Bibliometric Analysis Using VOS Viewer and Publish or Perish (using Google Scholar data) in Heart Disease Detection

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ABSTRACT

Heart disease detection is crucial for timely intervention and management to prevent adverse outcomes. This study uses bibliometric analysis with the tools VOS Viewer and Publish or Perish, leveraging data from Google Scholar to explore research trends in heart disease detection. Bibliometric mapping, a valuable method for visualizing and analyzing research trends, collaboration, and knowledge structures across various fields, is used to gain insights into the research landscape of heart disease detection. VOS Viewer, a widely used software tool, helps build and visualize bibliometric networks by analyzing co-authorship, co-occurrence, citation, bibliographic coupling, and co-citation data. This study aims to present detailed and systematic steps in the bibliometric data analysis related to heart disease detection research using VOS Viewer, with the goal of observing the development of this research from 2019 to 2024. The two clusters identified are as follows: Cluster 1, colored red, consists of 3 words: hypertension, coronary, coronary heart disease. Cluster 2, colored green, consists of 2 words: heart disease, hypertension. Using bibliometric analysis, researchers identify influential sources, research themes, and key contributors in this field. By systematically analyzing publications and identifying major research areas, this study contributes to advancing knowledge in heart disease detection. These findings highlight the effectiveness of VOS Viewer in mapping bibliometric data and its utility in providing comprehensive insights into scientific communication and collaboration in this important research area.

Keywords: Heart Disease, Detection, Bibliometric

1. INTRODUCTION

Detection of heart disease is crucial for timely intervention and management to prevent adverse outcomes. Various studies have highlighted the importance of early detection and accurate diagnosis in different aspects of heart disease. Haq et al. (2018) emphasized the significance of accurate and timely diagnosis for the prevention and treatment of heart failure [1]. Early detection of specific conditions such as cardiac sarcoidosis was underscored [2], who highlighted the role of cardiovascular magnetic resonance imaging in improving patient outcomes. Additionally, prenatal diagnosis of congenital heart defects has been shown to have a significant impact on neonatal outcomes, as demonstrated in a study by [3]. Furthermore, the use of advanced diagnostic tools such as coronary CT angiography (CCTA) has proven to be highly valuable in diagnosing coronary heart disease, as shown in the SCOT-Heart trial [4]. Similarly, the application of machine learning algorithms in diagnosing valvular heart disease has been found to have high accuracy rates by [5]. Moreover, the use of artificial intelligence in detecting ECG anomalies, as discussed by [6], can aid in monitoring the heart's electrical activity for disease detection. In the context of neonatal heart disease, studies such as those by [7] [8] highlight the importance of early detection through clinical assessment and neural networks, respectively. Echocardiography is emphasized as a necessary tool for diagnosing neonatal heart murmurs by [9]. Additionally, the importance of postmortem investigation and genetic evaluation to detect hereditary heart disease early and prevent sudden cardiac death is discussed by [10].

VOS Viewer is widely used software for constructing and visualizing bibliometric networks across various research domains. Researchers use VOS Viewer to create maps that depict relationships between scientific publications, journals, researchers, organizations, countries, and keywords through co-authorship, co-occurrence, citation, bibliographic coupling, and co-citation analysis [11]. This software allows for the visualization of research trends, including title analysis, country distribution, author contributions, publication counts, citation metrics, journal impact, and the H-index [12]. By utilizing co-citation networks, VOS Viewer can generate maps of publications, authors, journals, and keywords, providing a comprehensive understanding of the scientific landscape [13]. Additionally, VOS Viewer is valuable for exploring influential sources, research themes, cited references, intersections among references, and frequently cited authors within a field [14] [15]. Through various network analysis approaches such as keyword co-occurrence, co-citation, and bibliographic coupling, VOS Viewer helps identify prominent research areas and key contributors [16]. The software's capabilities include generating term maps based on document corpora and applying mapping and clustering techniques to effectively visualize bibliometric data [17]. Researchers have used VOS Viewer for co-authorship, co-occurrence, bibliographic coupling, and co-citation analysis in various studies, providing insights into research trends and valuable perspectives for policymakers and future research directions ("Global research trends in lumbar lateral interbody fusion (LLIF)" a bibliometric and visualization study" [18]. Moreover, VOS Viewer enables analysis of document citation relationships, organization citation relationships, and bibliographic coupling, offering a comprehensive view of scientific interactions [19]. The software's ability to generate co-authorship, citation, co-citation, bibliographic coupling, and co-occurrence maps allows researchers to explore various aspects of scientific communication and collaboration [20].

