

Alang [1] stated that the first thing to ask about the metaverse is whether it is something wanted. He also stated that a great deal of work will be done in the process of providing technological development for the metaverse and that this is not a single product presentation, but much more. For this, he gave the example of the Uber initiative and stated that Uber is not just a car calling application on your phone, but actually, an infrastructure that includes the entire transportation infrastructure. He stated that the company aims to be the technology layer that not only drives rides but also drives bicycles, scooters, public transport, and ultimately autonomous cars. But Uber sold its autonomous car division after it became clear that solving self-driving is a much more difficult problem than anyone knows.

Shotton et al.[19] stated that the ability to explore, integrate and reuse relevant scientific outputs from previous studies is critical for innovative research [19]. He emphasized the importance of information regulation to shape the future of societies and stated that information has become the most important resource for the future of late modern societies [17]. With the processing of information in the right hands, a strategy can emerge for institutions, countries, and businesses. Rotolo et al. [15] said that Conventional tools of strategic intelligence include science and technology foresight, innovation policy evaluation, and technology assessment. Thanks to the fields of bibliometry or scientometrics, it can be used for common science and technology assessment to see the outputs of policies and activities carried out in certain periods in such strategic associations. Metaverse is one of the most up-to-date technological developments in the rapidly transforming world in this regard. It is valuable to observe and follow the equivalent of the discussions in this direction in the literature.

Zuckerberg betting that it will be the next big computing platform for the metaverse, after the rise of smartphones and the mobile web [8]. Will this expectation come true, as in the case of Uber, and what kind of discussions have been made in the literature in this direction from past to present. At this point, the bibliometric field provides good tools for exploring the texture of work done in a particular field or topic. Bibliometric studies are important studies to define a particular field and to better understand the researcher's texture in that field. In this way, researchers working in the field can have information and ideas about the development of the literature and researchers who have come to the fore in the field. Likewise, there are important journals that stand out in certain fields. The motivation for this study is the lack of a bibliometric study in the literature on a topic that has been so popular recently. It is thought that it will be a guide for researchers and will provide information about important congresses, journals, and institutions of the field.

II. METHOD

This study, publications in the field of "metaverse", which are in the Web of Science database and scanned by SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI indexes, were evaluated. Data were collected on 26.11.2021. The search keywords used in the study is as follows: (ti="metaverse" or ak="metaverse" or kp="metaverse")

93 documents were accessed in the Web of Science database, 1560 different sources and a total of 1855 different references were used in 93 documents. It has been seen that related studies have been carried out by 155 different authors,

29 different countries, and 96 different organizations. The research questions that the study focuses on are as follows:

- What are the distribution, languages and document types of documents produced on Metaverse by years?
- What is the situation of researchers, institutions and countries doing intensive research on the Metaverse?
- What is the bibliometric trends according to published documents types such as book chapters, proceedings and articles on the Metaverse?
- What are the journals that publish the most on Metaverse, the publishers that come to the fore, and the congresses that stand out in the field?
- What are the most frequently cited works on Metaverse?
- What are the generally accepted debates on the Metaverse and what is the general trends of the topics discussed in the historical process from past to present?

Vosviewer program was used for bibliometric analysis in the study. VOSviewer is the software package for analysing and visualising large bibliographic datasets. VOSViewer applies its own algorithm that is a modularity-based clustering technique, which is similar to the multidimensional scaling and is based on the smart local moving algorithm [26,27].

III. DISCUSSION AND FINDINGS

The findings obtained from the bibliometric analysis carried out in the study will be carried out in the form of general view, focus on book chapters, focus on proceedings, focus on the article, and finally content analysis for all documents. These contents are presented under the headings in order below.

A. General View

The number of documents accessed via Web of Science is 93. These publications in total times cited:281 and average per item:3.02 and our h-index value is 9. These documents were produced by 155 different researchers. When sorted these documents according to their types; articles (f:42), proceedings papers (f:38), book chapters (f:14). In the Web of Science environment, a document can be included in the same class as both articles and book chapters as a document type.

When evaluated document productivity by years; 2021(f:6), 2020 (f:5),2019 (f:3), 2018 (f:5), 2017 (f:5), 2016 (f:6),2015 (f:12), 2014 (f:2),2013 (f:6),2012 (f:5), 2011 (f:6),2010 (f:10),2009 (f:9), 2008 (f:7), 2007 (f:2), 2006 (f:1), 2000 (f:1), 1996 (f:1), 1995 (f:1). Publishing organizations that have produced a minimum of two documents when sorted according to Publishers; Springer Nature (f:20), IEEE (f:15), IGI Global (f:7), Elsevier (f:6), Assoc Computing Machinery (f:5), MDPI (f:3), Kassel Univ Press Gmbh (f:2), Sage (f:2), Taylor & Francis (f:2).

