



Visualizing Knowledge Domains for University Research Strategic

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Abstract. A university's research strategy impacts the implementation of university governance in terms of publication. This study aims to visualize research conducted in 2012-2021 and provide an overview of future university research. A total of 1608 articles were searched based on the search strategy based on affiliate names. This study analyzed reports based on categories of indexed articles on the Scopus database. A research approach with bibliometric data visualization is used to map the knowledge domain at universities. Research has found that knowledge domains can help develop university research strategies. The results of the knowledge domain found several fields of science visualized, namely (1) Social sciences; (2) Humanities, (3) Brain research, (4) Health professionals, (5) Medical specialties, (6) Disease, (7) Biology; (8) Chemistry; (9) Biotechnology; (10) Earth sciences; (11) Math & Physics; and (12) Electrical Engineering & Computer Science, with a dominant breadth in social sciences, Electrical Engineering & Computer Science, Chemistry and Math & Physics. It is hoped that this research can be a reference for designing a research strategy at a university.

Keywords: Knowledge Domain, Research Strategy, Bibliometric, Data Visualization

1 Introduction

Currently, every university is competing to publish the results of its research in various journals. The study produced by researchers at the University is diverse and has multidisciplinary tendencies. This tendency is not without reason, but because each researcher has a different educational background, they also produce different scientific approaches when conducting the research process. Articles published in various journals are classified into journal articles and proceedings. The two objectives of this publication are, of course, different, where articles published in proceedings tend to present research results that are less in-depth and in the form of short articles compared to articles published in journals. But the most important thing is not where the article is issued, but every article that has been published can color

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the research map of a university. A research discipline is believed to support the value of strategic research orientation, facilitate research, and recognize the importance of research [1].

The increasing publication of research conducted by academics opens up opportunities for increased investment in research. This means that scholars and the government understand that the principal asset in education is improving the quality of education through research. Increasing research investment by each university provides the benefit of growing deep integration between industry, universities, and researchers. Support for research shows the ice of the innovation chain for improving the quality of education and sustainable development of the country's economy.

Many universities have, of course, carried out various approaches and strategic designs. The University designs a strategic plan based on the vision and ideals to be achieved in a certain period [2]. Strategic planning is an integral part of the managerial approach in a contemporary organization. However, it is not uncommon for strategic design to be irrelevant to the actions taken; others are considered a waste of time [4]. Many universities have planned strategies that may not reflect the research conducted by the university. Therefore, this study tries to visualize data and recommend knowledge domains as a reference for planning the strategic design of a university.

2 Methods

The Scopus database is used to obtain the publication of research results conducted by one of the state universities in Indonesia in the 2012-2021 period. Some records taken from the Scopus database relate to documentation related to the publication period, the identity of the author, the affiliation of the author, and the journal in which the article was published, as well as the information presented in the citation (such as APA references style, Last name, Initials. (Year). Article title. Journal Name, Volume (Issue), Page range. DOI or URL).

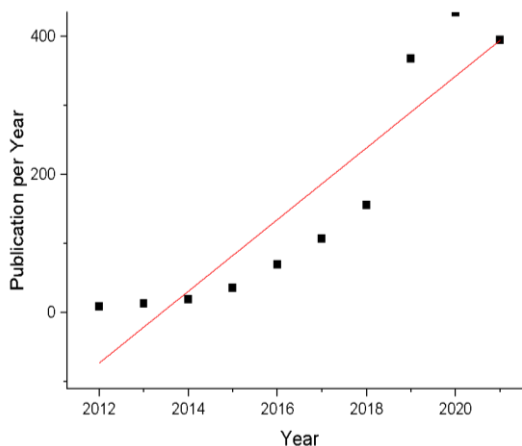


Fig. 1. Publication per year

The search category conducted on the research focuses on the title and abstract, which is the primary data to be processed to determine relevant research results related to research topics at one of the universities in Malang. A total of 1608 articles were taken from the Scopus database. Articles taken as data are published in international journals indexed by Scopus, not at international conferences. This study used bibliometric analysis to present a visual graph covering the research results' knowledge domain. Research findings through bibliometric analysis using two applications such as The Science of Science (Sci2) [5] and VoS Viewer. Bibliometric study provides a quantitative visual of the scientific field [6]. The publications per year are from 2012-2021, as in Figure 1.

Using bibliometrics helps map knowledge or science fields as the stages of research, as shown in Figure 2.