This study aims to present detailed and systematic steps in the bibliometric data analysis related to heart disease detection research using VOS Viewer, with the goal of observing the development of this research from 2019 to 2024. Bibliometric data analysis regarding heart disease detection has not been conducted in previous research. Therefore, this study is expected to serve as a reference to facilitate big data analysis. This report can also be utilized by new users as we provide a step-by-step guide on using VOS Viewer.

2. RESEARCH METHOD

This This research explores bibliometric analysis methods using VOS Viewer software. A detailed explanation of the research flow steps is provided below. This research has a process flowchart framework to achieve these goals, as shown in Figure 1.

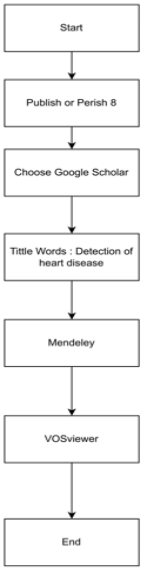

Figure 1. Flow of Research Method

2.1. Methodology

Bibliometric mapping is a valuable method for visualizing and analyzing research trends, collaboration, and knowledge structures across various fields. By using tools like VOS Viewer, researchers can create graphical representations of bibliometric data to gain insights into the landscape of scientific publications. The use of bibliometric mapping techniques has been demonstrated in various research areas, ranging from management and organization studies [21] to topics such as coronary heart disease and depression [22].

2.1.1 Applications used

To conduct data analysis, careful preparation of various essential applications and tools is required. This preparation involves systematic stages and necessitates precision in using relevant tools as well as the availability of raw data to be analyzed. The first step that must be prepared is "publish or perish." Publish or perish reflects the pressure in the academic world for researchers to continually produce and share their work to secure academic positions, promotions, and reputations [23] [24] [25] [26]. This culture emphasizes the importance of publishing research in peer-reviewed outlets to survive and advance in academia [27]. Although historically known as a driver of academic productivity [28], the contemporary landscape shows that this pressure to publish can have unintended consequences, leading to concerns about scientific trustworthiness, ethical considerations [29], and potential scientific misconduct [25]. The application and its interface are shown in Figure 2 below:

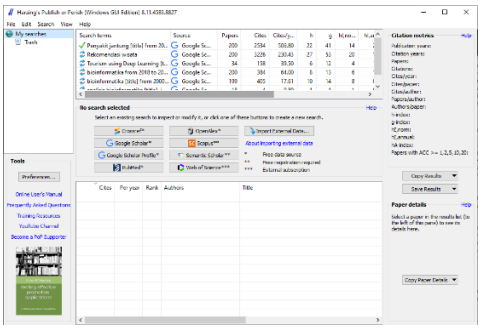

Figure 2. Publish or Perish application

2.1.2 Mendeley

The second step involves providing a comprehensive overview of Mendeley, a widely used reference management tool among researchers and academics. Mendeley is a free reference manager and academic social network that helps researchers organize their research, collaborate online with others, and discover the latest research in their fields. It was first released in 2008 and has since gained popularity among scholars for its user-friendly interface and powerful features. As shown in Figure 3 below.

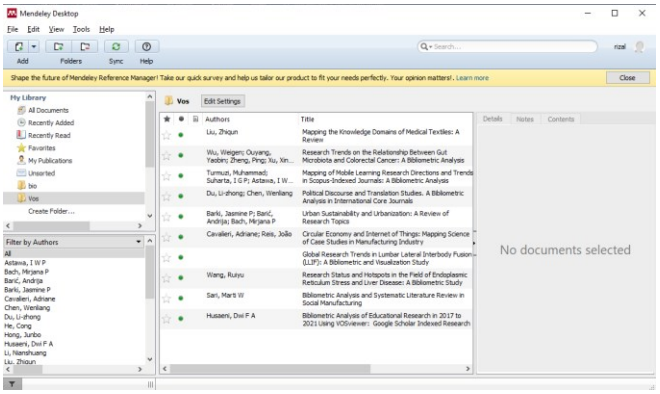

Figure 3. Mendeley Application

2.1.3 VOS Viewer

The third step involves using VOS Viewer. VOS Viewer is a widely used software tool for constructing and visualizing bibliometric networks. This tool is highly popular within the academic community for analyzing and visualizing scientific literature. VOS Viewer allows researchers to create maps of scientific fields based on co-citation, bibliographic coupling, and co-authorship networks. As shown in Figure 4 below.

