A BIBLIOMETRIC ANALYSIS OF CHATBOT IMPLEMENTATION

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ABSTRACT

The use of artificial intelligence (AI)-based technologies has become increasingly widespread. This includes chatbots. Chatbots are used in various sectors including education, health, and technology. This study aims to analyze research related to chatbots during the 2022-2024 period. A bibliometric analysis approach was used. Collection of articles from Google Scholar using Harzing's Publish or Perish software and analysis using VOSviewer software. The word "chatbot" was used as a keyword in the search for articles. The results obtained were 999 relevant publications with 30705 citations and 15352 cites/years discussing chatbots. The results of the analysis showed that there are nine main clusters related to chatbots. This includes research on chatbot use during the Covid-19 pandemic. This study also provides information on research topics that have not been widely discussed, such as GPT, educational chatbots, and medical chatbots. This can be used as a reference by other researchers to discuss this topic in further research.

Keywords: artificial intelligence, chatbot, technology, bibliometric analysis, GPT

INTRODUCTION

The use of artificial intelligence (AI)-based technologies is becoming increasingly widespread. The use of this technology has had a major impact on various aspects of life. One of these is how humans interact with machines. Chatbots are AI-based applications that are often used today. Utilizing this chatbot is expected to make it easier for humans to overcome the difficulties they face. Chatbots have been widely used in various sectors such as education, health, and customer service.

Based on data from (Grand View Research, 2023), it is estimated that the global chatbot market in 2022 will be around $ 5,132.8 million and is predicted to continue to grow with an average annual growth rate (CAGR) of around 23.3% from 2023-2030. This increase is based on the need for 24 x 7 customer service and operational cost efficiency. Customer service agent also feel the convenience of using the chatbot. According to a report from (Sweezey, 2019), 64% of customer service agents feel helped by AI chatbots to accelerate the handling of complex problems.

With the increasing use of chatbots, it is also necessary to conduct an in-depth analysis to identify trends in chatbot research. The purpose of this study is to analyze the development of chatbot research. A bibliometric analysis approach was used for data analysis. It is expected that by using this analysis method, a comprehensive picture of the development of chatbot research will be obtained. In addition, the results of this analysis are expected to provide guidance to researchers and practitioners for further research on this topic.

LITERATURE REVIEW
Artificial Intelligence (AI)
Artificial Intelligence (AI) is the ability of a tool or system to adapt to achieve a goal in an environment that affects the behavior of the system (Rozaq, 2019).
Artificial Intelligence (AI) can also be interpreted as a field of computer science that focuses on the development of computer systems that can perform tasks that require human intelligence. The primary goal of AI is to create machines that can learn, plan, solve problems, and adapt to humans (Hatta et al., 2024).

This concept of artificial intelligence has been widely implemented in various fields and has many benefits. For example, in the field of education, GPT Chat can help educators determine the content of learning media according to the theme determined by the educator, so that educators only need to create presentation slides based on the content created from GPT chat (Sudrajat et al., 2023). The application of Artificial Intelligence (AI) such as "Electric Nose" technology, which can distinguish the smell and aroma of food using AI sensors, can also be used to improve food hygiene (Lie et al., 2023).

Chatbot

A chatbot is an artificial intelligence (AI) based program designed to simulate human conversation through text or voice. Using natural language processing (NLP) algorithms, chatbots can understand and respond to user questions automatically, providing the information or services needed. Chatbots can provide real-time services to customers and intelligently simulate communication between a system and its users (Deshpande et al., 2017).

Chatbots can be integrated into various platforms, such as websites and messaging applications, and can function to improve customer service, reduce waiting times, and save operational costs for businesses. The use of chatbots in customer service in Indonesia is increasingly showing a positive trend, especially in various sectors, such as banking, telecommunications, and e-commerce. Based on the research conducted by (Sitanggang et al., 2023), chatbots are considered an effective tool for increasing customer satisfaction by speeding up response times and increasing the relevance of answers given to users. This study states that the use of chatbots can overcome the weaknesses of conventional services, which are often unable to provide a quick response, especially outside working hours. In research conducted by (Sitanggang et al., 2023), chatbots were proven to have a significant impact on customer satisfaction.

