OPEN ACCESS PUBLICATION OF UNIVERSITI SAINS MALAYSIA: A BIBLIOMETRIC ANALYSIS

[1a]Mohd Ikhwan Ismail, [1]Mohd Kamal Mohd Napiah, [2]Siti Roudhah Mohamad Saad, [1]Cik Ramlah Che Jaafar, [1]Noor Adilah Azmi, [1]Rosnani Ahmad, [1]Jamilah Hassan Basri, [1]Muhammad Akmal Ahmat, [1]A. Basheer Ahamadhu Ameer Sultan, [3]Farah Aisyah Jasni, [3]Nur Afifa Khairuddin, [3]Farah NurLiyana Ahmad Al-Munawar

[1]Senior Librarian
Hamzah Sendut Library, Universiti Sains Malaysia
[2]Assistant Chief Librarian
Hamzah Sendut Library, Universiti Sains Malaysia
[3]Industrial Trainee
Hamzah Sendut Library, Universiti Sains Malaysia

[a]Hamzah Sendut Library,
Universiti Sains Malaysia,
11800 USM,
Penang, Malaysia
+6046536317
ikhwanismail@usm.my

ABSTRACT

Open Access (OA) is the new publishing model that allows unrestricted access and reuse of research outputs. OA accelerates discovery in the sense that researchers can freely read and build on new findings based on other research. While public seems to welcome more involvement in OA among academics, many researchers are still discussing about the challenges that they face to publish with OA journals including the issue of article processing charge (APC) and the quality of OA journals. This paper examines several aspects relate to OA publication such as publication productivity, citation impact, subject coverage, and publishing cost of Universiti Sains Malaysia (USM) based on SCOPUS data from 2013 to 2015. The findings show that School of Medical Sciences, Physics and Pharmacy dominated the OA publications. Thus, it also indicates that science-based researchers are highly inclined towards publishing in OA as compared to non-science researchers. Top three OA journals in the list are Plos One (Multidisciplinary), Acta Chrystallographica Section E (Chemistry) and Electronic Journal of Geotechnical Engineering (Engineering, Geology). Most of the authors tend to publish in Quartile 3 journals (43%), followed by Q2 (28%), Q1 (16%) and Q4 (13%). However, with regard to citation impact per paper (average), every paper in Q1 journal received 6.25 citations, followed by Q2 (2.8 citations), Q3 (1.33 citations) and Q4 (0.87 citation).

The APC range of OA publication found to be from RM0 to RM15, 000 per paper. The study provides useful insights about OA publication among USM researchers which can guide other researchers who wish to engage with OA in the future. Further study can be done by interviewing authors, to further explore on the OA research funding, strategy in choosing OA journals to publish in and also the motivation in publishing with OA.

KEYWORDS: *Bibliometric, Open Access, Research Productivity, Research Impact, Academic Publishing*

INTRODUCTION

Open access (OA) journals began in the 1990s (Mashroofa & Senewiratne, 2016), has changed the landscape of scholarly publishing and has been vastly developed since 2002. Different authors have defined OA differently. According to OA philosopher, 'open access is digital, online, and free of most copyright and licensing restrictions' (Suber, 2012). Thus, the basic idea of OA publications is to remove access barriers and enable readers to access it free of cost. It gives authors and their works more visibility, readership and citations, and thereby increase impact of their research (Mashroofa & Senewiratne, 2016). Besides that, there are two routes to OA; the Gold and Green; the Gold route to OA deals with publications in OA journals which are peer reviewed and are accessible through internet without charges, and Green route to OA is self-archiving and delivered by repositories (Suber, 2012). In general, approximately 15% of articles in OA are being self-archived. To achieve 100% OA comprehensively, researchers' institutions and funders need to mandate self-archiving, as done presently (Gargouri, 2010).

OA scenario in Malaysia has been practiced immensely particularly in higher educational institutions through self-archiving using institutional repositories. Currently, many institutional repositories exist in Public and Private Universities and some has maintained good ranking in webometrics (Zainab, 2010). In Universiti Sains Malaysia (USM), the repository, known as Repository@USM serves as the main repository for storing a variety of electronic information materials such as articles from academic journals, books, theses, examination papers, research reports, photographs and others. It provides free access to the users and can be used freely for research and learning at the University. It also plays an important role to ensure continuity of intellectual property in the USM community. Instead of just a repository, the new paradigm of OA is publishing and sharing the information and knowledge without barriers.

RESEARCH OBJECTIVES

1. To identify the research productivity of USM authors with regard to publishing in OA journals.
2. To explore the scientific impact of USM's OA publications.
3. To identify the cost involved in publishing with OA journals.

RESEARCH QUESTIONS

1. What is the characteristics of OA publication productivity among USM authors?
2. What is the scientific impact of USM's OA publications?
3. How much does it cost for USM authors spend to publish in OA journals?

RESEARCH METHODOLOGY

Publication Data

SCOPUS is one of the largest citation databases of peer-reviewed academic materials especially journal article. Therefore, all publications were selected and derived from this database. The affiliation “university sains malaysia” is for searching publications in SCOPUS. The list of publications were then was filtered by year 2013 until 2015. The selection of document type from the database was “Article” for the purpose of this study. The “Article” in SCOPUS means publication in academic journal. The number of publications can be changed according to the frequency of indexing of the database by time to time. Hence, the publication data from this study were derived in November 2016.

