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Research mapping in North Sumatra based on Scopus

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Abstract. Research is needed to improve the capacity of human resources to manage natural resources for human well-being. Research is done by institutions such as universities or research institutions, but the research picture related to human welfare interests is not easy to obtain. If research can be proven through scientific publications, scientific research publication databases can be used to view research behaviour. Research mapping in North Sumatra needs to be done to see the suitability of research conducted with development needs in North Sumatra, and as a presentation is the Universitas Sumatera Utara which shows that research conducted has 60% strength, especially in the exact sciences.

1. Introduction

There has been a gap in the competence of human resources between North Sumatra and other provinces in Indonesia [1]. This is also in line with Indonesia's lower human development index compared to the overseas state, and it certainly affects the level of economic growth and the level of people's welfare. Dissent with it, in other words, the rich natural resources have no effect on improving the social welfare of the community, with which social engineering plays a role as object of unusual crime [2].

Social engineering aims to improve the quality of human resources, one of which is by increasing the knowledge of community members [3]. North Sumatra as one of the provinces in Indonesia has a large population, which is in fourth place in Indonesia, or 13,527,937 people (census of 2014), which is psychologically significant to the improvement of the Indonesian economy [4]. The low human development index of North Sumatra is caused by the inadequate knowledge of the community and its ability to process natural resources [5]. While the ability to process natural resources is obtained through research and development that runs in college. University of North Sumatra is one of the state universities in North Sumatra Indonesia [6]. Therefore, research abilities in universities should synergize with natural resources to benefit the community. This paper aims to map the research potential of the North Sumatra based on Scopus indexed scientific publication as a proof that the research has been done.

2. Problem Definition

In the Scopus database [7] there are 6 (six) institutions in North Sumatra that have produced Scopus index documents (July 2017), i.e.

a. Universitas Sumatera Utara (University of North Sumatra) or abbreviated to USU with 867 documents.
b. Indonesian Oil and Palm Research Institute with a total of 23 documents.
c. University of North Sumatra Medical School (this is as an affiliation name mistake made by the author so it is not included as a scientific paper from Universitas Sumatera Utara) with a total of 10 documents.
d. Islamic University of North Sumatra as many as 9 (nine) documents.
e. Universitas Sari Mutiara Indonesia as many as 9 (nine) documents.
f. Nias District Health Department - Indonesia has only 1 (one) documents.

The University of North Sumatra therefore is reasonable to represent the existing research in North Sumatra. Moreover, the research power of Universitas Sumatera Utara lies in 15 faculties plus one graduate school: Medicine, Law, Agriculture, Engineering, Economics and Business, Dentistry, Cultural Sciences, Mathematics and Natural Sciences, Social Science and Political, Pharmacy, Public Health, Psychology, Nursing, Computer Science and Information Technology (Fasilkom-TI), and Forestry, whereby the spearhead of strength is in 156 study programs that supported by the research institution [6].

For example, at Medicine Faculty of USU, there are courses and departments: clinical, tropical, nutritional, biochemical, histology, physiology, pharmacology, microbiology, parasitology, anatomy, community, eye diseases, internal diseases, neurological diseases, skin and venereal diseases, tht (ear-nose-throat) diseases, anesthesiology and reanimation, surgery, child health, orthopaedic surgery and traumatology, heart and blood vessel disease, anatomical pathology, clinical pathology, psychiatry, and neurosurgery (http://www.usu.ac.id/program-studi.html). Thus the description of the power distribution of the study program reflects the strength of medicine faculty. In this case, accreditation of the study program of neurosurgery department is A, it is to demonstrate that potential of its alumni in an international scale. However, it is necessary to consider the strength or superiority of research related to the intended study program, and among all of same study programs is quite competitive, it should be observed portrait of the related research.

