Mapping the Strength of Research in the Focus Areas for Information and Communication Technology based on SCOPUS 2014 – 2018

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Abstract. Higher education is one of the most critical stages of education in a country. Most experts in various fields become proficient through higher education. Therefore, providers of tertiary education or tertiary institutions must continuously improve the quality of their education. One way to improve its quality is by mapping university excellence. This mapping was held to see the advantages of each provider in Indonesia. As an education center, as well as a research center, one that can be used as a basis for mapping is scientific publications. In this study, the superiority to be seen refers to RPJPN 2005-2025 and RPJMN 2015-2019 and mapping based on journals in SCOPUS 2014-2018, which focuses on Information and communication technology. This mapping was carried out by the Ministry of Research, Technology and Higher Education, Republic of Indonesia (KEMENRISTEKDIKTI) with an assignment research scheme for strategic policy studies with a focus on information and communication technology. The results of the research discussion conclude that ITB (Bandung Institute of Technology) which has the most of total journal publications for the field of Information and communication technology focuses on 1313 journal publications.

1. Introduction

Higher education is one of the most critical stages of education in a country. Most experts in various fields become proficient through higher education. Therefore, providers of tertiary education or tertiary institutions must continuously improve the quality of their education. One way to improve its quality is by mapping university excellence. This mapping was held to see the advantages of each provider in Indonesia. As an education center, as well as a research center, The Ministry of Research, Technology and Higher Education (Kemenristekdikti) using mapping as a basis for scientific publications.
The Ministry of Research, Technology and Higher Education (Kemenristekdikti), especially the Directorate-General of Research and Development (Risbang) has clustered Higher Education (PT) in the research field based on data from each PT, and one of the data is an international journal (indexed by Scopus). Higher Education is obliged to organize education, research, and community service [1]. Research in Higher Education is directed at developing science and technology, as well as improving the welfare of the competitiveness of people and nations. The results of the research must have benefits for the enrichment and learning of science and technology, improvement of the quality of higher education and the advancement of the nation's civilization, increasing independence, progress, and competitiveness of the nation, meeting the strategic needs of national development, and transforming communities into knowledge-based societies [2]. National standards of higher education are established to ensure the quality of higher education. One such standard is the national research standard. National research standards are used to measure the quality of research activities. This standard is also used as a minimum performance measure for research activities carried out by universities in Indonesia. In other words, there are rules on the minimum results that must be achieved for each research activity.

Every PT in Indonesia is trying to show its superiority. Moreover, the advantages of each PT are still limited to one side and are not based on good reasons. However, not all universities apply like that. In this case, several universities have been recognized by the community. To find out which universities are superior in the specific focus area, mapping is conducting in this research. The mapping results can provide information about how many universities have published international journals (indexed by Scopus).

To align Long-term research, it needs to be adjusted to the direction of national development related to science and technology. The National Research Master Plan (RIRN) 2017-2045 is ready to improve the efficiency and effectiveness of implementation, especially among Ministries / Institutions. There are 10 studies focused on RIRN, which are: Food-Agriculture; Energy - New and Renewable Energy; Health - medicine; Transportation; Information and communication technology; defense and security; Advanced material; Maritime; Disaster, and Social Humanities - Cultural Arts - Education. However, the parameters to determine the advantages of PT are not only seen from leading international journals (indexed Scopus) can also be seen from several other publications that are not contained in this study.

In this study, to map an Information and communication technology focus area using a frequency distribution. The frequency distribution itself is the arrangement of numerical data according to magnitude (quantity) or by category (qualitative) [3]. The advantage of using a frequency distribution is data presented in certain classes or categories together with the corresponding frequencies.

Therefore, research on mapping Information and communication technology focus areas is very beneficial for Kemenristekdikti, especially the Director-General of Research and Development in developing strategic policies.

2. Methodology

This study is using secondary data, which is the Scopus database 2014 - 2018 obtained from the Ministry of Research and Technology. The population in this study is the data collection of Scopus in 2014 - 2018. The sample taken in this study is the Scopus data of the Information and communication technology Focus Areas in 2014 - 2018.

2.1 Data collection

The data were collected from KEMENRISTEKDIKTI in scientific publications focus on Information and communication technology. The search covers the journal published from 2014 until 2018. In the beginning, the study uses the keywords “Information and communication technology”. The initial search keywords were limited to the title of the paper and the keywords.
2.2 Identify scopus data based on areas of focus in information and communication technology
The initial search keywords were limited to the title of the journal and the keywords. At first, 10,488 papers were derived using those combinations of keywords and the specific keywords to Information and communication technology.

2.3 Data analysis using a frequency distribution
The data from all universities that publish journals with a focus on Information and communication technology were analyzed using frequency distribution. The frequency distribution is useful to see the class division for universities that send the most journals in the 2014-2018 range on Scopus. The formula that frequency distribution is used in determining the class of journal publications such as 1) determine the range of data, 2) determine the classes, 3) determine the class interval.

Determine the range of data using the largest value and the smallest value. The data range is the result of the difference between the largest value and the smallest value of the existing data.

\[ R = X_{\text{max}} - X_{\text{min}} \]  
\[ R \] = Range  \[ X_{\text{max}} \] = Largest value \[ X_{\text{min}} \] = Smallest value

Where \( R \) is the data range; \( X_{\text{max}} \) is the largest value of the data; \( X_{\text{min}} \) is the smallest value of the data.