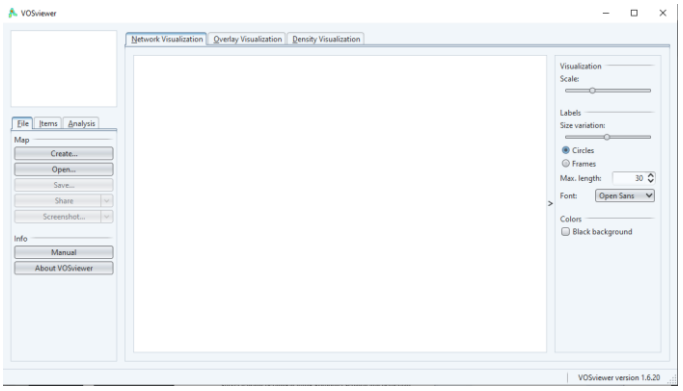

Figure 4. VOS Viewer Application

2.1.4 Data collection

The data used in this study are derived from journal publications analyzed using bibliometric methods for detecting heart disease. This data was obtained through a reference management application called Publish or Perish, used to conduct a literature review on the selected topic. The research database includes articles with similar themes published between 2019 and 2024. Publish or perish was utilized to identify the most frequently cited authors, publication years of articles, and to provide relevant bibliometric information from each article used in the study. Data sources available through this application include Crossref, Google Scholar, Google Scholar Profile, PubMed, Open Alex, Scopus, Semantic Scholar, and Web of Science, all accessible through Google Scholar for this research.

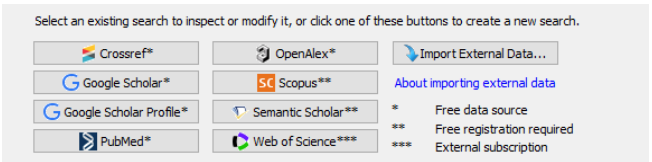

Figure 5. The sources to be used

3. RESULT AND ANALYSIS

To analyze the mapping results using VOS Viewer related to the growth of journal publications examining Bibliometric Analysis in the detection of heart disease, searches were conducted in the Google Scholar database from 2019 to 2024. The steps taken to analyze the mapping results are as follows:

3.1. Publish or Perish

The initial step to obtain data using Publish or Perish is to open the application as shown in Figure 2. Once Publish or Perish is opened, users can directly access the main window displaying various options and features available, where they can choose to utilize Google Scholar as shown in Figure 5.

3.2. Google Scholar page

As shown in Figure 5, there are several fields to fill out when conducting a search on Google Scholar. These include author names, publication names, words in the title, keywords, and maximum number of results. Under the "Publication Name" section, enter "Journal", then write the article's theme you wish to search for in the "Words in Title" column to search for articles based on specific words found in the title, or enter related keywords in the "Keywords" column to conduct a search based on keywords. After that, specify the maximum number of desired articles results in the "Maximum Results" column.