METHODOLOGY

This study was conducted using a bibliometric analysis approach. There are two stages carried out in this study. The first stage is to identify a number of articles published in the 2022-2004 period from Google Scholar using Harzing's Publish or Perish software. In the search for journal articles, the keyword chatbot was used. The next stage was to map the relationship pattern, year range, and topic density using VOSviewer. Articles with a minimum number of term concurrencies equal to 10 were selected.

RESULTS AND DISCUSSION

From the results of the bibliometric analysis, 999 publications with 30,705 citations and 15,352.50 cites/years that discussed the topic of chatbots (Figure 1). There were nine main clusters, as shown in Figure 2. Cluster 1 discussed chatbots in general by linking them to various other aspects. The discussion of chatbots is closely related to the system, the effects caused, its implementation, and its relationship to the Covid 19 pandemic.

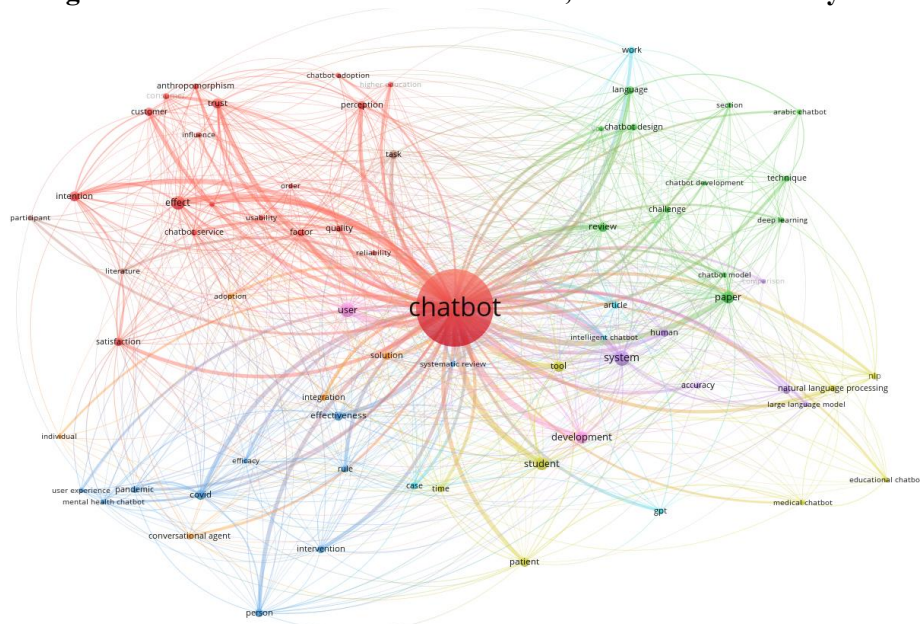**Figure 1. Data on the Number of Journals, Citations and Cites/year**

Figure 2. Visualization of Relationships between Chatbot-Related Topics

The visualization shown in Figure 3 shows the relationship between topics related to research/papers related to the topic of design, techniques, and models of chatbots. Other topics discussed that are also related are deep learning, natural language processing (NLP).
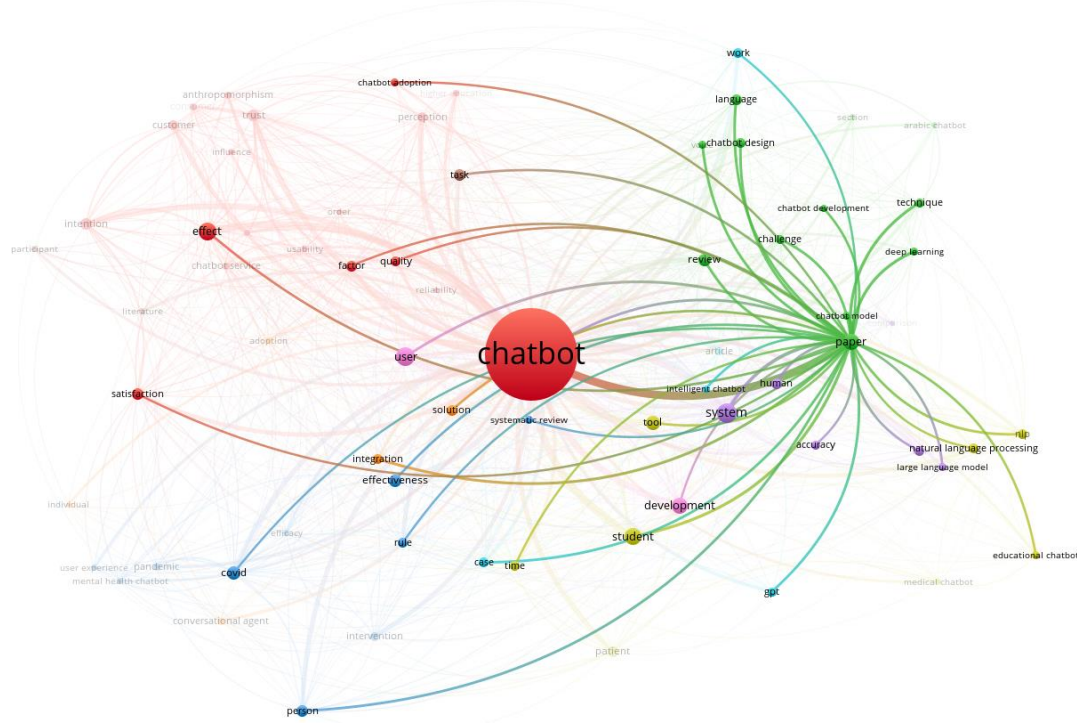
Figure 3. Visualization of the Relationship between Related Topics of the Paper