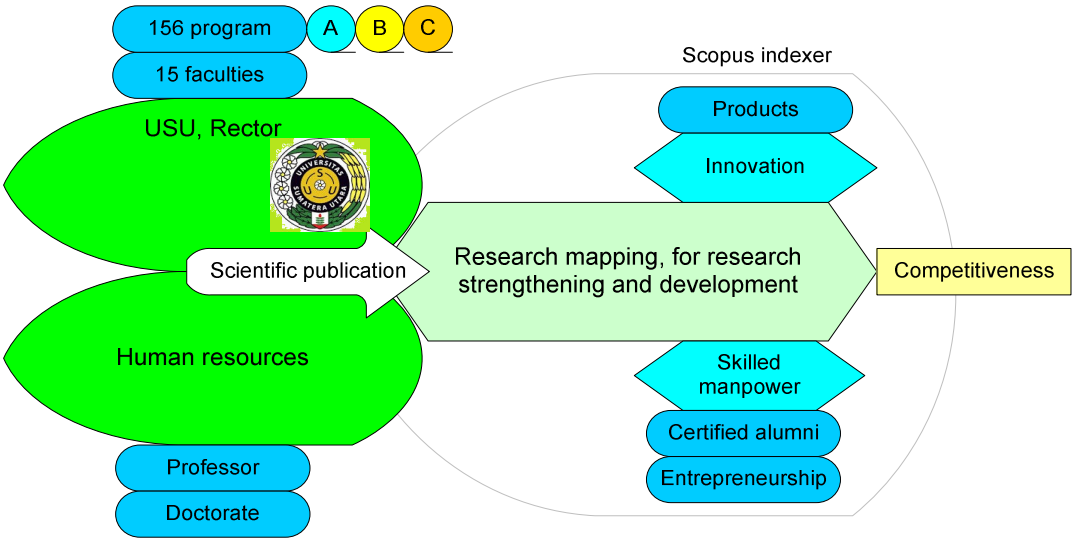


Figure 1. Research mapping of North Sumatra depends on USU.

Research mapping based on research outcomes such as Scopus index documents provides an overview of the growing research portrait at a university. Scopus-indexed document is one of the

parameters of the existing potential in USU as representation of North Sumatra to field of science and technology, or the knowledge and its development [8, 9]. As discussed in order to spur the presence of appropriate technology or research products in the community, or products that can improve the welfare of the community, the excellent centre is developed which ultimately leads to produce a number of scientific papers: scientific publications, patents and intellectual property rights. Furthermore, in implementation of downstream policy of research will appear related small businesses or industries associated with it [10].