SCImago Journal & Country Rank (SJR) is the platform to measure of scientific evaluation and influence of scholarly journal around the world. SJR also offers the indicator to any journal in the category of OA. Therefore, the list of publications from SCOPUS were merged to SJR to identify publications, which are OA that matches the journal title. However, one more step is required to identify the precise OA publication by inspecting the data in list one at a time because some of the OA journals in SJR are Gold OA based on the payment of specific fee by the author for OA publication. Consequently, some publications in the list were not OA even though listed in Gold OA journal.

Microsoft Excel was the main tool of analysis in this study. Moreover, after identifying all the publication data to be analysed, two methods were used; using manual counting and pivot table & chart. These methods were applied to study of distribution of authors, schools, and journal titles.

Citation Data

For each publication, the citation data was extracted from SCOPUS, Web of Science and Google Scholar. All the citations were counted one at a time from each platform and were determined by total citation in the period of collection of the publication data.

Subject Coverage

SJR is a platform to determine the subject for each publication. The subject is based on the journal title. There are two types of subject in SJR; subject areas and subject categories. The study selected subject categories as it is more specific rather than subject areas.

Publishing Cost

The Article Processing Charges (APC) for each publications were gathered from these platforms; Directory of Open Access Journals (DOAJ) and publisher's website. Some of OA journal were not indexed in DOAJ. Therefore, the information of APC were obtained from publisher's website. The method of this part was manual searching and counting.

LITERATURE REVIEW

Citations Impacts

Literature review on the issues of OA in recent years has gained pervasive use of the scientific evolutions due to the major changes in the way of publishing research results. Lawrence (2001) investigated that the citation impact of articles have been reported to receive higher citation rates compared to non-OA. Another related literature from Bernius and Hanauske (2009) stated on their simulation of the citation network found methods for an author to increase the citations when switching to OA. It suggests that the results of the simulation support empirical data regarding the increase in citations of articles published under an OA paradigm.

However, another related literature encountered a different view regarding OA that has no impact on the quantity of citations in the principal year after publication. These findings were based on a randomized controlled trial of 11 journals published by the American Physiological Society (Davis, 2008). Therefore new measures of research utilization and impact is needed for OA Publication, including citation and download counts, growth curves, and latencies; co-citation numbers; authority ranks, semantic indices and numerous other online performance indicators. These will be usable for navigation and evaluation as well as for analysing and predicting research headings and impacts (Hajjem, 2006).

A comparison study was conducted in utilizing the article usage data, citation and altmetric data for Nature Communications publication between OA and non-OA articles. From the point of view of static comparison, OA articles are highly considered than non-OA papers. OA articles could pull in support and consistent consideration, even after a long period of distribution. Interestingly, for the non-OA articles, most consideration occurs in the initial 30-day time span (1 month). The OA advantage exists for citation, as well as for article utilization. Compared with shorter time frame consideration for non-OA papers, OA is preferred as article utilization for lengthy era (Wang, 2015).

Publishing Cost

Publishing cost issues are among the main concern when dealing with OA. Van Noorden (2013) highlights in his papers that most open-access publishers charge fees that are much lower than the industry's average revenue, although there is a wide between journals. The largest open-access publishers - BioMed Central and PLoS - charge USD1,350-2,250 to publish peer-reviewed articles in many of their journals. In a survey published last year, economist Bo-Christer Björk of the Hanken School of Economics in Helsinki and psychologist David Solomon of Michigan State University in East Lansing looked at 100,697 articles published in 1,370 fee-charging open-access journals active in 2010, and found that charges ranged from USD8 to USD3,900. Higher charges tend to be found in 'hybrid' journals, in which publishers offer to make individual articles free in a publication that is otherwise paywalled. Outsell estimates that the average per-article charge for open-access publishers in 2011 was USD660. In addition, the reason that OA publishers have lower costs is simply that they are newer, and publish entirely online, so they do not have to conduct print runs or set up subscription paywalls.

Therefore, the following related literature regarding adoption of OA related costs is highlighted in this case study. DeGroff (2016) reported that recently, The Open Access Good Practice (OAGP) in a community-led support programme aims to produce a wide range outputs to develop and share best practice when implementing OA workflows, systems and procedures across UK higher education institutions (HEIs). The OAGP has adopted the new process to manage OA related cost as stated by Sonja Haerkoenen, Scholarly Publications Manager at Cardiff University in (DeGroff, 2016), encouraged institutions to share best practice for reporting and managing APCs. As a result, staff at Cardiff is planning to implement a different way of reporting and accounting for the APC payments, which positive will save time and therefore reduce administration costs. Open Access Librarian Liz Holliday from the University of Bath confirms Haerkoenen's mentions that the functional cost analysis of the APC payment process undertaken by the project partners 'allowed the four GW4 institutions to understand the costs and effort in each functional area of the payment processes'. Teplitzky (2016) states that researchers support the utilization of numerous subsidizing sources to pay APCs, although they feel that the university ought to offer more contributions that are prominent. The finding shows there were two variants that researchers perceived that the university ought to help with less financing. Researchers also felt that the university ought to offer monetary support for its OA policy to acknowledge the university's commitment in supporting the publications become more visible.

