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Analyzing Publication Productivity Using a Web-based System: A Preliminary Study

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Abstract

There is no automated system that collect Universiti Malaysia Sabah (UMS) academic staff publication from Scopus. Previously, data collection is made by retrieving the records from Scopus by searching for UMS affiliation and filtering by year. The data then is matched with Staff ID of the academic staff. This requires time and may lead to error because the work is done manually. In addition, the author name that are retrieved from Scopus may not be affiliated with UMS anymore, so the data is invalid. Thus, this paper highlights the significance of a project proposed as a platform for universities to gauge scholars' research productivity in the Scopus database. Data from Scopus were extracted, analyzed and visualized using criterions such as age, academic position, as well as teaching loads that may affect a scholar's research productivity. This paper focuses on the datest of academic staff from UMS, and their publication in Scopus, relative to their socio-demographic data.

Keywords: *Bibliometric analysis, Research Productivity & Lecturer's Productivity*

1. Introduction

With more than 30 years of experience in providing world class education, Malaysia is home to more than 100 public and private institutions offering tertiary education. Public institutions in are funded by the Malaysia government and directly under the purview of the Ministry of Education Malaysia (MOE). There are 20 public higher learning institutions in Malaysia. These institutions are segregated into three major groups i.e. Focused Universities, Research Universities and Comprehensive Universities. As the name implies, Focused Universities is comprised of institutions with focus on specific areas such as management, education, technical and defense [1]. Due to thei nature, institutions that falls under this group offers less courses than other universities, allowing them to concentrate on specific field of studies. On the contrary, institutions that belong under Research and Comprehensive Universities typically offer a lot of courses in various fields of studies. The difference between Research Universities and Comprehensive Universities are the research activities and output [2].

To gauge universities' research and innovation output, MOE developed the Malaysia Research Assessment (MyRA) instrument. To be fair, different metrics are used

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for different groups of universities. Due to their high research activities, Research Universities are assessed using MyRA II, while Comprehensive and Focused Universities are assessed using MyRA I. This preliminary study focuses on the sole public higher learning institution (HEI) located in Sabah, Malaysia. Universiti Malaysia Sabah (UMS), a comprehensive university was selected as the study location.

Being a comprehensive university, UMS has been actively engaged in research of various fields, attributed to the widely diverse knowledge of the academic staff in UMS. As of October 2019, the university have 2,212 affiliated authors and 4,780 documents on Scopus, covering a span of 27 subject areas that mainly focuses on agricultural and biological sciences, engineering, computer science, as well as environmental science. Figure 1 illustrates UMS's affiliation on Scopus.

