

Comparison of Clusterization of Higher Education Institutions in Regions XII Maluku and North Maluku based on the Science and Technology Index (Sinta).

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ABSTRACT

This research aims to analyze the comparison of clustering results of universities based on data sourced from the Science and Technology Index (Sinta). The analysis results will serve as a guide for all higher education institutions in the XII Maluku and North Maluku regions to improve their performance in the three pillars of higher education to achieve better clustering. This study was conducted by extracting Sinta data from the years 2019 to 2021. The research results show that based on the Total All Score, the universities in Maluku are ranked in descending order from the highest to the lowest score. The main cluster is occupied by Pattimura University with a total score of 16.04, followed by State Polytechnic of Ambon with a total score of 13.45. In the middle cluster, we have Indonesian Christian University of Maluku with a total score of 9.19, and in the basic cluster, we have Darussalam Ambon University with a total score of 6.62, Maluku Husada Health Sciences Institute with a total score of 4.79, Doktor Husni Ingratubun Tual University with a total score of 2.5, and Institute of Technology and Business, Ambon School of Computer Science with a total score of 2.37. As for North Maluku, the universities are ranked in descending order from the highest to the lowest score. The main cluster is led by Universitas Kharun with a total score of 14.01. In the middle cluster, we have Muhammadiyah University of North Maluku with a total score of 11.62, and Halmahera University with a total score of 9.45. In the basic cluster, we have Nuku University with a total score of 5.45, Pasifik Morotai University with a total score of 5.3, Hein Namotemo University with a total score of 4.63, and Bumi Hijrah University Tidore with a total score of 3.31.

Keywords: *Up to five keywords should also be included*

Introduction

Competition in the academic world among universities in Indonesia has led to changes aimed at improving the performance of the three pillars [1],[2]. As a result, the Ministry of Education, Culture, Research, and Technology, through the Directorate General of Research and Technology, has issued a circular on the clustering of higher education institutions [3]. Clustering is considered as a mapping process for each university based on its level of development and serves as a description of the quality of higher education institutions in Indonesia [4]. It can also be used to group homogeneous data [5]. Furthermore, clustering is utilized to group data based on equivalence levels [6] and can be used as a preference in determining career choices [7], [8]. One commonly used clustering approach in the clustering process is partitional clustering, where a set of data exhibits similarities among the data points [9].

Clustering of higher education institutions is essentially not a ranking of universities in Indonesia [10], [11], but rather serves as an indicator for grouping universities according to their performance qualifications. The purpose is to encourage universities to improve the quality of research and community engagement in a sustainable manner [12]. It also serves as a basis for developing research roadmaps, strategic plans, and determining the authority for research management and community engagement in universities [13].

In 2023, the clustering of higher education institutions is based on the processed data of their performance using the Science and Technology Index (SINTA) [14]. The clustering process has been developed and data has been collected from the period of 2019 to 2021. The performance data taken into account are those that have been verified and validated by the validators from the Institute of Research and

Community Engagement of the respective universities. The performance data includes authors, affiliations, journals, research, community service, intellectual property rights, and books [15].

The performance data of academic educational institutions is identified based on six main criteria with the following weighting: (1) Institutional quality with a weight of 15%; (2) Human resources with a weight of 15%; (3) Research with a weight of 15%; (4) Community service with a weight of 15%; (5) Publications with a weight of 25%; (6) Intellectual property with a weight of 10%. Specifically for vocational education institutions, there is an adjustment in the weighting of two main criteria: publication criteria with a weighting of 20%, and intellectual property criteria with a weighting of 15%.

The parameters used as assessment components in the institutional criteria are the accreditation of study programs and the number of accredited national scientific journals. In the human resources criteria, the parameter used as an assessment component is the academic/functional positions of lecturers. In the research criteria, the parameters used as assessment components are the number of research projects funded through external, international, or internal sources, including the total funding amount in Indonesian rupiah for research programs. In the community service criteria, the parameters used as assessment components are the number of international and national community service projects (funded externally) as well as local community service projects (funded internally), and the total funding amount in Indonesian rupiah for community service programs.