Subject Coverage

Lawrence (2001) mentions that the citation impact of conference articles in computer science reported higher citation rates for OA texts compared to non-OA articles. Similar findings were reported by Odlyzko (2002) in mathematics and Kurtz (2005) in astrophysics. Harnad (2004) also measured the impact of OA articles across all discipline and across time by sampling 12 years of publication for 14 million papers in the Institute for Scientific Information (ISI). The findings reveal a citation advantage of OA across all fields.

Serrano-Vicente (2016) posited that the choice to distribute in OA journals is firmly identified for academic reward and professional acknowledgement. In science, technology and medicine, publishing in journals encourage academic professions and considerable many of the journals are OA. Researchers in these areas are more inclined to publish their work in OA journals. In the humanities and sociologies, there are relatively few high-quality OA journals. Researchers in these regions either deposit their

research in the repository for institutional reasons or to accomplish greater visibility and citations. Thus, the finding from this study can further investigate and elaborate either science-based researchers are more inclined towards publishing in OA as compared to non-science researchers.

FINDING AND DISCUSSION

The data were analysed in the scientific method as a methodological basis in developing the analysis of results. The study applied some bibliometric indicators to describe the result considered as simple description. After the study of the journals, which were derived from SCOPUS from year 2013 until 2015, 1801 article titles found as OA publication and eventually were analysed to several scopes.

Distribution of Authors

FIGURE 1: Top 20 authors published in OA (2013-2015)

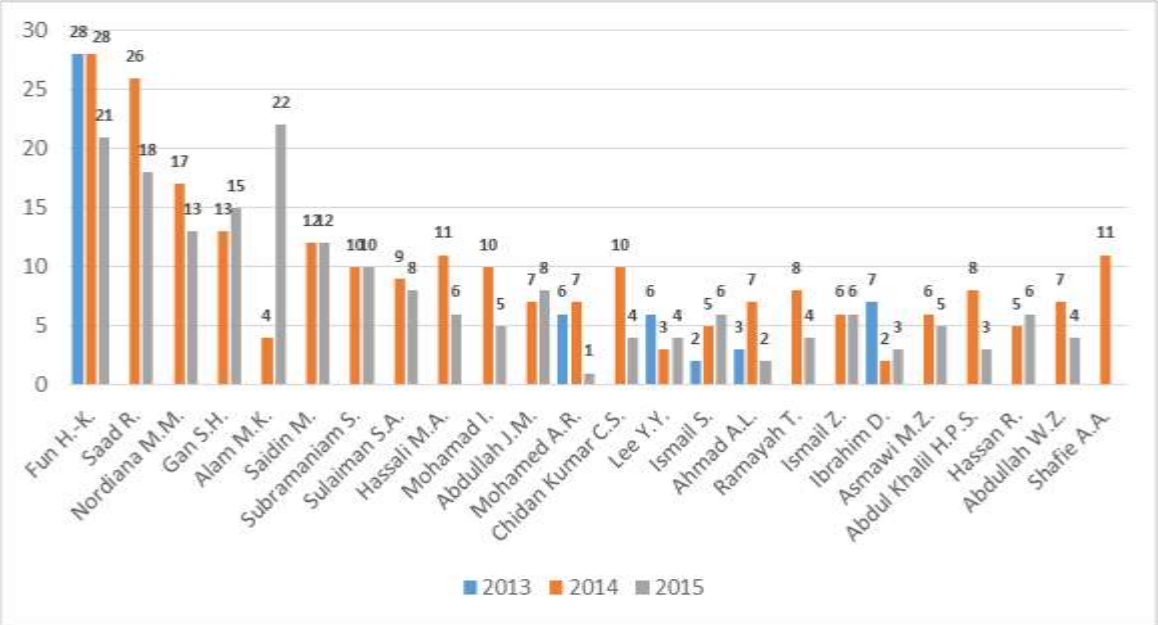


Figure 1 shows the top 20 authors known as academic staff in USM who had published their articles in OA journals. The data shows that most of the top 20 authors who published in OA journals are from the science field. However, Ramayah T. is one of the top 20 authors from the field of non-science. He majors in Management. Thus, it

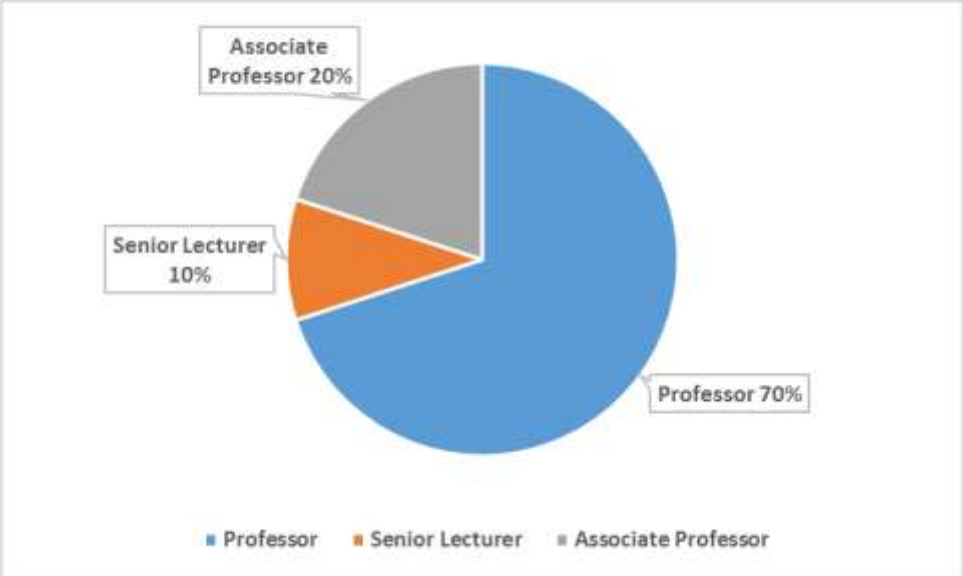
indicates that science-based researchers are more inclined towards publishing in OA as compared to non-science researchers.