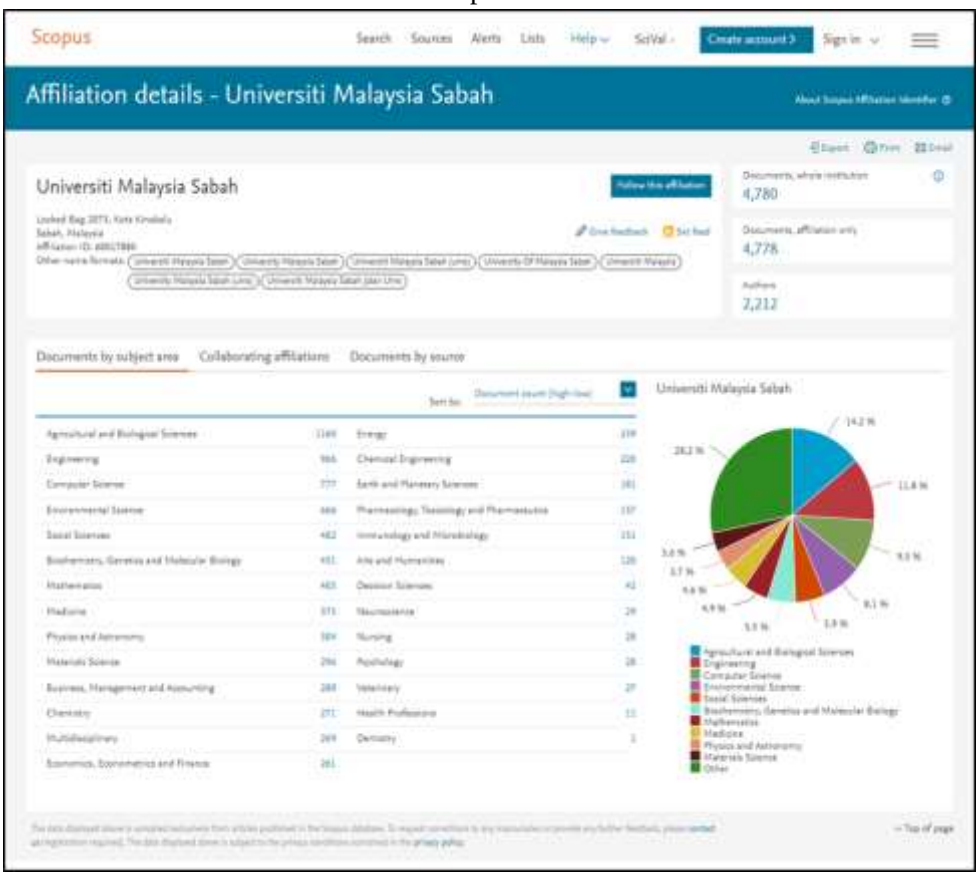

Figure 1: UMS Affiliation in Scopus (retrieved 17 October 2019)

It is worth noting that due to several limitations, this study focuses solely on academic staff in the Science and Technology (S&T) fields in UMS. This is due to the fact that in the university, academic staff from the S&T field tend to publish faster and more than those from non-S&T fields. Out of the 27 areas listed, less than 10 subject areas such as Arts & Humanities, Business, Management and Accounting, and Economics, Econometrics and Finance elong to non-S&T. There are also more S&T academic staff (628) as compared to their non-S&T counterparts (464). According to a recent study, humanities and social science scholars prefer to publish books that specific journal articles [3]. Based on these limitations, this study only considers publications by academic staff in S&T fields in UMS.

Other than Scopus, another online database that is commonly used to track academic staff's publications is Google Scholar. The wide coverage that Google Scholar offers make it a good source to monitor publications in the non-S&T fields [4]. Unlike Scopus, to date, Google Scholar still does not allow publications to be filtered according to

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institution. As of October 2019, manual search for UMS domain emails on Google Scholar returned with 838 authors with verified ums.edu.my domain. A stark difference from the 2,212 as reported by Scopus. It is worth highlighting that these number does not reflect active researchers in real-time as they include staff that may have been retired, terminated, deceased and even transferred to other institutions.

Scientific publications are highly crucial for knowledge sharing. New scientific findings must be reported as it is imperative in expanding exisiting knowledge of a particular research area. New findings are often published in peer-reviewed journals or reputable websites that can be accessible to other researchers, scholars, practitioners, and even the general public. Published works are cited as credible evidence of past work that was used to build upon future works, as well as to provide credit and acknowledge the work of past scholars. Citation count of a scientific publication is used to measure the impact of a paper in the research community [5]. Bibliometric is a systematic study that is used to measure the quality of scientific publications in terms of research growth, collaboration, and impact as well as the connectivity between research fields, departments, or authors [6] [7] [8].

The main bibliometric online databases are Scopus, Web of Science and Google Scholar [9]. As a preliminary study, this paper only observes and compare Scopus and Google Scholar due to the limited access to Web of Science (WOS). Table 1 summarizes the characteristics and functionalities of both databases.

Table 1. Comparison between Scopus and Google Scholar

Features	Scopus	Google Scholar
Number of journals	- 21,950 (as of August 2017) (Elsevier, 2017a)	N/A
Proceedings	- Over 8 million (Elsevier, 2017b)	N/A
Subject area	- Social sciences, health sciences, physical sciences, life sciences (Elsevier, 2017b)	All
Language	Mostly English (22% of titles on Scopus are published in languages other than English) (Elsevier, 2017b)	Various languages
Search functionality	- Search by documents, authors, affiliations or advanced search that has various operators and field codes. - Can filter search result by many categories.	- Search results are based on content and title of publications. - Limited Boolean operators. - Filter by year or can be done at advanced search.
Export	- Many methods including Excel (csv). - May limit information export by selecting fields.	- Before exporting, user need to add the records to My Library before exporting into BibTeX, EndNote, RefMan, RefWorks.