When ranked the obtained works according to the research area; computer science (f:42), engineering (f:17), education educational research (f:8), psychology (f:8), art (f:7), business economics (f:7), information science library science (f:5), science technology other topics (f:5), communication (f:4), cultural studies (f:4), imaging science photographic technology (f:3), public administration (f:3), religion (f:3), telecommunications (f:3), arts humanities other

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topics (f:2), chemistry (f:2), geography (f:2), philosophy (f:2), environmental sciences ecology (f: 1), government law (f:1), health care sciences services (f:1), instruments instrumentation (f:1), music (f:1), social issues (f:1), social sciences other topics (f:1), sociology (f:1).

When the studies are evaluated according to the subject area, it is seen that they concentrate on computer science and engineering (f:17). However, when the research area texture is evaluated, it can be seen that the studies on the metaverse find application in many different fields, from the field of health to the field of education, from the field of culture to the field of environmental sciences. It is seen that metaverse studies are carried out on psychology, religion, philosophy, and social issues due to human-computer interaction.

When ranked the works according to the languages in which they were produced; English (f:87), Spanish (f:4), Portuguese (f:1), Russian (f:1). The countries that come to the fore in this productivity are respectively; USA (f:19), Japan (f:10), Brazil (f:8), South Korea (f:8), England (f:7), Turkey (f:7), Spain (f:5), Belgium (f:3), Colombia (f:3), France (f:3), Sweden (f:3). The data of book chapters, proceedings, and articles are presented below, respectively. While South Korea has come to the forefront in studies and the expansion of countries, South Korea is behind the USA and Japan in terms of the metaverse. In addition, although recently, both Facebook manager Zuckerberg's statement [2,8,10], it has been seen that the subject that have discussed extensively in daily life has been evaluated by few studies and researchers in the literature. It is thought that the literature on metaverse will be enriched after the concept is overlapped with the words augmented reality and virtual reality, and there is more work in the literature in this direction, the definition of a general concept as an umbrella term as metaverse, and the discourses of important companies and some states are developing policies.

B. Focus on Book Chapters

Distribution of book chapter studies on Metaverse by years; 2017 (f:1), 2015 (f:7), 2013 (f:3), 2012 (f:1), 2010 (f:1), 2009 (f:1). A total of 14 book chapter studies were carried out and related studies received 25 citations in total. All of the book section studies have been published in the English Language. Book chapters' publishers are IGI Global (f:7), Springer Nature (f:6), Ashgate Publishing Ltd (f:1). Book Series Titles are Advances In Educational Technologies And Instructional Design Book Series (f:7), Human-Computer Interaction Series (f:1), New Directions In Planning Theory (f:1), Smart Computing and Intelligence (f:1).

Researchers who carried out the work of the book section; Backes L (f:7), Schlemmer E (f:7), Calongne C (f:1), Dede CJ (f:1), Devisch O (f:1), Huvila I (f:1), Jacobson J (f:1), Lombardi J (f:1), Lombardi M (f:1), Power D (f:1), Richards J (f:1), Sheehy P (f:1), Sonvilla-weiss S (f:1), Sonvillaweiss S (f:1), Stricker A (f:1), Teigland R (f:1). Distribution of researchers who made book chapters to countries; Brazil (f:7), USA (f:3), Sweden (f:2), Belgium (f:1), Finland (f:1), Norway (f:1). It was seen that Brazil came to the fore in the book chapters. The reason for this issue is the study of the book Learning in Metaverses: Co-Existing in Real Virtuality: Co-Existing in Real Virtuality [16], edited by Eliane Schlemmer in the Metaverse field in the relevant country.

The institutions of the researchers who carried out the book section are as follows; Centro Universitario La Salle

(f:7), Universidade Do Vale Do Rio Dos Sinos Unisinos (f:7), Uppsala University (f:2), Aalto University (f:1), Colorado Technology University (f:1), Consulting Services for Education (f:1), Duke University (f:1), Enterprise VR (f:1), Harvard University (f:1), PHL University College in Belgium (f:1), Stockholm School of Economics (f:1), University of Agder (f:1). In addition, the distribution of book chapter studies according to research areas is as follows: psychology (f:8), communication (f:3), cultural studies (f: 3), computer science (f:2), art (f:1), education educational (f:1), geography (f:1), public administration (f:1).

C. Focus on Proceedings

The progress of the papers by years is as follows: 2019 (f:2), 2018 (f:3), 2016 (f:4), 2015 (f:4), 2014 (f:2), 2013 (f:2), 2012 (f:3), 2011 (f:4), 2010 (f:5), 2009 (f:4), 2008, 2007 (f:1), 2006 (f:1), 2000 (f:1). When this course is evaluated, there is no significant jump. It has been seen that 3-4 papers are presented in the related congresses a year. Facebook and South Korea's serious releases on the metaverse and their sharing of their strategic action plans with the public promises hope in the number of papers produced in the coming years and even in the planning of new congresses related to the metaverse.