The total number of authors published their articles in OA journals increased drastically from 25 authors in 2013 to 1106 authors in 2014. In 2015, the total number of authors decreased to 989. (MacKenzie-Cummins, 2012) had mentioned that the survey found about 26% said the authors had published with an OA publisher for a journal article. Many researchers were unaware of the concept of OA or, if they have heard of it, they remain largely in ignorance of its implications.

In 2013, it shows that Fun H.K. had the highest published articles with 28 articles published in OA, followed by Ibrahim D. with seven articles and Mohamed A.R and Lee Y.Y. sharing the number of published articles at six articles each.

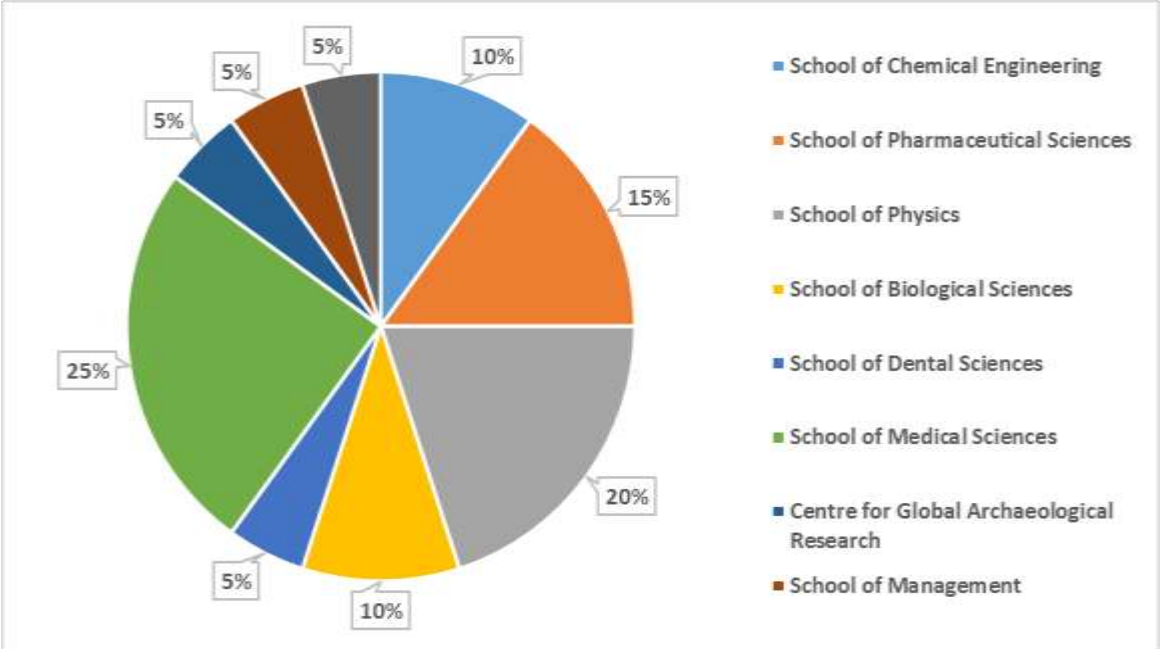
Meanwhile in 2014 and 2015, Fun H.K. again was the author who the highest published articles in OA (28 articles in 2014, 21 articles in 2015), followed by Saad R. (26 articles in 2014, 18 articles in 2015) and Nordiana M.M. (17 articles in 2014, 13 articles in 2015). Based on the study, it shows that Fun H.K. was the top author with published articles in OA journals from 2013-2015 with 77 articles.

FIGURE 2: Categories of top 20 authors published in OA (2013-2015)



From Figure 2, the study also classified the author by categories of academic staff. Professor, for instance, which is the largest percentage that published articles in OA journals (70%), followed by Associate Professor (20%) and senior lecturer (10%). In other words, the Professors dominated the OA publication among USM academic staffs and there is vast difference between the publications by Professors and Associate Professors.

FIGURE 3: Schools of top 20 authors published in OA (2013-2015)



The study further analysed to provide more details from top 20 authors published in OA based on school/center. As mentioned before, the study found that science-based researchers were highly inclined towards publishing in OA as compared to non-science researchers. Figure 3 shows that most authors published in OA are from the School of Medical Sciences (25%), followed by School of Physics (20%) and School of Pharmaceutical Sciences (15%).