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Authors profile	- Automatically created by Scopus - Display total number of author's documents - Can directly export all documents by author	- Created by author - Does not display total number of author's documents
Citation	- Provides citation analysis by year range and export to Excel	- Does not provide citation analysis

After initial comparison of the two online databases, this study decided to use and analyze publication data from Scopus. The main purpose of this study is to analyze the research productivity of academic staff in UMS using several criterions. These criteria were identified based on reviews of past articles that analyzes publications (Table 2). As illustrated in Table 2, past research on publication productivity agreed upon several factors affecting productivity such as age, gender, experience, academic qualification, academic position, country graduated from, number of faculty members, as well as yearly research budget [10] [11] [12]. Therefore, these factors were used in this study.

Table 2. Previous studies on scientific publication analysis

Source	Method	Factors	Domain
[13]	Regression analysis and correlation coefficients	Degree/Academic title	Faculty of Political Science and International Studies, Nicolaus Copernicus University, Poland
		Teaching load	
[14]	Spearman's correlation test and the Mann-Whitney U test Tool: R-3.3.1	Gender	Social science and humanities researcher in Vietnam
		Age	
		Research experience	
		Leading role in publication	
[15]	Linear and non-linear regression analyses Tools: PASW Statistics 18 and GraphPad Prism 4.0	Number of faculty members	Akdeniz University, Turkey
		Amount of yearly research budget	
		Encouragement and motivation (policies)	
[16]	Data presented as frequency and percentage	Document and source type	Term "Industry 4.0"
		Year of publication	
		Language of documents	
		Subject area	
		Keyword analysis	
		Geographical distribution	

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		Number of authors	
[17]	Data presented as frequency and percentage by parameters	Gender	Library & Information Science (LIS) Professional in Dr. Babasaheb Ambedkar Marathwada University
		Types of research	
		Year	
		Rank list of authors	
		Age group	
		Language	
		Authorship pattern	
		Communication channel	
		Purpose of research	
		Financial support	
[18]	Data presented as frequency and percentage	Academic position	Academic staff in Universiti Teknologi Malaysia
		Age	
		Experience	
		Interest in research	
		Funding	
[19]	- Descriptive statistics for quantitative data - Transcriptions and categorization of patterns and themes for qualitative data - Findings presented by use of tables, percentages and frequencies	Academic qualification	Mwenge Catholic University, Tanzania
		Salary	
		Teaching policy	
		Resources	
[20]	Regression analysis	Gender	Norway
		Age	
		Academic position	
[21]	Logistic Regression	Age	Institut Teknologi Sepuluh Nopember (ITS), Indonesia

The researchers anticipate a massive collection of data will be obtain from Scopus. Although a recent study suggests Google Fusion Table were suitable for library data visualizations [22], Google has announced the retirement of the software by December 2019. Scholars have suggested that using Tableau will make it easier to generate charts, allowing for direct viewing after filter applications [23]. Tableau is a practical solution in academic library in addressing the problem of representing large datasets [24].

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2. RESEARCH METHOD

One of the biggest factors that dictate the choice of a methodology is the clarity and stability of the project requirements. Frequent changes in requirements after the project has started can ruin the progress against the real plan.

2.1 Data Collection

The first phase of this study is to collect the socio-demographic data of academic staff in the S&T fields in UMS and their Scopus publication data. There are a total of 1,092 active academic staff in UMS as of November 2019. The publication data were extracted using staff's Scopus Author ID. Figure 2 shows the flowchart of retrieving the Scopus Author ID. In the second phase, the researchers will retrieve the publication details of each academic staff and transfer the data to the main database.

