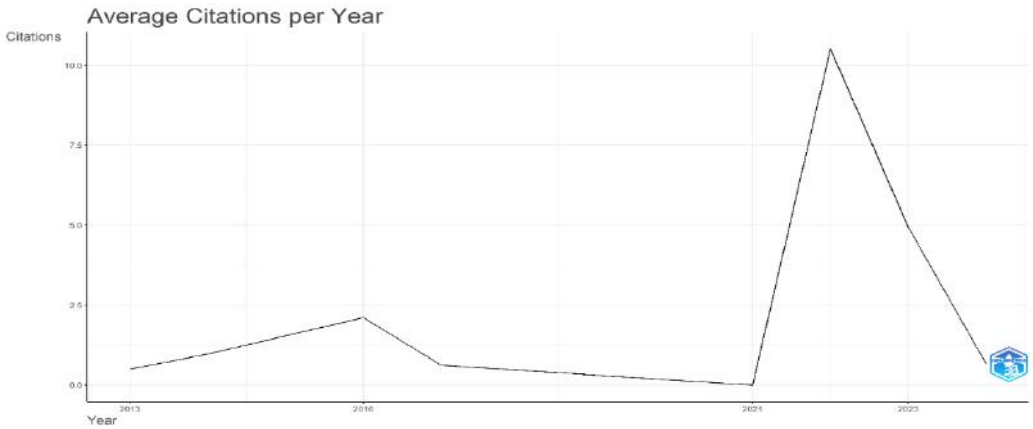
In this map, bibliometric networks is shown of countries having more documents relationg to the topic "role of metaverse in employee training" and also showing the collaboration of countries. Thus, the study's results indicate that India and United states having 44 documents that is highest no. of documents and after that UK have 38 no. of documents, Australia have 15 no. of documents and france have 11 no. of documents and so on.



Source: Biblioshiny

Figure 5 – most cited countries

Biblioshiny was used to build this map, which displays the top 10 countries with the most citations. Thus, with 1003 citations, the United Kingdom has the largest number in this graph. Following Malaysia have 204 citation and China with 142 citations, Germany with 85 citations, Italy and United States with 59 citations, the United Arab Emirates with 57 citations, Korea and Mexico with 46 citations, and Turkey with 41 citations.



Source: Biblioshiny

Figure 6 – average citation per yer

This graph illustrates the average cited time between 2013 and April 29, 2024. Thus, we can observe that starting in 2013, the graph increases until 2016, at which point citations start to decline until 2021. Starting in 2021, citations continue to rise, reaching their peak in 2022, and then declining after that.

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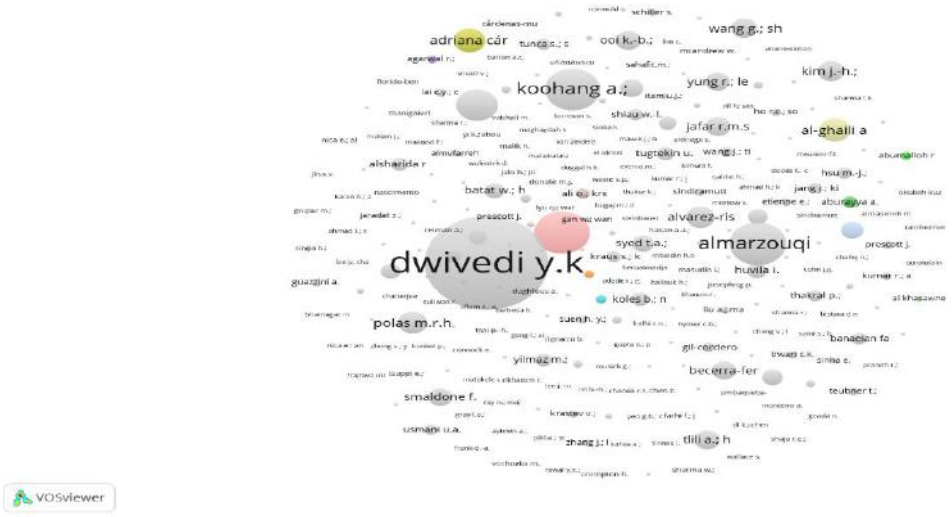
AUTHORS HAVING MORE CITATION

This map showing the authors citation that which author have more citation. In this big circle showing highest citation. So in this map we can see that dwivedi y.k have the highest citation.
After that Almarzouqi have more citation and after that koohang have more citation and so on.



Source: Vosviewer

Figure 7 – Author with highest citation

Table II – Journal having more citation

Serial no.	Source	document	citation
1	International journal of information management	2	686
2	Ieee access	3	188
3	Journal of computer information systems	3	165
4	Computers and education: artificial intelligence	2	145
5	Telematics and informatics	2	78
6	Journal of open innovation: technology, market and complexity	2	74
7	Technology in society	3	42
8	Sustainability (Switzerland)	5	40
9	Service industries journal	2	38
10	Human resource management review	2	25

Source: Vosviewer

This table showing top 10 journals that are having higher no. of citation. And in this "International journal of information management" with 2 documents have 686 citations. And then Ieee access with 3 documents have 188 citations. After that journal of computer information systems with 3 documents have 165 citations. The maximum citation signifies the most relevant journal on the theme of research.

6. FUTURE RESEARCH DIRECTIONS:

Research on the Metaverse's involvement in employee training is a developing field with a lot of room for growth. Several avenues for further research can be suggested based on the results of this bibliometric investigation. Additional research should be done on the psychological and social effects of immersive training environments on staff members. Future research may examine problems with student motivation, social interaction, virtual presence, and possible drawbacks including isolation or virtual weariness. Research ought to look into how developments like artificial intelligence (AI), machine learning, and improved virtual reality interfaces might be incorporated into training curricula as Metaverse technologies continue to expand. Research may concentrate on how these technologies improve training modules' efficacy, customisation, and engagement. Cross-cultural research can offer insightful information about how cultural variations affect the efficacy and acceptability of Metaverse-based training, especially in light of the worldwide

reach of many enterprises. Training programs that are sensitive to cultural differences could be developed with the help of such study.

7. CONCLUSION:

As a result of offering immersive, captivating, and productive learning experiences, the Metaverse has a great deal of promise to transform employee training. Together, academics and industry professionals must tackle the obstacles and realize the full potential of this cutting-edge technology as research continues to advance. The significance of the Metaverse as a powerful instrument for improving employee training was highlighted by the analysis, which also showed a sharp increase in scholarly interest. Advances in technology and an increased awareness of the potential advantages of immersive learning environments are driving the volume of publications and citations, which point to a strong and rising body of knowledge. The knowledge gained from this bibliometric analysis can be applied to future research projects, directing the continuous investigation and incorporation of the Metaverse into staff training. Even with the encouraging results, this analysis also identifies a number of areas that still need research. Future studies should concentrate on sector-specific applications, comparison evaluations with traditional training approaches, and longitudinal studies to evaluate long-term consequences. Furthermore, resolving issues of inclusivity, accessibility, and ethics will be critical to the success and broad adoption of training programs based in the metaverse.

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