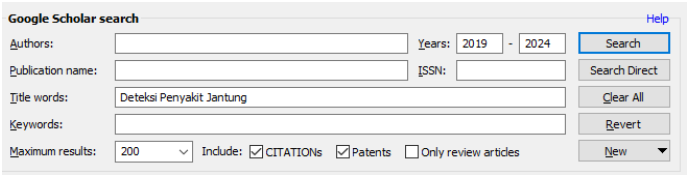

Figure 6. Google Scholar page

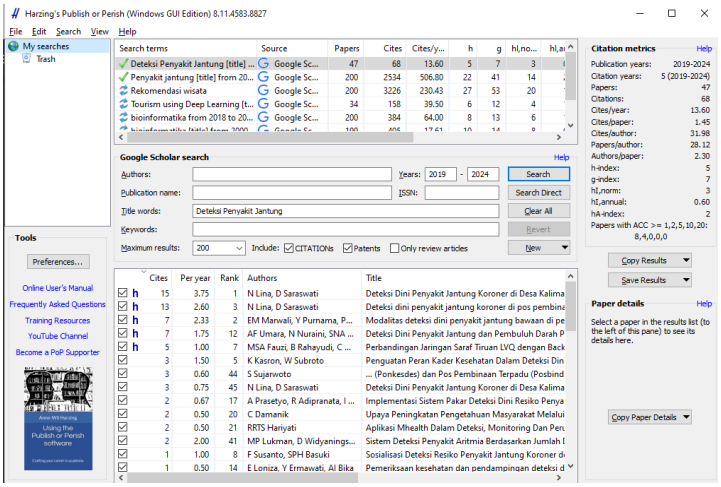

Figure 7. The process of searching for articles on Publish or Perish

3.3. Saving Search Results

The next step is to save the search results by clicking the "Save Result" button in RIS format. Mendeley and VOS Viewer can only read search results from Publish or Perish in RIS format.

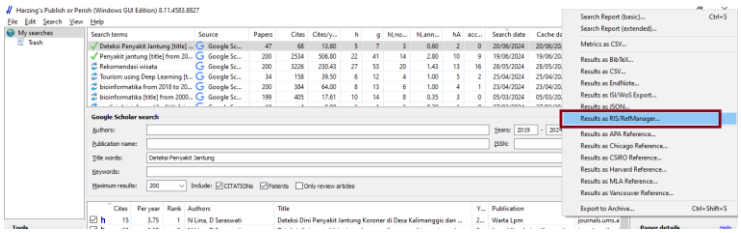

Figure 8. Saving Search Result

3.4. Open the Mendeley application

After installing the Mendeley application, open the RIS format.:

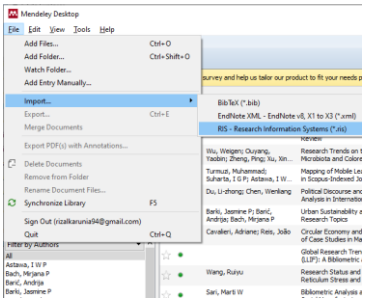

Figure 9. Import RIS format

After all sites appear, select all data and right-click. Next, choose "update details" and save in RIS format. As shown in the image below:

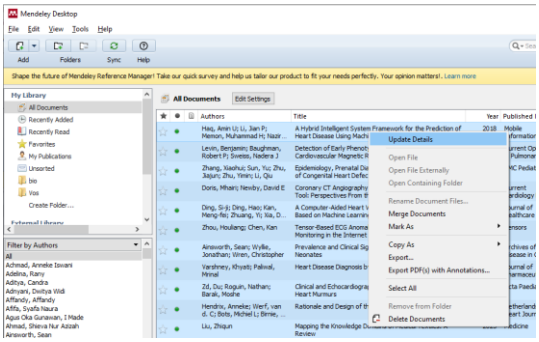

Figure 10. Update Details

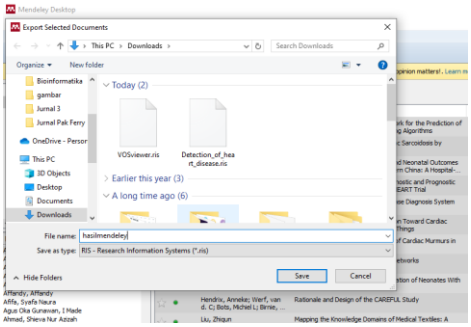

Figure 11. Saving Format RIS

3.5. Open VOS Viewer

After opening the VOS Viewer application, click the "Create" button to start creating a new mapping. There are three options for data types: network data mapping, bibliographic data mapping, and text data mapping. In this study, mapping is based on text data, as the research mapping is conducted based on research titles. After that, click the "Next" button.