Table 1. Description of faculties in USU

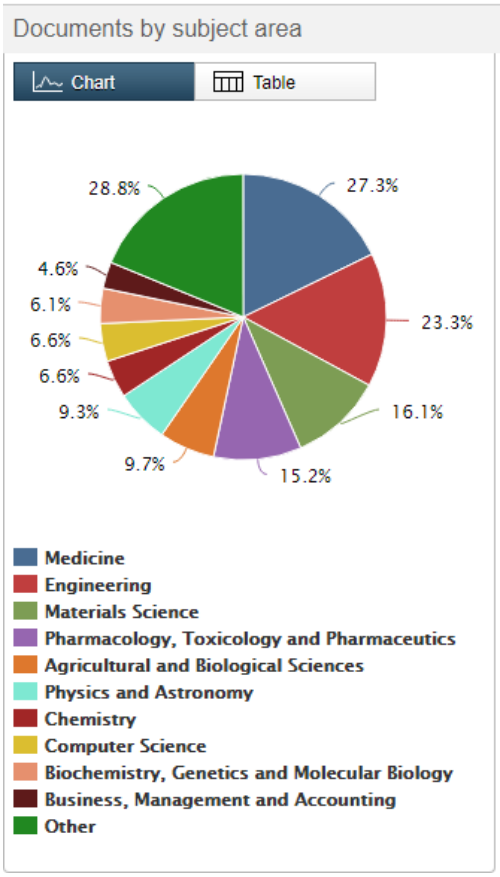
No	Faculties	Subject area based on study program - department	Totality
1.	Medicine	clinical, tropical, nutritional, biochemical, histology, physiology, pharmacology, microbiology, parasitology, anatomy, community, eye diseases, internal diseases, neurological diseases, skin and venereal diseases, tht (ear-nose-throat) diseases, anesthesiology and reanimation, surgery, child health, orthopaedic surgery and traumatology, heart and blood vessel disease, anatomical pathology, clinical pathology, psychiatry, and neurosurgery	25
2.	Law	law science, notariat, economic law, international law, state administration, civil, state, and criminal.	8
3.	Agriculture	agricultural science, agro-technology, soil science, aquatic resources management, agribusiness, food science, food technology, livestock science, agricultural engineering.	9
4.	Engineering	mechanical, electrical, civil, chemical, industrial, factory management techniques, industrial mechanical technology, civil engineering sciences, chemical analysis, architecture, urban, and environmental.	12
5.	Economic and Business	economics, development economics, development studies, management, management sciences, secretarial, financial, accounting.	7
6.	Dentistry	dental education, dental professions, periodonsia, orthodontics, and prosthodontics.	5
7.	Cultural Sciences	linguistic sciences, Indonesian literature, regional literature: Batak, Malay, Arabic literature, English and English literature, history, ethnomusicology, creation and study of art, literature and Japanese language, library science, Chinese literature, tourism.	13
8.	Mathematics and Natural Sciences	physics, chemistry, factory instrumentation technology, metrology and instrumentation, mathematics, statistics, informatics engineering, and biology	8
9.	Social Sciences and Political	sociology, social welfare science, taxation, state administration, communication science, social anthropology, political science, commercial administration.	8
10.	Public Health	Public health sciences, environmental health management, administration and health policy, public health, population and biostatistics, epidemiology, public health nutrition, occupational safety and health, environmental health, health education and behavioural sciences.	10
11.	Pharmacy	pharmaceutical science, pharmaceutical and food analyst, pharmacist profession and education, pharmaceutical pharmacology, pharmaceutical chemistry, pharmaceutical biology, and pharmaceutical technology.	7
12.	Nursing	nursing science, nursing, ners, profession, educator midwife, soul and community nursing, nursing maternity an child, nursing basic medical surgery.	7
13.	Psychology	science and professions, industry and organization, clinical, educational, general and experimental, developmental, social.	7
14.	Fasilkom-TI	computer science, informatics engineering, and information technology	3
15.	Postgraduate	management, property management, science management of natural and environmental sub lay, science of regional and rural development planning, development studies, natural resource and environmental management, regional and rural development planning.	7

3. An Approach

To map the strength of research in an institution there are several parameters to consider: human resources, availability and budgetary adequacy, dissemination and overlapping of activities or cooperation, and partisanship. These parameters have constraints, i.e. resource productivity, regulation, research performance, research strength, natural or local resources, and the strength of graduate students [11, 12]. Institutionally, qualified university is an institution that has the ability to conduct research. Research is carried out by qualified human resource, such as qualified physician

lecturers supported by funding, otherwise funds that spent without any outcomes in the associated resources not having sufficient, then the human resource is not competence as a quality resource [13]. Quality resources lead to the emergence of skilled workers (alumni) who are able to produce products and innovation. The determinant factor of human resources are qualified if they produce scientific publications, intellectual property, patents, and books as research outputs, see Fig. 1.

Research outcomes through information technology can be easily accessed, but difficult to understand well immediately [14]. Information about scientific publications or scientific papers can be obtained either by involving search engines directly to researchers, or accessing database online [15,16]. For example, through the Google search engine the name of the author of the scientific papers "Opim Salim Sitompul" resulted in hit count 29,000 with various recording activities, while through Google Scholar there are 209 hits relating to the document, whereby the citation recorded as 61. While the database data publication field of computer science or dblp computer science bibliography only presents 3 scientific papers [17]. If we collect several authors from an institution and the appropriate information about them, it can be representative of the institution as a whole. The field that develop will be visible from the continuity of the writings of the related authors. Therefore, the development of research can be seen directly through the database of scientific publishing indexers, such as DBLP, Scopus or others. Thus, to map the research in North Sumatra, we collect scientific papers from Scopus database based on affiliation (Medan for North Sumatra). As research mapping, the strength of the research is tailored to the description of the faculty at USU by involving the measurement of similarity [18].