Distribution of Schools

FIGURE 4: Top 20 schools/centers published in OA (2013-2015)

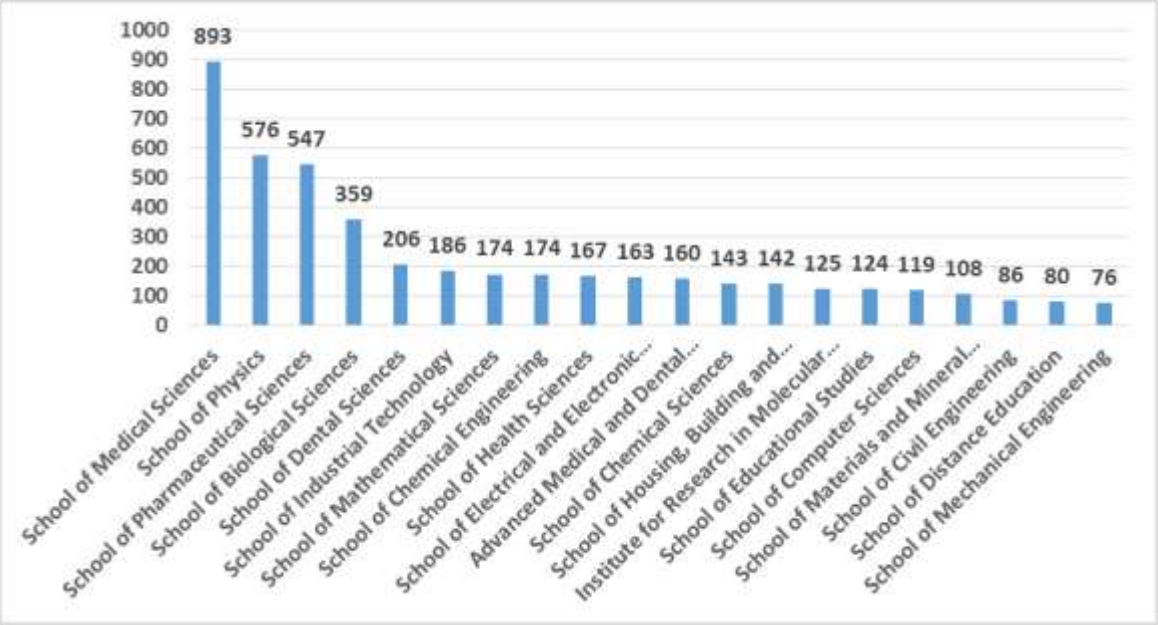


Figure 4 shows the top 20 schools/centers published in OA from 2013 to 2015. Overall, the graph shows that most of the Schools from science field either pure science or applied science. The study found that schools from the science field are moving towards OA publishing. As indicated in Figure 4, the data shows that the School of Medicine is ranked at number one among the 20 other Schools. It shows 893 the School of Medical Sciences has produced publications in OA journals. The difference between School of Medical Sciences and School of Physics is 317 publications. This difference is likely due to the need for dissemination of medical information to the public as mentioned by Grouse (2014). Medical research yields important and valuable information that benefits the people of the world. Furthermore, OA is particularly valuable for developing countries where limited financial resources have historically deprived health care professionals of the latest medical information.

Distribution of Subjects & Journal Titles

FIGURE 5: Top 20 journal titles published in OA (2013-2015)

