A Bibliometric Analysis of Virtual Influencer

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ABSTRACT

In the current digital era, Virtual Influencers have become a trending phenomenon in social media. This research utilizes bibliometric analysis to explore the developments in Virtual Influencer-related studies, with a focus on the involvement of Artificial Intelligence (AI) technology in their creation. The study also identifies the most influential works, active researchers, and journals at the forefront of publication. Additionally, it unveils the evolution of the concept of virtual influencers from an AI perspective. The research aims to analyze how AI influences marketing strategies through virtual influencers, enabling the optimization of AI-based virtual influencer usage in creating authentic and relevant experiences for today's digital consumers. This study enhances our understanding of AI's role in shaping the future of influencer marketing and opens opportunities for further innovation in virtual influencer research. The research also provides insights into virtual influencers and their role in shaping social media trends and consumer culture transformation in the digital era.

Keywords: Virtual Influencer, Bibliometric, Artificial Intelligence

1. INTRODUCTION

People with a sizable following on social media are commonly referred to as influencers [1]. Real people who share their stories and thoughts on social media in order to build and grow a following are known as common social media influencers. Influencers don't necessarily need to be genuine people, though. Virtual influencers are social media personalities that are created by computers and have a large following [2]. Their design is inextricably linked to artificial intelligence technologies. Not only are local and global cultures being structurally, methodically, and psychologically altered by artificial intelligence, but so is the concept of what it means to be human or to be viewed as human [3]. James Williams explains how digital technologies manipulate human impulses by operating at a neurological level [4]. According to Brett Frischmann and Evan Selinger's analysis, artificial intelligence (AI) will re-engineer humans to be computable rather than replace them [5].

Virtual influencers, however, are distinguished from real-world influencers by a number of factors. The degree of anthropomorphism is one of the most noticeable and fascinating. In other words, virtual characters resemble humans in a wide range of ways; some are clearly computer graphics, while others have a realistic appearance and might easily be mistaken for actual people. There are around 125 active virtual influencers on Instagram alone [2]. Virtual influencers can be digitally modified real people or a digital composite of a genuine human head and body created with computer graphics [6].

For many, virtual influencers are the future of advertising, fashion and commerce [7]. However, although virtual influencers are trending in this digital era, there is still no research that confirms that virtual influencers can thrive like real-life celebrities and that their presence can truly replace real-life celebrities in promoting products and brands [8]. Virtual influencers can minimize human error as they allow brands to exercise more control over their influencers' content [9]. As a

newly emerging trend, it is still uncertain whether virtual influencers can replace real influencers in promoting a product or brand [8].

Based on the description above, this study aims to (1) map virtual influencer research trends, (2) map the forms of collaboration between authors, and (3) examine the development of virtual influencer trends in social media using bibliometric analysis methods. This can be seen in terms of authors, publishers, and the number of citations of journal articles.

2. METHODS

2.1 Data collection and Data Cleansing

The database source used to obtain data is *Google Scholar* through the Publish or Perish (PoP) application for the data extract process. PoP has a data filter feature so that it can only display journals.
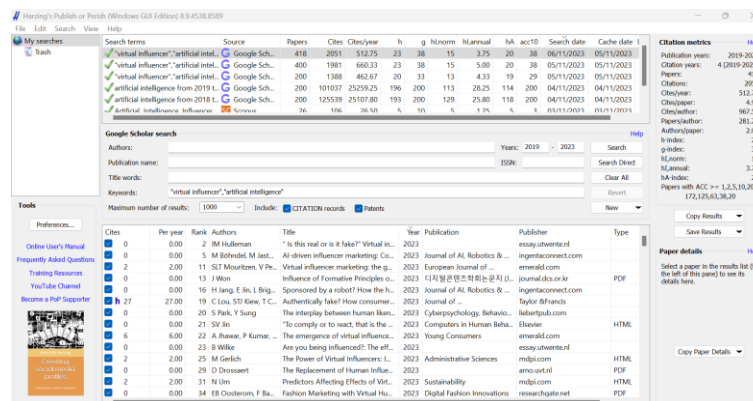

Figure 1. Metadata Search Results Using Publish or Perish

Estimated data collection is carried out with a time span of 2019 to 2023, the *keywords* used for the search are *"virtual influencer"*, *"artificial intelligence"*. The use of double quotes serves to find the full search result phrase (Harzing 2016). The two keyword phrases are put together to find the relationship between *virtual influencers* and *artificial intelligence,* thus the search results will not deviate from the desired keywords. The *title words* section was left blank in the search because sometimes there are articles that do not include words in the article title, but are available in the keywords.