(a)

	Subject area	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
2	Total	187	103	62	39	28	22	16	12	7	6
3	Medicine	31	22	7	8	5	5	4	2	2	1
4	Biochemistry, Genetics and Molecular Biology	11	4	3	1	3	3	3	2		1
5	Immunology and Microbiology	1	2	1		1					
6	Agricultural and Biological Sciences	17	12	5	8	9	3	3	3	2	
7	Energy	3	2		5	1		1			
8	Materials Science	16	4	2	3	3	1	1			2
9	Economics, Econometrics and Finance	20	2	1	1	1			1		
10	Social Sciences	11	4	1	1			1	1		
11	Pharmacology, Toxicology and Pharmaceutics	46	33	22	4	1			1		
12	Decision Sciences	2									
13	Mathematics	11	1	3	1	1		3	2		
14	Physics and Astronomy	11	3	2	9	3					
15	Engineering	23	23	11	7	5	5	5		2	2
16	Chemistry	20	9	7	4	2		1			
17	Chemical Engineering	13	8	6		2	1		1		
18	Dentistry	1			1	1					
19	Arts and Humanities	6									
20	Nursing		1		1						
21	Computer Science	16	7	3	2	1	1	1		1	2
22	Environmental Science	11	3	3	2		1				
23	Business, Management and Accounting	24	4	1	1	5			1		
24	Health Professions			1				1			
25	Multidisciplinary		1	2		1	2				
26	Earth and Planetary Sciences	4		1		1					
27	Psychology				1						
28	Veterinary		1								
29	Neuroscience	1									

(b)

Figure 2. Subject area based on scientific papers of USU in Scopus.

4. Discussion

The branches of knowledge developed at each faculty of Universitas Sumatera Utara [6] at most are in the medical faculty that is 25 subject areas, see Table 1. This is in line with the number of scientific papers indexed by Scopus still dominated by the medical fields, or most of 867 documents, see Fig. 2 (a) – July 2017. A lecturer in USU first has been produced document Scopus indexed records in 1970 in the Faculty of Medicine, since then the following years have sprung up though not many (1971, 1973, 1974, 1976, 1978, 1979, 1980, 1981, 1982, to present) USU produces documents gradually. Number of documents more than 10 papers first time in 1990, i.e. 17 documents, while previous years under 10 papers only that were dominated by medicine, but although not many some other subjects area also present their Scopus documents. Thus, there is a change of behaviour about research: ideas, concepts, and innovations in USU [10], which shows the change of research map a goal to meet the welfare society [19, 20].

By the time line, before 2012, not all subject areas (fields) that have emerged are able to produce the scientific papers, indicating that research in the field is not conducted or nothing is done, but on the medicine area continues to exist. The consistency of research in the various fields of science emerged one by one, see Figure 2 (b). This condition continues to be take place from 2012 until now (July 2017). Thus, almost all fields of sciences, especially the exact field is represented by scientific publications every year. But the weakness but seen in the field of social sciences, although the subject of new areas continue to emerge but only in the exact field not on social areas.

Although similarity [18] between the subject areas in Table 1 and Fig. 2 (b) are only about 60% roughly, it indicates that research services that may impact on the welfare of society come only from the presence of technology and exact sciences, but from the point of social policy change only few can be proven to exist. Therefore, social engineering is given only by technology factors or development of exact science in medicine and engineering.

5. Conclusion

Welfare comes from every human ability, the ability emerges from the knowledge they possesses. The development of knowledge gained from the implementation of research that is proven and disseminated through scientific papers. By comparing the strength of USU in faculty description with the growth of scientific publications from year to year in the Scopus databases according to the subject areas obtained the mapping research that developed in North Sumatra with a strength of 60% in the exact sciences mainly. Research mapping needs to be exposed so as to see the researcher's behavior as the next research.

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