Sturges rules can be used in determining many classes. Sturges rules in this research methodology use a total of data.

\[ K = 1 + 3.322 \log(n) \]  
\[ K \] = Classes \[ n \] is the total of data

Determine the class interval or commonly called class length is the result of the difference from the largest data value minus the smallest data value then divided by the total of classes.

\[ P = \frac{X_{\text{max}} - X_{\text{min}}}{1+3.322\log(n)} \]  
\[ P \] = Class Length \[ R \] = Range \[ K \] = Classes

Where \( X_{\text{max}} \) is the largest value of the data; \( X_{\text{min}} \) is the smallest value of the data; \( n \) is the total of data.

3. Results and discussion
This study using secondary data of reputable journals (Scopus) in 2014-2018 which focus on Information and Communication Technology areas. The data from the focus area has an overall total of 10,488 data.

From the data obtained, frequency distribution will be made, then proceed with mapping into the low, medium and high categories of the number of universities based on the number of journals uploaded on Scopus. The results of the mapping areas shown in table 1.
Table 1. Frequency Distribution of Paper Published on Scopus

| No  | Interval | Frequency | Percentage |
|-----|----------|-----------|------------|
| 1.  | 1-132    | 451       | 96.8       |
| 2.  | 133-264  | 6         | 1.3        |
| 3.  | 265-396  | 3         | 0.6        |
| 4.  | 397-528  | 1         | 0.2        |
| 5.  | 529-660  | 1         | 0.2        |
| 6.  | 661-792  | 1         | 0.2        |
| 7.  | 793-924  | 2         | 0.4        |
| 8.  | 925-1056 | 0         | 0.0        |
| 9.  | 1057-1188| 0         | 0.0        |
| 10. | 1189-1320| 1         | 0.2        |
|     | TOTAL    | 466       | 100        |

Based on table 1, it can be seen that the majority of tertiary institutions in Indonesia or around 96.8% of the total tertiary institutions that publish Scopus indexed journals, amounting to 451 are only able to publish journals ranging from 1 – 132 publications. While universities that can publish journals ranging from 1189 - 1320 only amount to 1 college, or only 0.2% of the total number of universities that publish Scopus indexed journals.

Based on the analysis result, the government is expected to be able to make a sustainable policy regarding the number of publications, which is to make a minimum publication limit for a university, so that all universities will jointly competent in the standards set. Meanwhile, universities that have published journals in large numbers are expected to be given awards by the government, so that these universities can maintain and even increase the quality and quantity of their research.

Table 2 Higher Education with the Most Number of Publications

| Ranking | University          | Total Publication | Sub-Focus Research                                      | Total Publication |
|---------|---------------------|-------------------|---------------------------------------------------------|-------------------|
| 1       | ITB                 | 1313              | ICT infrastructure development                          | 611               |
|         |                     |                   | Development of artificial intelligence-based systems    | 152               |
|         |                     |                   | Open Source based system/platform development           | 195               |
|         |                     |                   | ICT device technology and ICT support                    | 172               |
|         |                     |                   | Technology for improving ICT content                     | 183               |
|         |                     |                   | ICT infrastructure development                          | 388               |
|         |                     |                   | Development of artificial intelligence-based systems    | 125               |
| 2       | UI                  | 861               | Open Source based system/platform development           | 150               |
|         |                     |                   | ICT device technology and ICT support                    | 92                |
|         |                     |                   | Technology for improving ICT content                     | 106               |
|         |                     |                   | ICT infrastructure development                          | 357               |
| 3       | TELKOM UNIVERSITY   | 794               | Development of artificial intelligence-based systems     | 78                |
|         |                     |                   | Open Source based system/platform development           | 117               |
|         |                     |                   | ICT device technology and ICT support                    | 128               |
|         |                     |                   | Technology for improving ICT content                     | 114               |
Based on table 2, we can see that ITB (Bandung Institute of Technology) is a university with the highest number of journal publications which is 1313, then UI (University of Indonesia) stated in second ranks with 861 publications, and Telkom University stated in the third ranks with 794 publications. Therefore, universities with the most journal publications are ITB, with 611 publications dominant on focus research in the field of ICT infrastructure development. UI with 388 publications for dominant research focus in the field of ICT infrastructure development and TELKOM UNIVERSITY which has a dominant research focus in the field of ICT infrastructure development with 357 publication journals.

4. Conclusion

Based on the analysis described in the discussion chapter, the following conclusions are obtained: The majority of universities in Indonesia or about 96.8% of the total universities that publish Scopus indexed journals are only able to publish in small amounts, which is only between 1 - 132 publications in the range of more less 5 years. While universities that can publish journals range from 1189 - 1320 only amount to 1 college, or only 0.2% of the total number of universities that publish Scopus indexed journals.

It stated that ITB (Bandung Institute of Technology) was the university with the highest number of journal publications in the Information and communication technology focus area, which has 1313 publications. UI (University of Indonesia) placed on second-ranked with total publications of 861, and TELKOM UNIVERSITY in the third-ranked with total publication 794 of journal Scopus indexed.

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