The visualization in Figure 4 shows the relationship between the Covid-19 topics. The topics discussed highlight the chatbots' mental health, effectiveness, efficacy, and user experience.
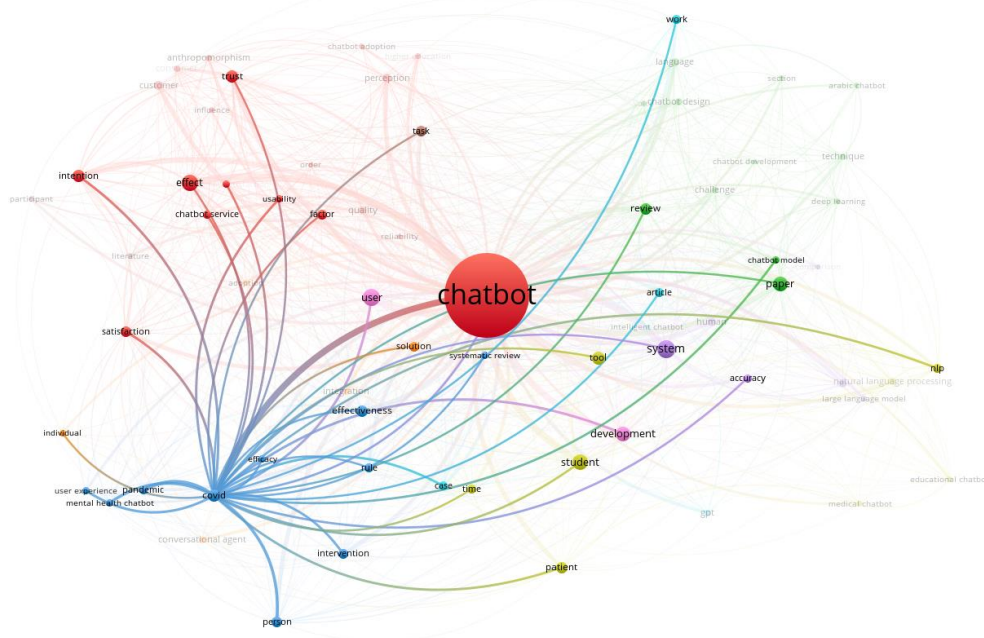

Figure 4. Visualization of the Relationship between Topics Related to Covid-19

The visualization in Figure 5 shows the relationship between student topics. In this relationship, the relationship between the topic and the system, natural language processing, large language models, medical chatbots, and educational chatbots is visible.

Figure 5. Visualization of Relationships between Student-Related Topics

The visualization shown in Figure 6 shows the relationship between the topic system and accuracy, intelligent chatbot, human, development, natural language processing, and large language model.