When the papers produced on Metaverse are evaluated; Japan (f:10), USA (f:7), Turkey (f:4), England (f:3), Austria (f:2), France (f:2), Netherlands (f:2), South Korea (f:2), Spain (f:2). When the papers are evaluated according to the institutions where they are produced (minimum 2), the following table is encountered; Sabanci University (f:4), Clarkson University (f:3), Ritsumeikan University (f:3), Suzuka College (f:3), Gifu College (f:2) Graz University of Technology (f:2), Nagaoka University of Technology (f:2), Tsuyama College (f:2), University of La Reunion (f:2) There are not very serious differences between countries and related countries.

The prominent researchers in the paper are as follows. Ayiter E (f:4), Barry DM (f:4), Fukumura Y (f:4), Kanematsu H (f:4), Ogawa N (f:4 Kobayashi T (f:3), Thawonmas R (f:3), Conruyt N (f:2), Dharmawansa A (f:2), Sebastien D (f:2), Shirai T (f:2), Yajima K (f:2) When both institutions and researchers are evaluated, it is thought that the relevant data will be a reference for researchers who want to do post-doctoral research on the metaverse, who want to do their postgraduate education in the metaverse field, and who are looking for an institution.

When the papers are sorted according to the research areas in which they are located, the following view is encountered; computer science (f:35), engineering (f:12), imaging science photographic technology (f:3), business economics (f:2), education educational research (f:2), telecommunications (f:2), chemistry (f:1), health care sciences services (f:1), information science library science (f:1), philosophy (f:1), public administration (f:1), religion (f:1), science technology other topics (f:1), social issues (f:1). It can be stated that the trend in the field of proceedings research is similar to the general trend.

The conferences that come to the fore in the field for papers can be expressed as follows; International Conference on Cyberworlds, International Conference on Entertainment Computing, Biennial Pan Ocean Remote Sensing Conference Porsec, International Conference on Entertainment Computing, International Conference on E-Commerce and

with blockchain technology, from the day the novel was written.

Fig. 1. Keyword Density, Overlay and Network Visualizations about Metaverse

The video game second life, released by Linden Lab in 2003, created a virtual world where users can navigate by building their structures [22]. In the literature, it has been seen that intensive studies have been made on Second Life. Roblox, a children's video game released in 2006, has recently evolved into an immersive world where players can design and sell their creations, from avatar costumes to their own interactive experiences [14]. Sci-fi "metaverse" concepts are slowly becoming reality as products like Fortnite, Minecraft, and Roblox bring immersive social experiences to hundreds of millions of people and blur the lines between games and social networks [24].

Sweeney [24] foundational principles and technologies are applied computing, computing methodologies, and networks and on the other hand computer systems organization, real-time systems, human-centered computing, theory of computing for the metaverse. Siva et al. (2018), to create a virtual environment, use of intelligent avatars and holographic projects, can simulate a real-world classroom scenario.

IV. CONCLUSION AND RECOMMENDATIONS

It seems that the world of the Metaverse is now clearly coming. This world can harbor both benefits and harms as expected. Just as social media has good and bad sides, the metaverse also has good and bad sides. The hotspot is the usage area. Of course, these issues will be discussed in many scientific studies.

Despite the increasing interest of researchers on the subject of the metaverse, there are few explanatory and comprehensive studies on the subject of a metaverse in the literature. However, it is thought that this situation will increase especially in recent years with the developments in blockchain technology, sensor technology, the advancement of augmented and virtual reality technologies, and the recent statements of South Korea and Facebook founder Zuckerberg.

Facebook is not the only tech company that is invested in exploring a 3D virtual reality where people interact with others using avatars of themselves. Video games such as Roblox and Fortnite are already popular among Gen Z, where they create and interact with each other within their universe [10]. And also they believe this will be the successor to the mobile internet [2]. It can be stated that many different companies may enter the field in this future, enterprises operating in technologically parallel or related sectors are only 3-5 steps ahead of the race at this point, but the sector is fresh and appetizing for entrepreneurs at this point.

Metaverse is not a single product that a company can handle alone. Just like the internet, the metaverse will exist with or without Facebook. It will also not be built overnight. Many of these products will only be fully realized in the next 15-20 years. This situation strengthens the possibility that the subjects will be evaluated from many different aspects in the literature in this development process. This shows the importance of Metaverse and the valuable analysis of the studies carried out in this direction in the literature. It is thought that it will be beneficial for the researchers to compare the data obtained from different databases with the data obtained, and to present a texture analysis on the metaverse periodically, in terms of the development of the field and for the researchers to see the general view.

Facebook is considering recruiting 10,000 new teammates across the EU at Facebook and putting its European presence at the center of plans to help build the metaverse [3] in fact,

this situation confronts us with the possibility of many big IT companies entering this field in terms of the metaverse. and it can be seen that it will create new employment areas.

Of course, at this point, it is considered beneficial for higher education institutions to include topics that will be related to the metaverse in some way, such as virtual reality, augmented reality, simulation technology, blockchain technology. In this way, higher education institutions will be able to support and meet the demands of the sector in terms of trained human resources that the sector needs.

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