In the publication criteria, the parameters used as assessment components are the number of publications and citations of scientific works [16] indexed in Scopus, Web of Science, Garuda, and Google Scholar, as well as the number of textbooks, monographs, and reference books. In the intellectual property criteria, the parameter used as an assessment component is the number of intellectual property assets, including patents, utility models, trademarks, geographical indications, industrial designs, layout designs of integrated circuits, plant variety protection, and copyrights.

The clustering score is determined based on the performance achievements of each parameter in the main criteria. The performance of each university is normalized with the data on the number of lecturers or the number of active study programs in each university, according to the data available in the Higher Education Database (PDDIKTI). Additionally, the data on the website is considered as a large-scale data mining source [17].

There have been numerous studies addressing the issue of clustering. Among them are studies aimed at describing the competition among universities based on clustering [3]. There are also studies that utilize the K-Means Clustering algorithm, focusing solely on research documents [18], [19], while other studies employ the same method to group Higher Education Institutions (HEIs) in Madura based on the performance of human resources and students [1]. Additionally, there are other studies that utilize clustering techniques to evaluate the quality of education in universities [20]. This study aims to examine and describe the comparison of university clustering based on the presentation of the Science and Technology Index data.

Research Methods

In this study, a quantitative descriptive method is used, where the research findings are obtained from the statistical data of university clustering presented by the Ministry of Education, Culture, Research, and Technology in March 2023. The research process consists of the following stages:

- a. Literature Review In this stage, a literature review is conducted to gather information and data necessary for the research and to compare it with previous studies.
- b. Data Collection Data collection is carried out based on the available data sources in the Science and Technology Index (Sinta).
- c. Data Processing Data processing in this study is based on the collected data from university clustering, according to the performance data of universities during the period from 2019 to 2021.
- d. Data Analysis and Interpretation This stage involves analyzing the processed data and comparing the clustering results of higher education institutions in Region XII.

Results and Discussion

Based on the performance data of universities measured over a period of 5 years from 2019 to 2021, taking into account the Science and Technology Index (SINTA) database, the university clusters are divided into five categories: Independent, Main, Intermediate, Primary, and Developmental. According to the data provided in the Announcement of University Clustering issued by the Director of Research, Technology, and Community Service, Number 0183/E5.5/AL.04/2023 dated March 8, 2023, the results of higher education clustering can be seen in table 1.

Table 1. Recapitulation of University Clustering in 2023 based on Academic Education Providers

Cluster	Academic Organized College	Vocational Organized College	Grand Total
Independent	40	4	44
Main	160	32	192
Intermediate	238	71	309
Primary	442	58	500
Grand Total	880	165	1045

There are a total of 880 Academic Higher Education Institutions, with 40 institutions in the Independent Cluster, 160 institutions in the Main Cluster, 238 institutions in the Intermediate Cluster, and 442 institutions in the Primary Cluster. As for Vocational Higher Education Institutions, there are a total of 165 institutions, with 4 institutions in the Independent Cluster, 32 institutions in the Main Cluster, 71 institutions in the Intermediate Cluster, and 58 institutions in the Primary Cluster

■ Independent ■ Main ■ Intermediate ■ Primary ■ Independent ■ Main ■ Intermediate ■ Primary

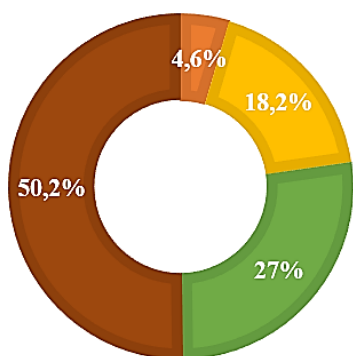


Figure 1. Percentage of University Clustering for Academic Institutions in Indonesia

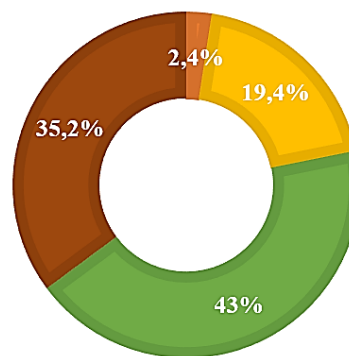


Figure 2. Percentage of University Clustering for Vocational Institutions in Indonesia

Clusterization in Maluku and North Maluku

There are 6 academic educational institutions in Maluku province, with 1 institution in the Main Cluster, 1 institution in the Intermediate Cluster, and 4 institutions in the Primary Cluster. As for Vocational Education Institutions, there is only 1 institution that is classified in the Main Cluster. In North Maluku province, there are 8 academic educational institutions, with 1 institution in the Main Cluster, 2 institutions in the Intermediate Cluster, and 5 institutions in the Primary Cluster. As for Vocational Education Institutions, there is only 1 institution that is classified in the Intermediate Cluster.