Figure 6. Visualization of Relationships between System-Related Topics

The visualization in Figure 7 shows the relationship between work topics related to users, systems, development, chatbot design, and customers. However, there has been no research related to work environment, management, and operations.
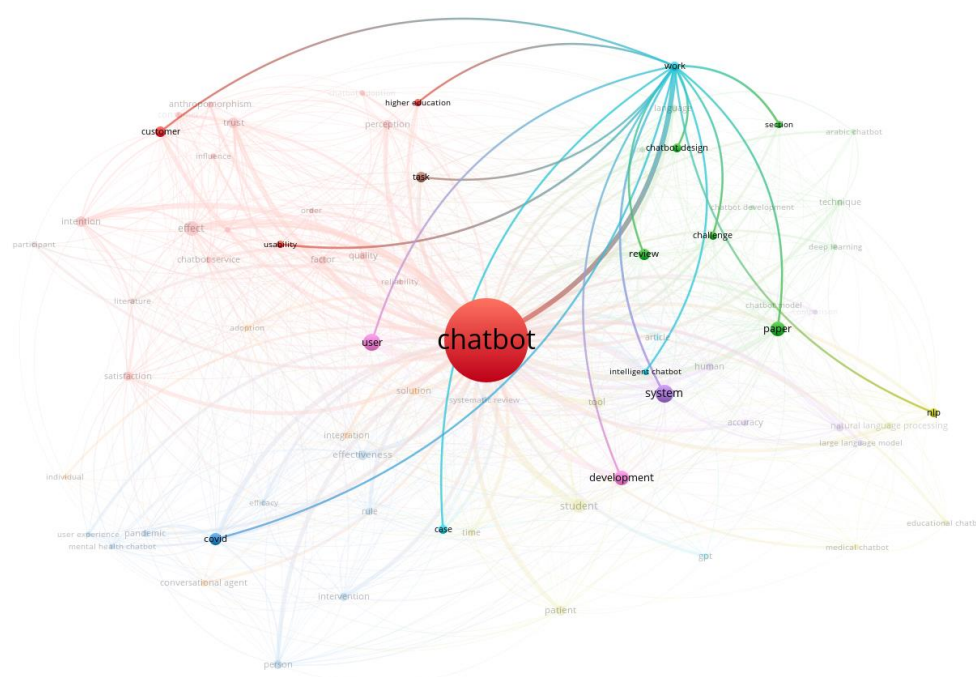
IJEC
International Journal of Economics
https://ejournal.ipinternasional.com/index.php/

Figure 7. Visualization of Relationships between Work-Related Topics

The visualization in Figure 8 shows the relationship between the solution topic and integration, quality, perception, adoption, and quality.
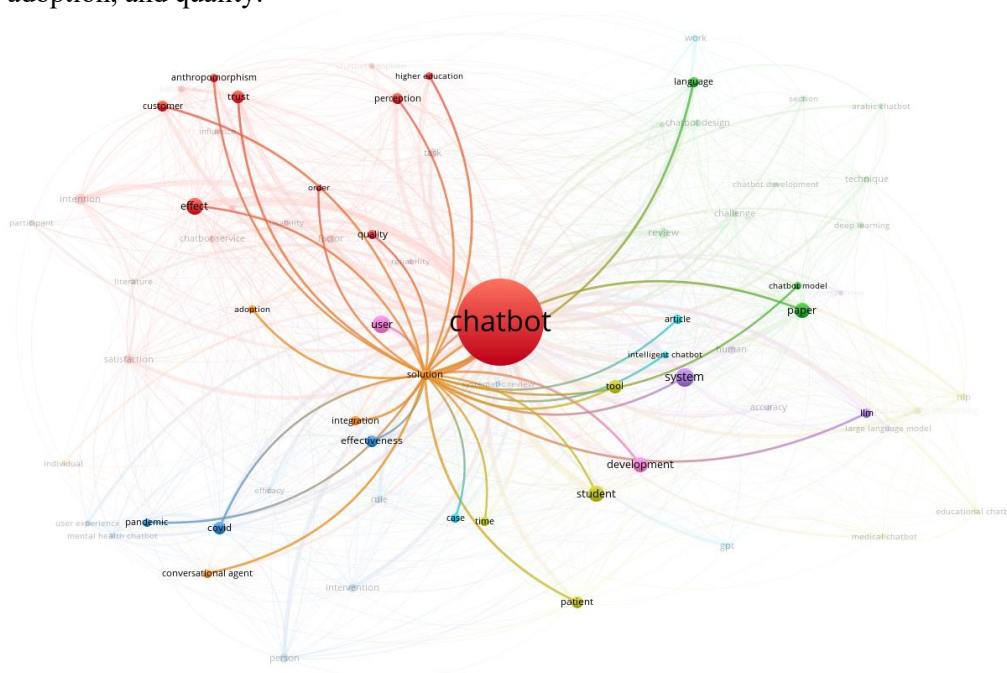

Figure 8. Visualization of Relationships between Solution-Related Topics

The visualization in Figure 9 shows the relationship between the task topic and students, integration, perception, literature, and effect.