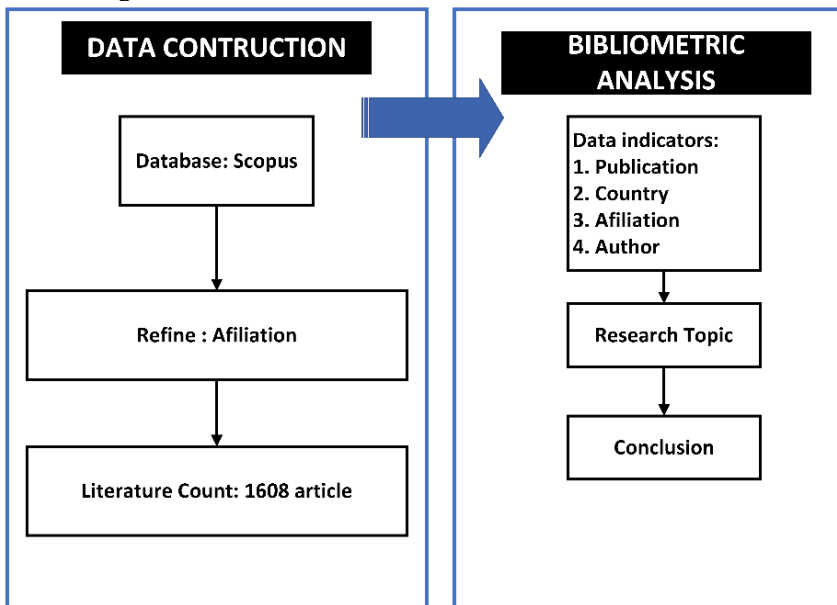
**Fig. 2.** Steps of research

Figure 2 shows the stages of analysis used in research consisting of two phases, namely data construction and bibliometric analysis. At the data construction stage, the Scopus database becomes data used to see the extent of the development of science. The refining process is done by choosing affiliate keywords. The consideration for selecting these two search keywords is because the naming of the two affiliates chose the same place and only different language approaches. The metadata indicators used in bibliometric analysis are publication, country, affiliation, and author. Furthermore, as many as 1608 articles were classified based on the scientific families that had been identified. The research uses a data visualization approach to see the extent of

scientific developments resulting from publications. The data used in this study has RIS format from the Scopus database.

3 Result and Discussion

The publication trend of Scopus-indexed articles has increased significantly, from 9 articles in 2012 to 1608 articles in 2021, published in Scopus-indexed international journals, as shown in Table 1.

Table 1. Publication growth

Year	Publication Per Year
2012	9
2013	13
2014	19
2015	36
2016	70
2017	107
2018	156
2019	368
2020	435
2021	395

Publications have experienced significant growth due to the increasing interest in journals in various disciplines. The publication carried out consists of 2 phases of development. Phase 1 in 2012-2016, where the growth of article publication has yet to experience significant positive growth, compared to phase 2 in 2017-2021, shared growth of 361.68%. The growth of this publication certainly impacts the strategy of universities in determining steps in the development of the field of science. Higher education strategy planning is carried out with a quantitative approach by analyzing the institution's competitive opportunities, strengths, and weaknesses and determining the necessary resources [7], [8], [8]. The policies given by the head of the institution are, of course, very influential on the growth of publications. The strategic planning process creates a framework and competitive advantage for institutions where higher education is currently under increased pressure regarding student success and post-graduation [9]. A mapping of the fields of science that Higher Education Institutions have developed is needed through publications that have been developed, as shown in Figure 3.