In Maluku province, the universities included in the Main Cluster are Pattimura University (UNPATTI) and Ambon State Polytechnic (POLNAM). The university classified in the Intermediate Cluster is Indonesian Christian University of Maluku (UKIM). As for the Primary Cluster, it includes several institutions such as Institute of Technology and Business-Ambon School of Computer Sciences (ITB-STIKOM Ambon), Maluku Husada Health Sciences Institute (STIKES Maluku Husada), Darussalam Ambon University (UNIDAR Ambon), and Husni Ingratubun Tual University.

In North Maluku province, there are 8 academic institutions, with 1 university in the main cluster, 2 universities in the intermediate cluster, and 5 universities in the primary cluster. As for vocational institutions, there is only 1 university in the intermediate cluster. In Maluku province, the universities in the main cluster are Pattimura University and State Polytechnic of Ambon, the university in the intermediate cluster is Indonesian Christian University of Maluku, and the universities in the primary cluster are Institute of Technology and Business, Ambon School of Computer Science, Maluku Husada Health Sciences Institute, Darussalam Ambon University, and Husni Ingratubun Tual University. In North Maluku province, the university in the main cluster is Khairun University, the universities in the intermediate cluster are Halmahera University, North Maluku Muhammadiyah University, Halmahera Peace Polytechnic, and the universities in the primary cluster are Kie Raha College of Education and Teacher Training, Bumi Hijrah University Tidore Hein Namotemo University, Nuku University, and Pasifik Morotai University. See table2.

Table 2. Recapitulation of University Clustering in 2023 based on Academic Education Providers

Province	Cluster	Academic Organized College	Vocational Organized College	Total
Maluku	Main	1	1	2
	Intermediate	1		1
	Primary	4		4
	Total	6	1	7
North Maluku	Main	1		1
	Intermediate	2	1	3
	Primary	5		5
	Total	8	1	9
Grand Total		14	2	16

Comparison of Clusterization Scores for Universities in Region XII

The comparison of clusterization scores is calculated based on the Total All Score, which is derived from the following normalized scores: Total Score Publication (25%), Total Score HKI (10%), Total Score Institutional (15%), Total Score Research (15%), Total Score Community Service (15%), Total Score Human Resources (15%), and Total Score Revenue Generating (5%).

The SINTA (Science and Technology Index) scores for universities in Maluku province are as follows: Pattimura University: 16.04 and State Polytechnic of Ambon: 13.45 in the main cluster, Indonesian Christian University of Maluku: 9.19 in the intermediate cluster, Darussalam Ambon University: 6.62, Maluku Husada Health Sciences Institute: 4.79, Doktor Husni Ingratubun Tual University: 2.5, and Institute of Technology and Business, Ambon School of Computer Science: 2.37 in the primary cluster.

In North Maluku province, the SINTA scores are as follows: Khairun University: 14.01 in the main cluster, Muhammadiyah University of North Maluku: 11.62 and Halmahera University: 9.45 in the intermediate cluster, Kie Raha College of Education and Teacher Training: 7.8, Halmahera Peace Polytechnic: 6.4, Nuku University: 5.45, Pasifik Morotai University: 5.3, Hein Namotemo University: 4.63, and Bumi Hijrah University Tidore: 3.31 in the primary cluster.