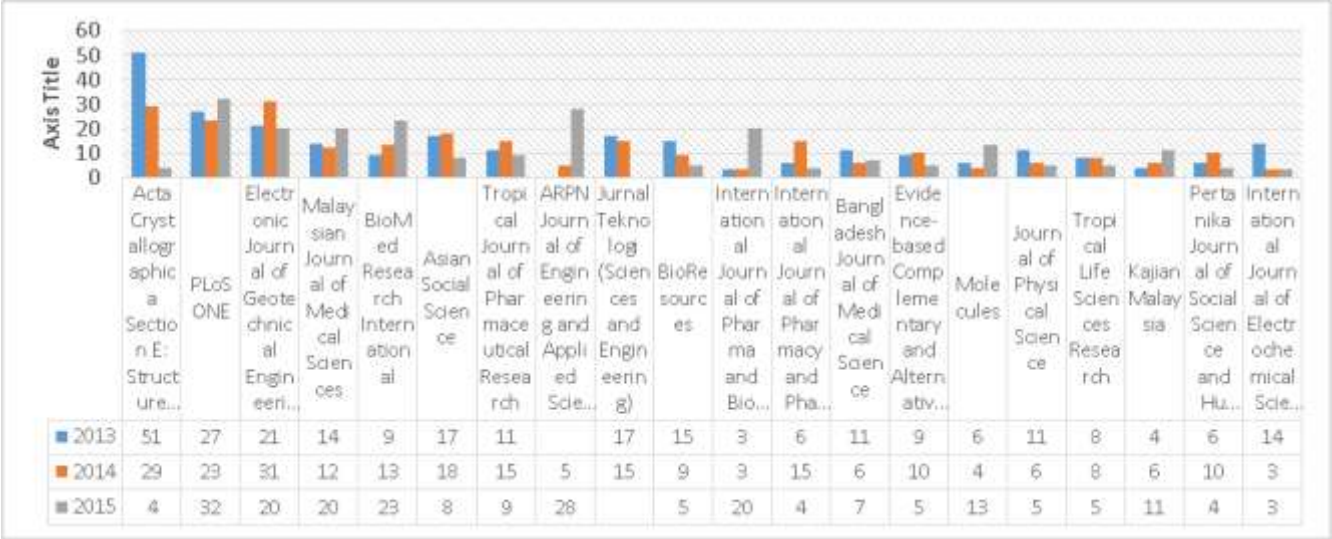
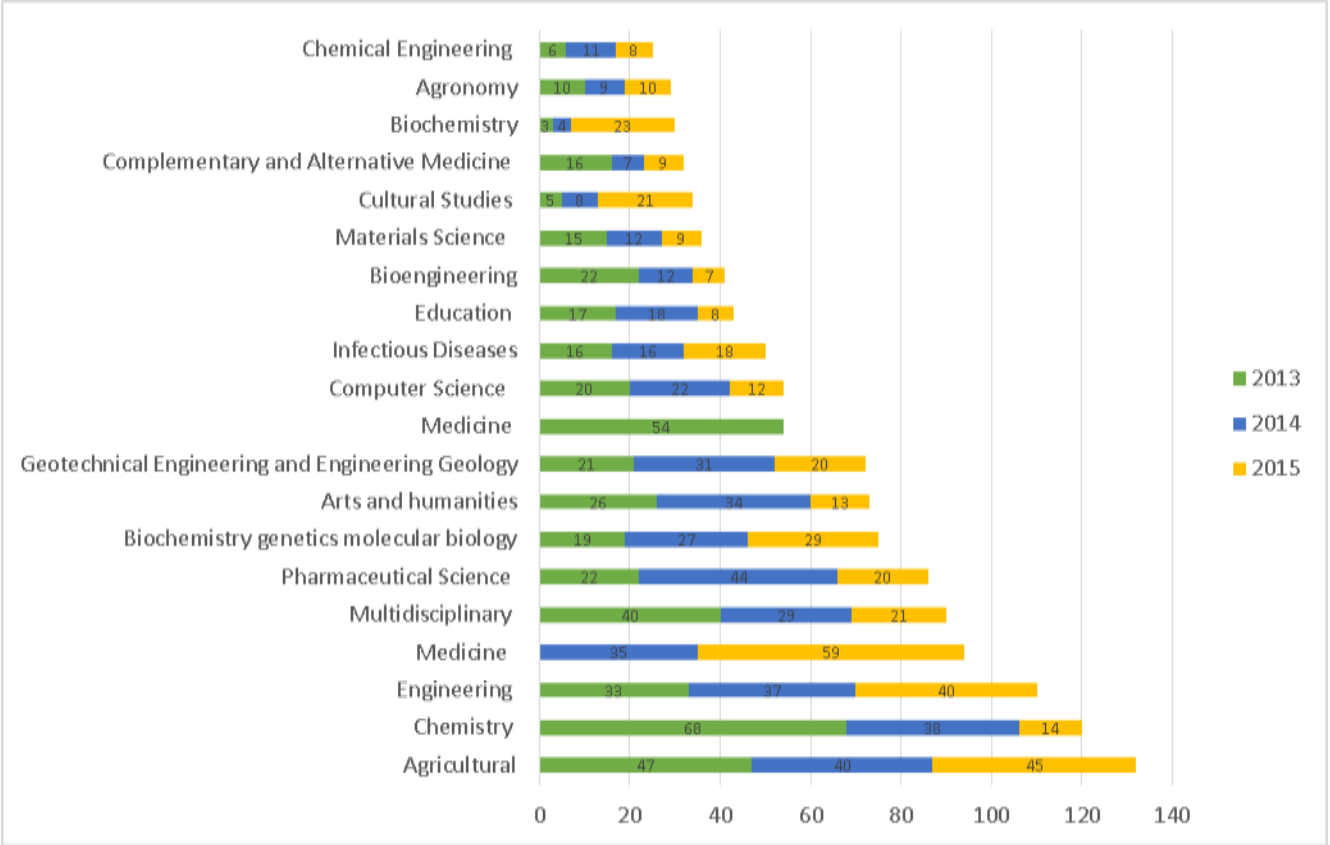


Figure 5 shows the top 20 journal titles published in OA from 2013 to 2015. The study found 454 journal titles from 1801 publications, whereby, the top three journal titles are Acta Crystallographica Section E: Structure Reports Online (84 publications), PloS One (82 publications) and Electronic Journal of Geotechnical Engineering (72 publications). On the other hand, the Malaysian Journal of Medical Sciences, which ranked at number four (46 publications), has shown disparity on numbers of publications with Electronic Journal of Geotechnical Engineering (72 publications), which is at the third rank, with 26 publications. Researchers illustrate that perceived journal's reputation; perceived visible advantage; perceived topical relevance; perceived career benefits; and awareness and familiarity have a relationship with intention to publish in OA journals stated by Masrek and Yaakub (2015).

Figure 5 depicts that majority of journal titles are science, technology, and engineering fields, respectively, except three titles, which are, inform the social sciences field. Those journals with impact factors has gradually risen (Poltronieri, Bravo, Curti, Ferri, & Mancini, 2016), either there are in Quartile 1, 2, 3 or 4. Moreover, the data illustrates the publication trend of USM researchers pertaining to their awareness and consistency for choosing OA as the publishing platform. In 2013, the total numbers of OA journals were 221 and increased to 228 in 2014. A slight decrease occurred in 2015 when 12 journal titles were not listed anymore, thus only 216 journal titles were available. In fact, APC,

citations and quartiles may become researchers' consideration before choosing the right journal for publishing their articles.