To maximize the number of data searches, the *maximum number of results* can be filled in with the desired number of journals. After searching according to the predetermined criteria, 418 journals were obtained, the data obtained included the number of citations, author names, journal titles, years of publication, and publishers. Visualization of search criteria and results can be seen in Figure 1. After the data is obtained, then the data cleansing process is carried out, where the data used for study are only those in English and Indonesian, so that the results of the data cleansing process obtained 299 relevant journals.

2.2 Data Analysis and Mapping

Based on the data that has been collected, the next stage to find out the development and mapping can be done using the VOSviwer application. VOSviwer displays visualizations of the data obtained in the form of *Network Visulization, Overlay Visualization,* and *Density Visualization.*

Based on the visualization results displayed, it can be seen that various information about the latest research, the most research and the least research. In addition to displaying visualization of mapping results, VOSviewer also displays cluster information along with the items in it.

3. RESULTS AND DISCUSSION

Development of Virtual Influencer Research

Based on the results obtained from the *Google Scholar* database using Publish or Perish, research on virtual influencers began to appear in 2019, with 12 journals.

From 2019 to 2023, research on virtual influencers continues to grow. Interestingly, in 2023 the number of virtual influencer journals grew rapidly with 141 studies, published in scientific journals. This significant increase is due to the trend of virtual influencers in social media and their potential influence in the future. Based on the discussion above, the first research objective is to determine the trend of research on virtual influencers, which continues to increase from 2019 to 2023. The development of research research on virtual influencer can be seen in Figure 2.
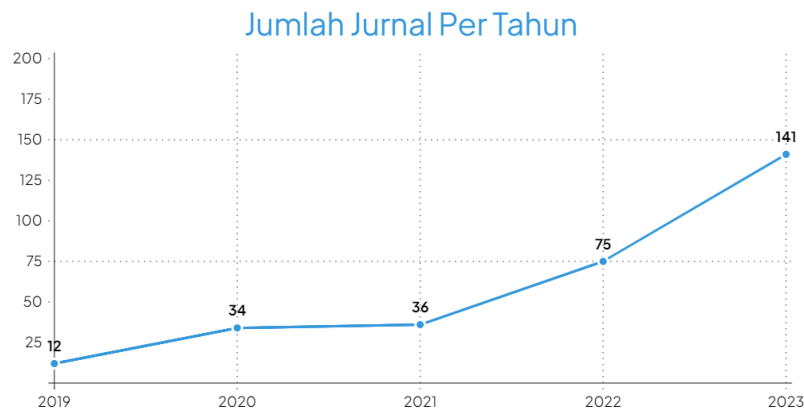

Figure 2. Virtual Influencer Research Progress Chart

Publisher Analysis

Of the 299 studies obtained from the *Google Scholar* database, there are major publishers who publish many studies on virtual influencers. Globally, some of the publishers who publish these articles include Taylor & Francis, Elsevier, and Spinger, which occupy the top 3 positions. The ranking order of the top 10 publishers in detail can be seen in table 1.

Table 1. Top 10 Journal Publishers

No	Name of Publisher	Total Article
1	Taylor & Francis	25
2	Elsevier	19
3	Springer	16
4	Emerald	14
5	ProQuest	11
6	Sage Publishing	11
7	ACM DL	7
8	MDPI	7
9	SSRN	7
10	IEEE	6

Table 1 shows the top 10 publishers that publish studies on virtual influencers. From the table, it can be seen that Taylor & Francis published 25 journals, followed by Elsevier 19 journals, Springer 16 journals. In fourth place is Emerald which has 14 journals, followed by ProQuest and

Sage Publishing with 11 journals each, ACM DL, MDPI, and SSRN with 7 journals each, and finally IEEE with 6 journals.

Researcher and Citation Analysis

Mapping virtual influencer research using VOSviewer can identify the most productive researchers. In VOSviewer, the *create a map based on bibliographic data* option is used. The data source used is in the form of RIS data type. In the *Counting method* option using *Full counting*. The criteria for the *maximum number of authors per document* is set at 15, and the *minimum number of documents of an author* is 2, the result is 62 researchers who can meet the criteria.

Selected	Author	Documents ✔	Total link strength
✔	lee, h	5	6
✔	yang, j	4	6
✔	lee, s	4	3
✔	chuenterawong, p	3	6
✔	li, s	3	4
✔	□□□	3	3
✔	□□□	3	3
✔	kushwaha, bp	3	2
✔	sands, s	3	2
✔	kim, d	3	1
✔	zhou, x	3	0
✔	eastin, ms	2	4
✔	ham, j	2	4
✔	kirk, ub	2	4
✔	maindal, n	2	4
✔	obel, c	2	4
✔	chen, x	2	3
✔	hofeditz, l	2	3
✔	mirbabaie, m	2	3
✔	schmäh, m	2	3

Figure 3. The Search for the Most Productive Researcher

Based on Figure 3, of the 69 researchers, the one who published the most virtual influencer research was Heejae Lee (lee, h) from Sogang University, South Korea with 5 documents. The next order is J.yang, and S.lee with 4 documents each, as well as several other authors. Figure 3 also shows that H.lee, J.yang, P.Chuenterawong collaborated with 6 other researchers. This result also answers the second research objective, namely the form of collaboration between authors.