Comparison of Normalized Total Publication Scores (25%) The Publication Score is

Calculated based on the scores of scopus article Q1-Q4, scopus article non-Q, scopus non-article, scopus citation, scopus cited document, WoS document core Q1-Q4, WoS document core non-Q, WoS document non-core, WoS document cited, Garuda document S1-S6, Garuda document not accredited, Garuda proceeding, Garuda citation per paper, Garuda citation per lecturer, Garuda cited document, Google scholar document, google scholar citation per paper, google scholar citation per lecturer, google scholar cited document, textbooks, reference books, and monographs.

Muhammadiyah University of North Maluku obtained a score of 4.39, Pattimura University obtained a score of 2.27, Khairun University obtained a score of 2.16, Halmahera University obtained a score of 1.86. Indonesian Christian University of Maluku obtained a score of 1.53, Maluku Husada Health Sciences Institute obtained a score of 1.51, Pasifik Morotai University obtained a score of 1.16, State Polytechnic of Ambon obtained a score of 0.88, Darussalam Ambon University obtained a score of 0.61, Hein Namotemo University obtained a score of 0.59, Halmahera Peace Polytechnic obtained a score of 0.32, Kie Raha College of Education and Teacher Training obtained a score of 0.27, Institute of Technology and Business, Ambon School of Computer Science obtained a score of 0.19, Nuku University obtained a score of 0.18, Bumi Hijrah University Tidore obtained a score of 0.18, Doktor Husni Ingratubun Tual University obtained a score of 0.16.

Comparison of Normalized Total Intellectual Property Rights Scores (10%)

The Intellectual Property Rights Score is calculated based on the scores of patents, simple patents, trademarks, geographical indications, industrial designs, integrated circuit layout designs, trade secrets, plant variety protection, and copyrights. From the summary, Pattimura University obtained a score of 0.12, Khairun University obtained a score of 0.06, Hein Namotemo University obtained a score of 0.06, Indonesian Christian University of Maluku obtained a score of 0.05, Halmahera University obtained a score of 0.04, Pasifik Morotai University obtained a score of 0.03. As for Muhammadiyah University of North Maluku, Maluku Husada Health Sciences Institute, State Polytechnic of Ambon, Darussalam Ambon University, Halmahera Peace Polytechnic, Kie Raha College of Education and Teacher Training, Institute of Technology and Business, Ambon School of Computer Science, Nuku University, Bumi Hijrah University Tidore, and Doktor Husni Ingratubun Tual University, they all have a score of 0.

Comparison of Normalized Institutional Scores (15%)

The Total Institutional Score is calculated based on the number of scores for Accreditation of Study Programs A/Excellent/International, Accreditation of Study Programs B/Very Good, Accreditation of Study Programs C/Good, Accreditation of Study Programs D/Not Accredited, the number of accredited sinta 1 journals, the number of accredited sinta 2 journals, the number of accredited sinta 3 journals, the number of accredited sinta 4 journals, the number of accredited sinta 5 journals, the number of accredited sinta 2 journals.

From the summary, Pattimura University obtained a score of 1.29, State Polytechnic of Ambon obtained a score of 0.72, Khairun University obtained a score of 0.42, Halmahera Peace Polytechnic obtained a score of 0.37, Muhammadiyah University of North Maluku obtained a score of 0.06, Halmahera University obtained a score of 0.04, Indonesian Christian University of Maluku obtained a score of 0.04, Kie Raha College of Education and Teacher Training obtained a score of 0.03, Darussalam Ambon University obtained a score of 0.03, Pasifik Morotai University obtained a score of 0.03, Hein Namotemo University obtained a score of 0.02, Bumi Hijrah University Tidore obtained a score of 0.02, Nuku University obtained a score of 0.01, Maluku Husada Health Sciences Institute obtained a score of 0.01, Institute of Technology and Business, Ambon School of Computer Science obtained a score of 0.01, and Doktor Husni Ingratubun Tual University obtained a score of 0.