FIGURE 6: Top 20 subject categories published in OA (2013-2015)



The study identified 81 subject categories in 2013 with 632 publications. The following year shows a growth in subject categories; 95 subject categories and 628 publications by USM researchers. However, in 2015, it decreased to 90 subject categories with 542 publications. Figure 6 illustrates the Top 20 subject categories published in OA from 2013 to 2015. As shown in the graph, the three highest numbers of publications according to subject categories are dominant to agriculture, chemistry and engineering. In 2013, those three subject categories had good competition with 148 publications but then the number of publications decreased and reached at 115 publications. In 2015, the trend occurred where only 99 publications could be published in OA according to the top three subject categories.

Even though most of the subject categories of OA journals are from the sciences and engineering field, researchers from the arts and humanities categories had taken the

opportunities to commence with OA by having 73 publications in their subject category. Another subject category with similar trend is from the cultural studies with 34 publications. According to (Ismail, Napiah, & Ismail, 2013), many articles in their study were published in the science field as there are more core subjects in USM rather than non-science subject. However, nowadays it may due to the new agenda driven by the USM Top Management where their aim is to have STEAM (science, technology, engineering, mathematic, art) rather than only STEM (science technology, engineering, mathematic) (USM TV, 2017).

Distribution of Citations and Quartiles

TABLE 1: USM OA publications, citations and average (2013-2015)

QUARTILE	NO. ARTICLE	CITATION	AVERAGE CITATION PER ARTICLE
QUARTILE 1	297	1855	**6.25**
QUARTILE 2	496	1389	**2.80**
QUARTILE 3	778	1063	**1.37**
QUARTILE 4	230	200	**0.87**

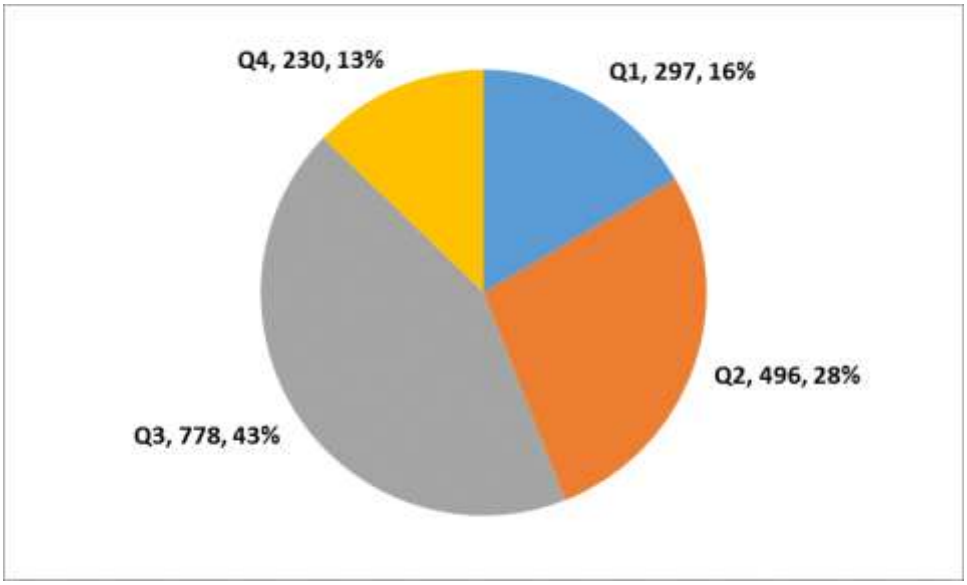
Journals are categorized into four different tiers, namely Quartile 1 (Q1), Quartile 2 (Q2), Quartile 3 (Q3) and Quartile 4 (Q4), which apparently is supposed to indicate their quality or tier in ranking. This is done based on the number of citations and the Impact Factor (IF) of the journal concerned. Q1 denotes the top 25% of the IF distribution, Q2 for middle-high position (between top 50% and top 25%), Q3 middle-low position (top 75% to top 50%), and Q4 the lowest position (bottom 25% of the IF distribution)

From the Table 1, there is a positive relation between the quartiles and the number of citations received. Based on the case study at USM, the articles published in high

quartile get more citations as compared to from the lower quartile. In terms of impact based on average citation per article, it is found that for every article published in Quartile 1, it obtains 6.25 citations. Next, it is followed by Quartile 2 with 2.8 citations, Quartile 3 (1.37 citations) and Quartile 4 (0.87 citation). Therefore, researchers are strongly advised to publish their articles in higher quartile in order to obtain more impact in the form of citations.