An overview of the correlation mapping of these researchers is shown in Figure 4. While other researchers who are not correlated are not shown in the figure.
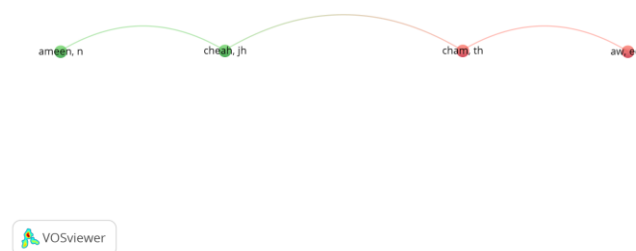

Figure 4. Researcher Mapping

However, the most cited journal article is *An emerging theory of avatar marketing*, written by F.Miao, IV.Kozlenkova, H.Wang, T.Xie, and RW.Palmatier in 2022. With a total number of citations of 161. The journal was published by the Journal of Marketing by Sage Publishing. The second most cited journal article was written by J.Arsenyan, and A.Mirowska with the title *Almost human? A comparative case study on the social media presence of virtual influencers*. The study was cited 131 times, and published by the International Journal of Human-Computer Studies, with Elsevier Publishers in 2021.

Based on the explanation above, it has answered the research question as well as the third objective of this study, namely the author who is most productive in researching virtual influencers is Heejae Lee or abbreviated as "lee, h". However, the article with the highest number of citations was *An emerging theory of avatar marketing*, F.Miao, IV.Kozlenkova, H.Wang, T.Xie, and RW.Palmatier in 2022. Then, the publisher that published the most journal articles on the topic of virtual influencers was Taylor & Francis.

Analysis of Mapping Results

The results of mapping the development of virtual influencer research using VOSviewer are carried out using the *create a map based on text data* option.

Furthermore, data extracts are taken from titles and abstracts, with *counting methods* in the form of *Binary counting*. The *minimum number of occurrences of a term* selected is 5, and the *number of terms* to be selected is 100. The selection of the value of 100 is based on the maximum number of items there are 100, while the default value is 60% (60 items). Therefore, the researcher set the number above the default value and below the maximum value.
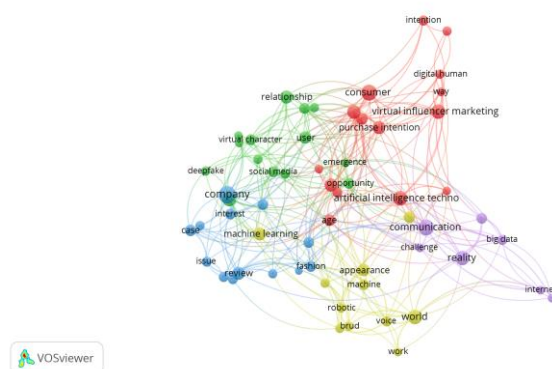

Figure 5. Social Media Marketing Research Mapping Results with Network Visualization Mode

The mapping results obtained 60 items grouped into 5 clusters. Cluster 1 has 15 items, consisting of: *age, artificial intelligence technology, concept, consumer, digital human, era, influence, intention, life, power, purchase intention, uncanny valley, virtual influencer endorse, virtual influencer marketing, way*. Cluster 2 has 14 items, consisting of: *addition, artificial intelligence influencer, deepfake, emergence, image, opportunity, relationship, rise, risk, scholar, social media, trust, user, virtual character*. Cluster 3 has 13 items, including: *area, article, case, company, creation, fashion, first virtual influencer, interest, issue, paper, review, virtual, virtual influencer lil miquela*. Furthermore, cluster 4 has 11 items, namely: *appearance, application, brud, fact, machine, machine learning, robotic, society, voice, work, world*. Finally, cluster 5 with 7 items, namely: *big data, challenge, communication, internet, reality, thing, virtual reality*.

Each cluster contains a different number of subjects. This means that research on virtual influencers varies greatly. Of the five clusters, cluster 1 and cluster 2 have the highest number of items. This also indicates that the themes in these clusters receive a lot of attention by researchers.