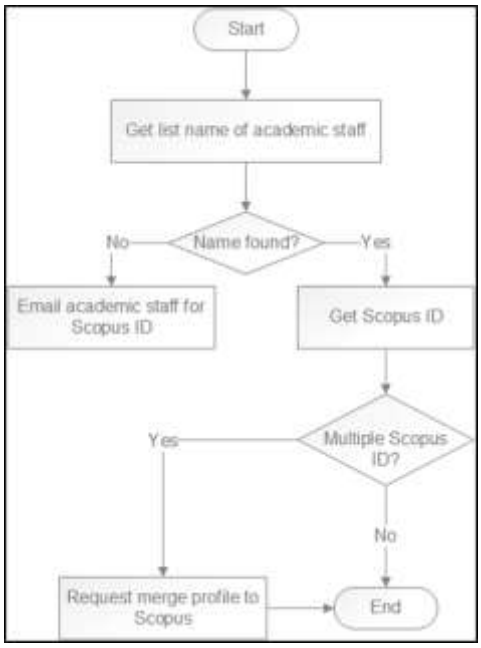

Figure 2: Flowchart of collecting Scopus ID

2.2 Evaluation

The system will be delivered to the user upon the completion. To evaluate the usability of the system, Computer System Usability Questionnaire [25] will be used. The questionnaire comprises of 19 questions on a 7-point Likert scale ranging from 1 being strongly disagree to 7 being strongly agree.

2.3 Results and Analysis

Table 3 to 7 summarizes the socio-demographic data of academic staff in the S&T fields in UMS.

Table 3 Academic staff by gender

Gender	Number of academic staffs	Percentage
Male	561	51.4%
Female	531	48.6%

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Table 4 Academic staff by age group

Age group	Number of academic staffs	Percentage
< 30	59	5.4%
31 – 40	429	39.9%
41 – 50	373	34.2%
51 – 60	161	14.7%
61 – 70	64	5.9%
> 70	6	0.5%

Table 5 Academic staff by faculty, institute and center

Faculty/Institute/Center		Number of academic staffs	Percentage
Science & technology field	FKI	64	5.9%
	FKJ	94	8.6%
	FPL	34	3.1%
	FPSK	168	15.4%
	FSMP	41	3.8%
	FSSA	122	11.2%
	IBTP	27	2.5%
	IPB	24	2.2%
	IPMB	30	2.7%
	PPST	24	2.2%
Science social field	FKAL	58	5.3%
	FKSW	107	9.8%
	FPEP	96	8.8%
	FPP	92	8.4%
	PPIB	111	10.2%

Table 6 Academic staff by academic position

Academic position	Number of academic staffs	Percentage
Professor	56	5.1%
Associate professor	158	14.5%
Senior lecturer	381	34.9%
Lecturer	376	34.4%
Post-doctoral	2	0.2%

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Fellow	61	5.6%
Teacher	39	3.6%
Tutor	5	0.5%
Others	14	1.3%

Table 7 Academic staff by Scopus ID

Faculty/Institute/Center		Has Scopus ID	No Scopus ID	Total number of academic staffs
Science & technology field	FKI	62	2	64
	FKJ	88	6	94
	FPL	22	12	34
	FPSK	93	75	168
	FSMP	33	8	41
	FSSA	107	15	122
	IBTP	26	1	27
	IPB	22	2	24
	IPMB	30	0	30
	PPST	21	3	24
Science social field	FKAL	26	32	58
	FKSW	44	63	107
	FPEP	55	41	96
	FPP	48	44	92
	PPIB	38	73	111

3. CONCLUSION

This paper discusses the limitations in gauging publication productivity in UMS using Scopus and Google Scholar. For futher works, the study proposes a web-based system that eases publication data collection, while simultaneously analyze and visualize the data using Tableu. Upon completion of this study, an analysis of publication productivity of S&T academic staff in UMS will be presented. Further research can also be extended the system to include publications from non-S&T academic staff. Prediction of staff's publication and citations can also be derived. Also, the development of prototypes to explore design alternatives rather than the actual new system.

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