Figure 9. Visualization of Relationships between Task-Related Topics

The visualization shown in Figure 10 shows the relationship between users and systems, development, quality, effects, covid-19, quality, and satisfaction.

Figure 10. Visualization of Relationships between User-Related Topics

Figure 11 shows the timeline visualization as a research trend in the 2022-2024 period. Based on timeline visualization, several recent studies have focused more on GPT, reliability, chatbot adaptation, consumers, quality, higher education, and individuals. Previously, research related to the topic of chatbots has discussed the COVID-19 pandemic, natural language processing, chatbot techniques, and chatbots in the health sector.
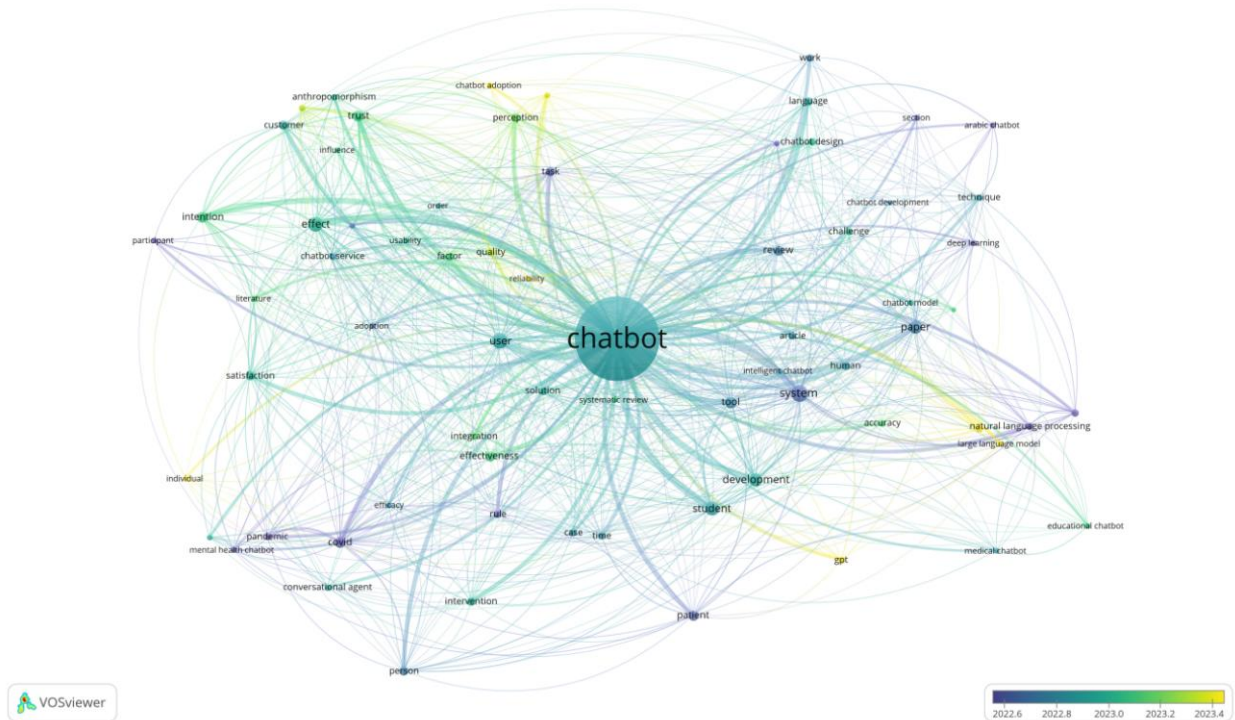
Figure 11. Chatbot Related Timeline Visualization