Figure 5 also shows some of the strongest links to virtual influencers, including: *purchase intention, trust, company, consumer, era, and communication*. Meanwhile, it is also possible to identify links with weak connections, which are indicated by small circles. This also shows that there is still not much research in this field, so it has the opportunity as a new form of research. Some of the links that are not strongly related include *power, virtual influencer endorse, intention, addition, deepfake, scholar, first virtual influencer, virtual, work, artificial intelligence influencer, and uncanny valley*.

The next mapping result is the display of mapping results in the form of *Overlay Visualization* which shows a history of research that has been done from previous years. This display can be seen in Figure 6.
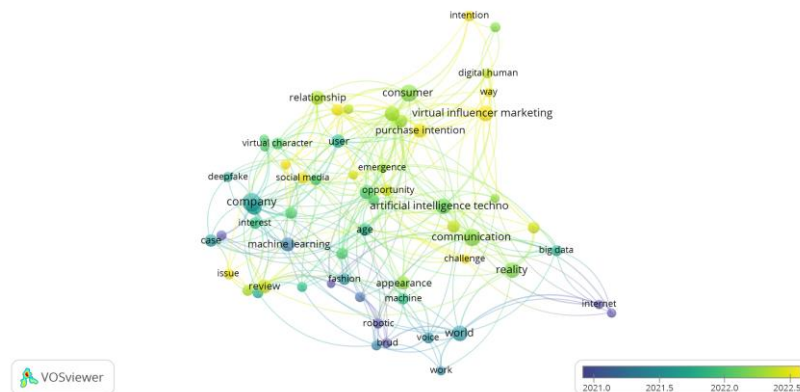

Figure 6. Mapping Results with Overlay Visualization Mode

Figure 6 is a visualization with *Overlay Visualization* mode. From this picture, information can be obtained about the latest research conducted in relation to virtual influencers. The research ranges from 2021 to 2022, relating to *artificial intelligence, influnce, virtual influencers, and virtual influencer marketing*.
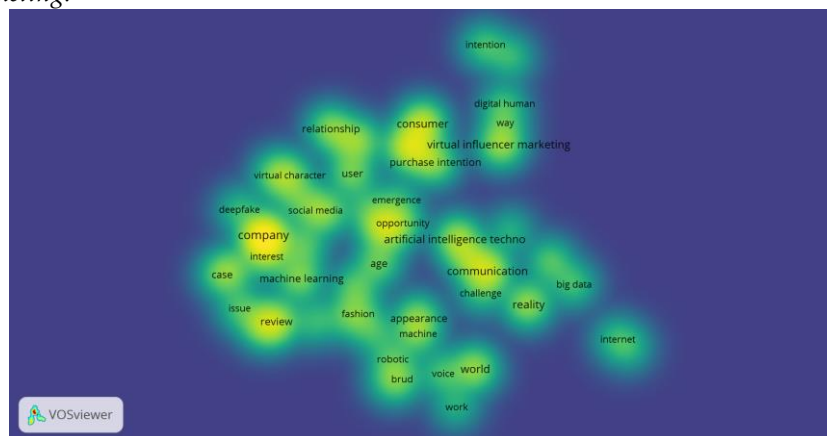

Figure 7. Mapping Results with Density Visualization Mode

Next is the visualization in the form of *Density Visualization* which serves to explain the density or density of research topics. The brighter the color in an area, the more the topic has been researched. On the other hand, the fainter the color, the less researched the topic is.

Figure 7 is a visualization with *Density Visualization* mode showing research that has many links with virtual influencers are *company, consumer, virtual influencer marketing, review, communication, influence*. This can be seen from the yellow color which is brighter than the others. The color also shows that the brighter the color, the more research in that field. Likewise, if the color is not lit, it shows that there is still little research being done.

Thus, it can be seen that there are still few studies around *uncany valley*, *digital human*, *vitual reality*, *deepfake*. This means that there are still opportunities for new research in the future based on these items.

CONCLUSION

Looking at the results of the research that has been conducted, it explains the first goal, that the utilization of virtual influencers for broader marketing of a product. The second objective has to do with cooperation between brands to market their products. The third objective in the research has found the article that has the highest number of citations is *An emerging theory of avatar marketing*, written by F.Miao, IV.Kozlenkova, H.Wang, T.Xie, and RW.Palmatier in 2022.

Based on the analysis, it is known that research that has many links with virtual influencers is *company*, *consumer*, *virtual influencer marketing*, *review*, *communication*, *influence*. In addition, there are still few studies about virtual influencers consisting of *uncany valley*, *digital human*, *vitual reality*, *deepfake*. This means that there is still the possibility of opening up various other research in the future. The implications of this research show that the importance of utilizing virtual influencers for marketing utilization of a product. With the use of virtual influencers, brands can control their influencers and minimize mistakes.

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