Comparison of Normalized Research Scores (15%)

The Total research score is calculated based on the number of scores for the following: number of research grants from foreign sources, number of research grants from external institutions, number of research grants from internal institutions, and total research funding in million rupiahs. From the summary, Pattimura University obtained a score of 1.33, Halmahera University obtained a score of 0.16, Pasifik Morotai University obtained a score of 0.1, State Polytechnic of Ambon obtained a score of 0.05, Khairun University obtained a score of 0.05, Halmahera Peace Polytechnic obtained a score of 0.05, Hein Namotemo University obtained a score of 0.05, Muhammadiyah University of North Maluku obtained a score of 0.04, Indonesian Christian University of Maluku obtained a score of 0.02, Darussalam Ambon University obtained a score of 0.02, Nuku University obtained a score of 0.02, Kie Raha College of Education and Teacher Training obtained a score of 0.01, and Maluku Husada Health Sciences Institute obtained a score of 0.01. Meanwhile, Bumi Hijrah University Tidore, Institute of Technology and Business, Ambon School of Computer Science, and Doktor Husni Ingratubun Tual University obtained a score of 0.

Comparison of Normalized Community Service Scores (15%)

The total community service score is calculated based on the number of scores for the following: number of international community service projects, number of national community service projects (external), number of local community service projects (internal institutions), and total community service funding in million rupiahs. From the summary, Pasifik Morotai University obtained a score of 0.04, and Halmahera University obtained a score of 0.02. Meanwhile, Pattimura University, State Polytechnic of Ambon, Khairun University, Halmahera Peace Polytechnic, Hein Namotemo University, Muhammadiyah University of North Maluku, Indonesian Christian University of Maluku, Darussalam Ambon University, Nuku University, Kie Raha College of Education and Teacher Training, Maluku Husada Health Sciences Institute, Bumi Hijrah University Tidore, Institute of Technology and Business, Ambon School of Computer Science, and Doktor Husni Ingratubun Tual University did not receive a score.

Comparison of Normalized Human Resources (HR) Scores (15%)

The total human resources score is calculated based on the number of scores for the following: international journal reviewers (individuals), professor lecturers, chief lecturers, lecturers, assistant lecturers, and non-teaching staff. From the summary, State Polytechnic of Ambon obtained a score of 11.8, Khairun University obtained a score of 11.32, and Pattimura University obtained a score of 11.03. Indonesian Christian University of Maluku received a score of 7.55, Kie Raha College of Education and Teacher Training received a score of 7.49, and Halmahera University received a score of 7.33. Muhammadiyah University of North Maluku obtained a score of 7.13, Darussalam Ambon University received a score of 5.96, and Halmahera Peace Polytechnic received a score of 5.66. Nuku University obtained a score of 5.24, Pasifik Morotai University received a score of 3.94, and Hein Namotemo University received a score of 3.91. Maluku Husada Health Sciences Institute obtained a score of 3.26, Bumi Hijrah University Tidore received a score of 3.11, Doktor Husni Ingratubun Tual University obtained a score of 2.34, and Institute of Technology and Business, Ambon School of Computer Science received a score of 2.17.

Conclusion

From the above discussion, it can be concluded that out of 1,045 universities included in the university clustering, only 44 universities belong to the independent cluster, 192 universities belong to the main cluster, 309 universities belong to the intermediate cluster, and 500 universities belong to the primary cluster. There are no universities in the independent cluster for both Maluku and North Maluku Utara provinces. In the province of Maluku, there are 2 universities in the main cluster, 1 university in the intermediate cluster, and 4 universities in the primary cluster. In the province of North Maluku, there is 1 university in the main cluster, 3 universities in the intermediate cluster, and 5 universities in the primary cluster.

The total score for each evaluation category is ranked for the top 3 universities. In the Publication category, the universities with the highest scores are Muhammadiyah University of North Maluku with a score of 4.39, Pattimura University with a score of 2.27, and Khairun University with a score of 2.16. For the intellectual property rights category, Pattimura University obtained a score of 0.12, Khairun University with a score of 0.06, and Hein Namotemo University with a score of 0.06. In the Institutional category, Pattimura University scored 1.29, State Polytechnic of Ambon with a score of 0.72, and Khairun University with a score of 0.42. For the research category, Pattimura University scored 1.33, Halmahera University with a score of 0.16, and Pasifik Morotai University with a score of 0.1. In the community service category, Pasifik Morotai University obtained a score of 0.04, and Halmahera University with a score of 0.02. As for the human resources category, State Polytechnic of Ambon scored 11.8, Khairun University with a score of 11.32, and Pattimura University with a score of 11.03.

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