Based on density visualization, it can show research topics that are often or rarely discussed, as shown in Figure 12. The fainter the color shown in the image, the more rarely the topic is discussed or, in other words, not many people have done research on the topic. The results of the analysis show that several topics such as GPT, educational chatbots, and medical chatbots are rarely discussed in journal article publications indexed on Google Scholar in the period 2022-2024.
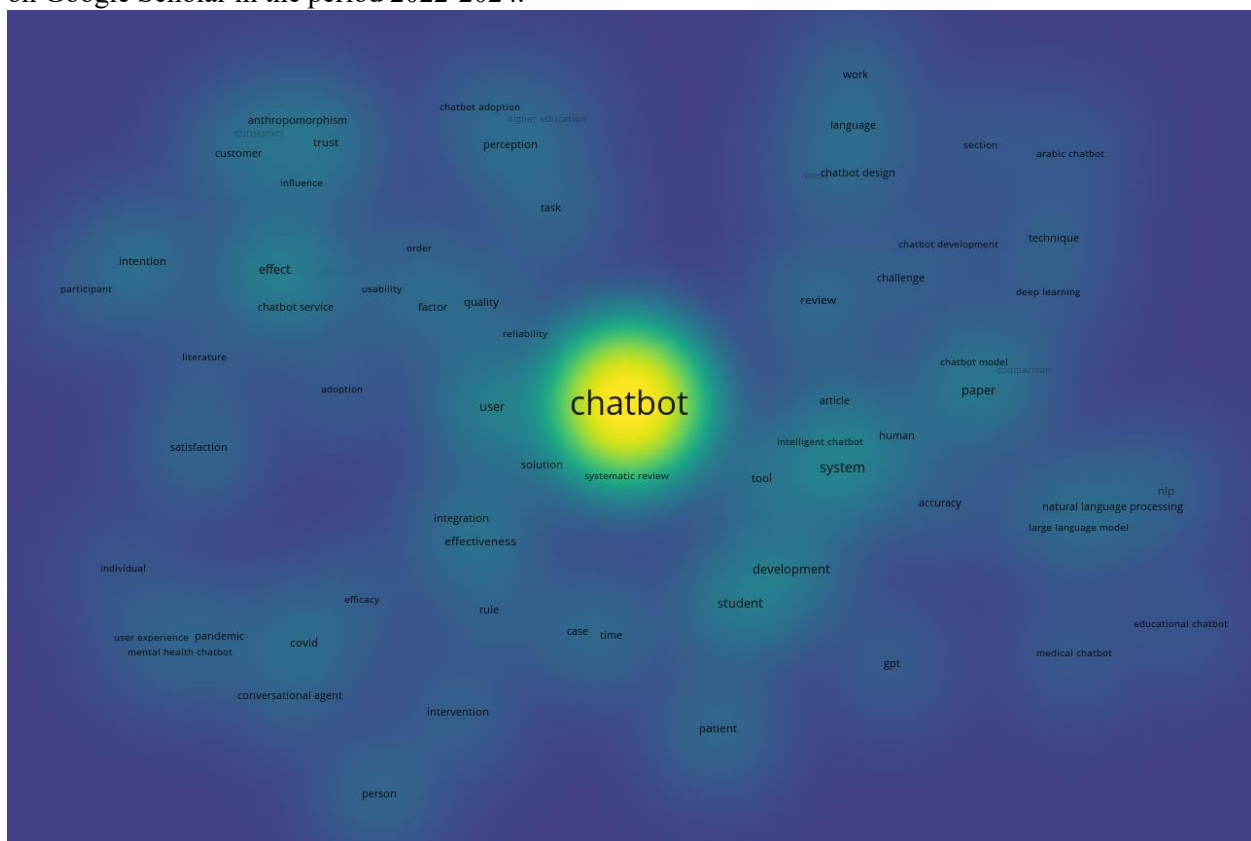
Figure 12. Visualization of Chatbot-Related Topic Density

CONCLUSIONS

From the results of the bibliometric analysis of research on the topic of chatbots in the period 2022-2024, there were 999 articles, 30705 citations, and 15352.50 Cities/year. There were nine main clusters in this study. Topics that have not been widely discussed in existing research include GPT, educational chatbots, and medical chatbots. Therefore we, hope that the results of this analysis can be used as a reference for further research to examine topics that have not been widely published.

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