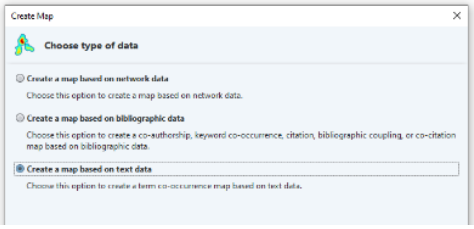

Figure 12. Choose Create a map based on text data

3.6. Data Source Selection

The next step in creating the research mapping is selecting the data source, as shown in Figure 13. At this stage, there are four options available for data sources: Download data through API, read data from bibliographic database files, Read data from reference manager files, Read data from VOS Viewer files. Previously, in the data collection process using the Publish or Perish application, which is one of the reference managers that generates data in RIS format, this step involves selecting data from the reference manager file before proceeding by clicking the "Next" button. This procedure allows for precise data integration for research mapping, ensuring that the bibliometric analysis conducted yields accurate and informative results.

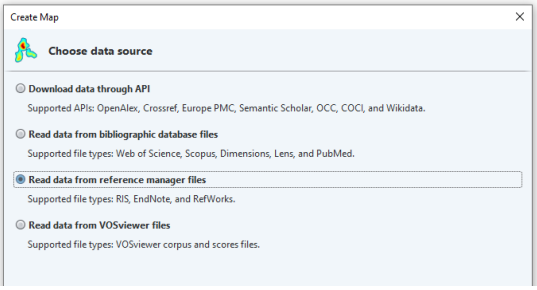

Figure 13. Read data from reference manager files

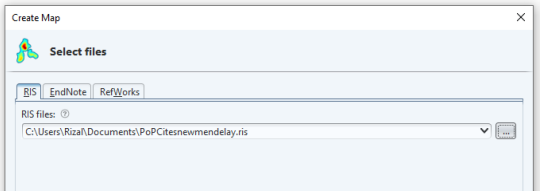

Figure 14. Selection of documents as data sources (RIS)

3.7. Selection of Attributes (Fields)

Next, the window for selecting the data attributes to be extracted will appear, as shown in Figure 15. There are 3 types of data attribute options that can be extracted: title and abstract attributes, title attributes only, and abstract attributes only. In this study, the option chosen is title and abstract attributes from the collected articles. Consequently, VOS Viewer maps each keyword extracted from the titles and abstracts of the collected articles. Meanwhile, the other two options, "Ignore structured abstract label" and "Ignore copyright statement," remain selected (checked). Click the "Next" button.

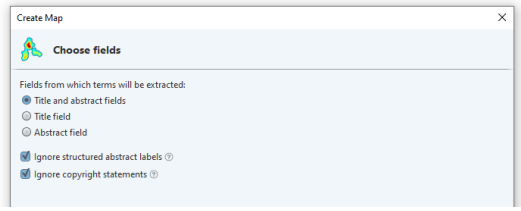

Figure 15. Selection of Attributes (Fields)

3.8. Determination of Calculation Method

In Figure 15, there are two calculation method options: binary counting and full counting. Binary counting displays data as either 0 or 1, meaning if the same word appears multiple times in the title, it is counted as one. Meanwhile, full counting means that the total number of occurrences is counted as they appear. In this study, the full counting method is used. Then click the "Next" button.

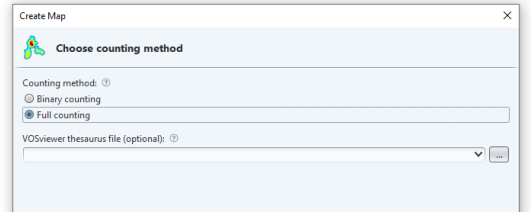

Figure 16. Determination of Calculation Method

3.9. Setting the Minimum Attribute Occurrence Threshold

Figure 17 illustrates the minimum threshold value used to determine the minimum number of times a keyword must appear to be displayed in a cluster. In this study, the minimum threshold set is 10 times, so only keywords that appear 10 times or more will be included in the mapping. Below that, the maximum number is set to reach 16 words.

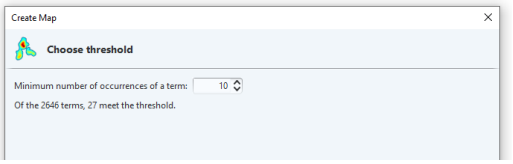

Figure 17. Setting minimum

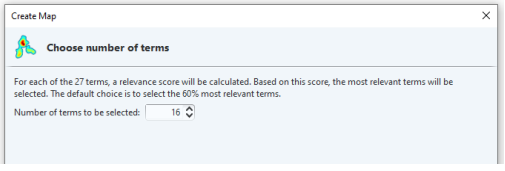

Figure 18. Setting the maximum number of words

3.10. Verification of Word Selection

The first step in the verification window, as shown in Figure 19, is to select the words that appear in the research mapping

being conducted. After selecting these words, click the "Finish" button to complete the mapping process with VOSviewer. This process will result in a thematic map of bibliometric analysis in the context of heart disease detection. The outcome of this mapping includes visualizing relationships between various terms and concepts analyzed, which can be seen in Figure 20. This visualization provides a comprehensive overview of the distribution and interconnection of research themes, aiding in identifying significant trends and patterns in the bibliometric analysis conducted.