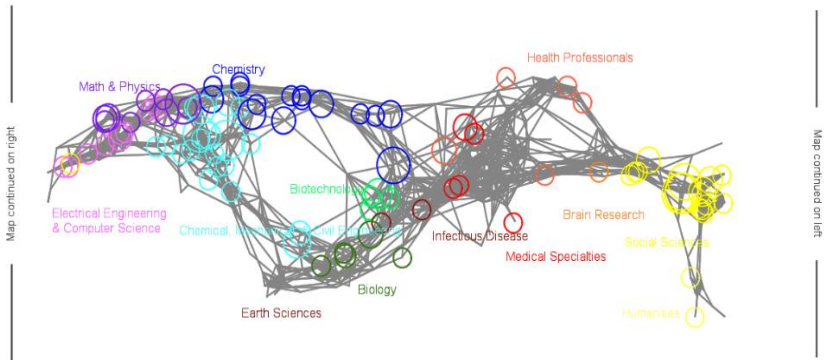


Fig. 3. Mapping of knowledge domain

Figure 3 shows the mapping results generated by The Science of Science (Sci2), consisting of several identified fields of science. Mapping the domain of knowledge finds that the science that has been developed is (1) Social sciences, (2) Humanities, (3) Brain research, (4) Health professionals, (5) Medical specialties, (6) Disease, (7) Biology; (8) Chemistry; (9) Biotechnology; (10) Earth sciences; (11) Math &; Physics; and (12) Electrical Engineering &; Computer Science. Several domains dominate based on research results, namely: (1) Social sciences, (2) Chemistry, (3) Electrical Engineering and computer Science; and (4) Math and physics. The results of these findings certainly significantly impact the steps of universities to determine the management strategy of higher education institution governance. Of course, this field of science is closely related to the scientific identity of the Higher Education Institution. Higher education institutions adopt management strategies based on scientific domain mapping to improve competitiveness, quality, and global challenges [10]. This scientific domain mapping can provide input to university institutions in determining development indicators and strategic design of institutions in the following few periods [11]. In the subsequent data analysis approach using VoS Viewer, it was found that scientific topics in the field of education became the dominant topic in the period 2012-2021, as shown in Figure 4. This may be a natural thing because many departments of university institutions have concentrations in the field of education. Developing strategies on university institutional governance, if based on scientific fields, can sharpen institutional identity based on a scientific approach. University institutions implement strategic plans by conducting a strategic planning process, including informative advice, strategic direction, and design [12]. Strategy management becomes an integral part of the university that aims to anticipate changes and mobilize institutions in the vision and mission of the university [13].

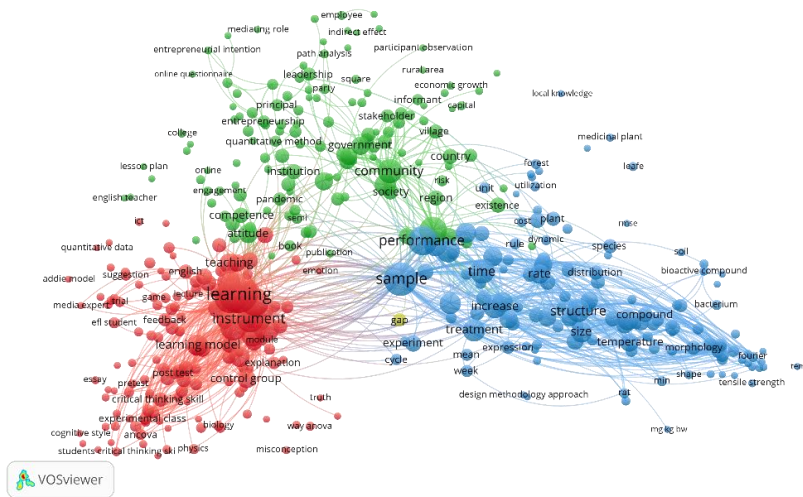


Fig. 4. Mapping topics with VoS Viewer

Figure 4 shows several topics that must be considered to develop strategic management: learning, assessment, quantitative method, qualitative method, physics, plant, bioactive compound, and economic. Of course, this finding is in line with the results of the analysis of the mapping of the knowledge domain, where the field of social sciences is the dominant field of science. Research studies increase along with the down-streaming research results implemented in society. The challenges of implementing research results encourage universities to develop a culture of research and formulate policies to regulate research implementation. The knowledge domain facilitates understanding of essential knowledge and research boundaries that develop so that it impacts the development of university management because it allows university researchers to have a sustainable research roadmap [14]. There are techniques used to explore bibliometric techniques to look at changing knowledge paradigms and intellectual structures [15]. This research is based on a theoretical framework and is in line with the research trends that the university undertakes. The need for analysis based on the knowledge domain is urgent for academic leaders and stakeholders in planning university strategies [16].

4 Conclusion

This study found that visualization of knowledge domains can help universities determine strategic steps for research to be carried out. Several domains of science are identified as domains of science that dominate research, namely: (1) Social sciences, (2) Chemistry, (3) Electrical Engineering, Computer Science; and (4) Math and physics. The results of these findings certainly significantly impact the steps of universities to determine the management strategy of higher education institution

governance. Of course, this field of science is closely related to the scientific identity of the Higher Education Institution.

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