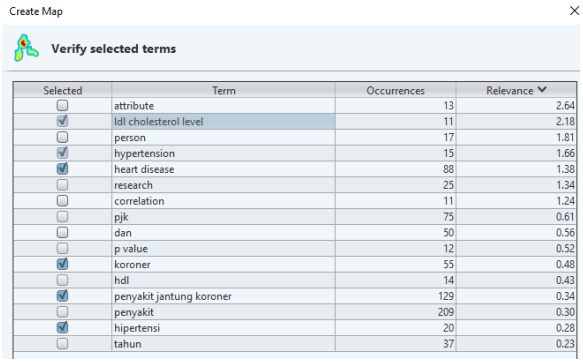

Figure 19. Verification of Word Selection

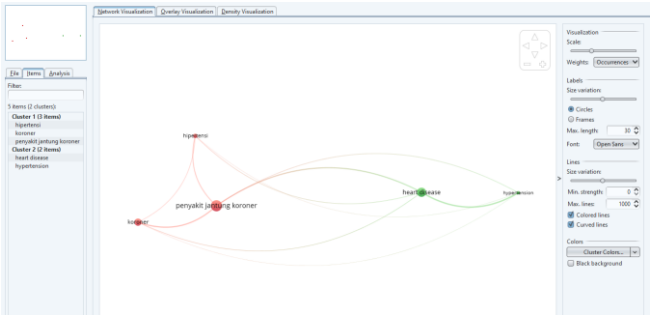

Figure 20. Research mapping results in VOS Viewer

3.11. Word Mapping Network Visualization

The visualization results of the co-word mapping network regarding research development related to bibliometric analysis in library collection evaluation show 16 words divided into 2 clusters, as seen in Figure 21 below.

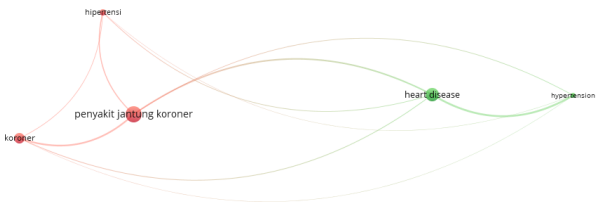

Figure 21. Visualization of the co-word map

The two clusters are as follows:
Cluster 1, colored red, consists of 3 words: hypertension, coronary, coronary heart disease.
Cluster 2, colored green, consists of 2 words: heart disease, hypertension.

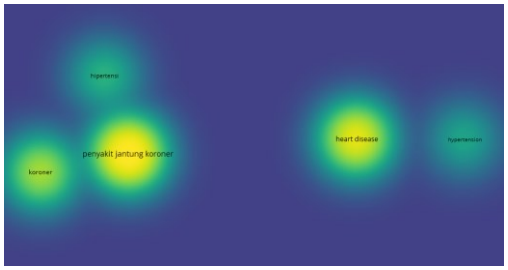

Figure 22. Visualization of Data Density Mapping

4. CONCLUSION

Based on the results and discussion presented, it can be concluded that VOS Viewer is a highly effective and efficient tool for mapping and analyzing bibliometric data. In this study, VOS Viewer was applied to analyze bibliometric data on heart disease detection published between 2019 and 2024. The analysis showed that VOS Viewer is capable of identifying research trends, collaboration networks, and the intellectual structure within the researched topic, providing a deeper understanding of heart disease detection. This study utilized two clusters: Cluster 1, colored red, includes three words-hypertension, coronary, and coronary heart disease, while Cluster 2, colored green, consists of two words-heart disease and hypertension. The results of this study are expected to enhance the existing literature and serve as a reference for future research in developing this field.

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