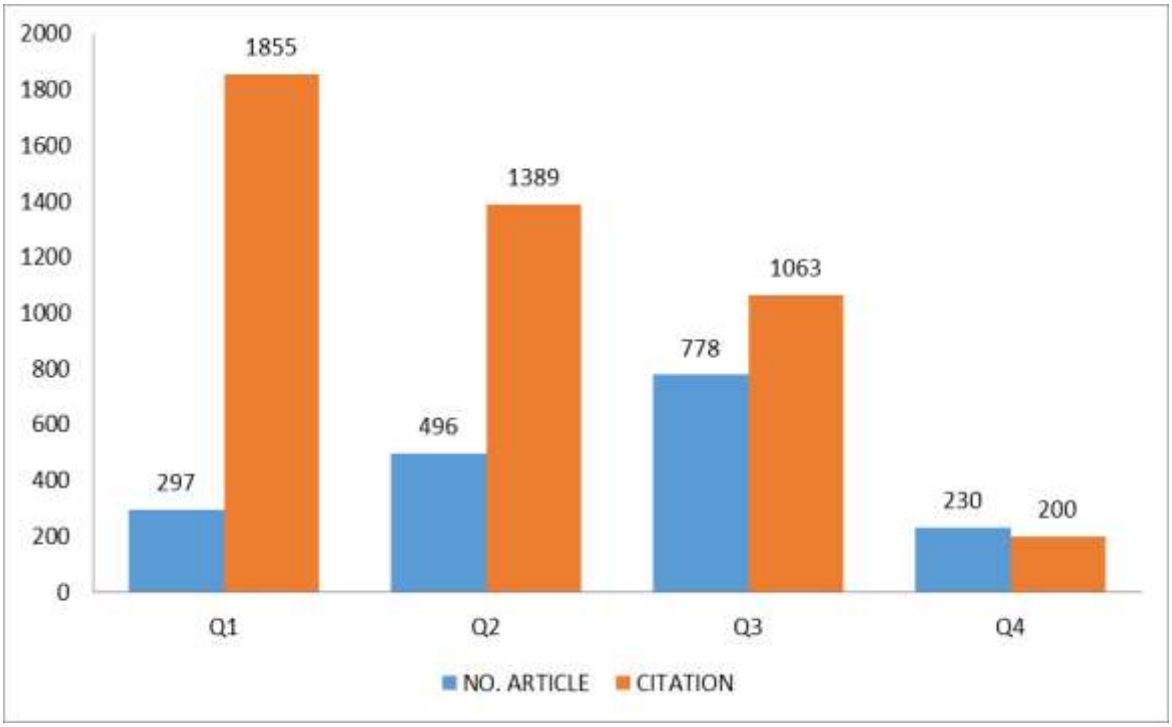
Another study by Napiah and Abrizah (2016) explored publication productivity and impact of 50 top Malaysian scientists in publishing with Quartile 1 journals. The study revealed that publication in Q1 correlates with quality and thus increases the scientific impact (citation); one may conclude that the amount of citations received would be mechanically inherited by the journal's importance or where it has been published.

FIGURE 7: USM OA publications based on quartile (2013-2015)



Based on Figure 7, this study found that most of the USM authors who published their papers as OA preferred to publish in Quartile 3 journals (43%), followed by Quartile 2 (28%), Quartile 1 (16%) and Quartile 4 (13%).However, there is no evidence on why it occurred, unless interview is done to explore the reasons.

FIGURE 8: USM OA publications and citations (2013-2015)



In the academic world, scientific impact of a scientific writing always refers to citations that it received. In the case of USM OA publication, it is found that the articles published in higher quartiles have more impact. From Figure 8, there were 297 articles published as OA in Quartile 1, and managed to obtain 1855 citations. Another 496 articles published in Quartile 2 with 1389 citations, followed by Quartile 3 with 778 articles and 1063 citations. Meanwhile, the number of citation for articles in Quartile 4 is much lower (200) compared to the number of articles (230). In other words for every article published in Quartile 4 received less than one citation on average.

TABLE 2: USM OA publications, citations and citation per article based on three citation databases (2013-2015)

Databases	Publication	Citation	Citation Per Article
SCOPUS	1801	4507	2.50
WOS	816	2426	2.97
Google Scholar	1708	7449	4.36

Out of 1801 OA articles under study extracted from Scopus, 816 articles appeared in Web of Science and 1708 indexed by Google Scholar. In term of scientific impact, Google Scholar received the highest number of citations (7449) which equals to 4.36 citations per article on average. However, even though Web of Science has a smaller number of publications and citations, but it is found that it has slightly higher citation per article (2.97) as compared to Scopus (2.50).

Article Processing Charges for Open Access Journals and its Expenses

There were enigmatic studies that showed who were the researchers and which universities have the highest numbers of published papers in OA journals, as well as which universities have big spending on public fund for APC to OA journals. However, a study by Solomon and Björk (2012) showed that whenever researchers want to publish an article in any journals listed in DOAJ; they would need to spend an average of USD904/MYR 3,797 for APC per paper. Moreover, the researchers in Biomedicine field that intend to publish an article in OA journals would need to pay expensive APC compared to others. The APC could reach more than USD1,500 /MYR 6,300 although the cost of online publishing actually could be break down to USD 100/MYR 420. However, it depends on the extra costs invested by the publishers toward each papers which combine additional activities for the learned society that patronage the journal as well as system development and maintenance (Van Noorden, 2013).

Nevertheless, USM as a public-funded university persist to investigate the general APC cost of OA journals under the USM researchers' budget especially during the year 2013 until 2015. It is important to know that USM work efficiently in budget spending and put a good value for research activities in the aspect of OA publishing expenses in the future. Hence, the study has been executed by analysing the APC statement of 1,801 articles written by USM researchers in 427 OA journals throughout the journals' website (as shown in Table 3). However, not all OA journals provided transparent APC statement on the journal's website (1,514 articles). There were still 287 articles written by USM researchers published in OA journals. . However, USM researchers already spent about USD 1,153,107.14/MYR 4,843,049.98 for whole articles published in OA journals on those three (3) conservative years. It also showed that total average of each paper cost USM USD640.25 /MYR 2,689.09 and majority of USM researchers spent the lowest APC between zero cost to USD237.85 /MYR 999.

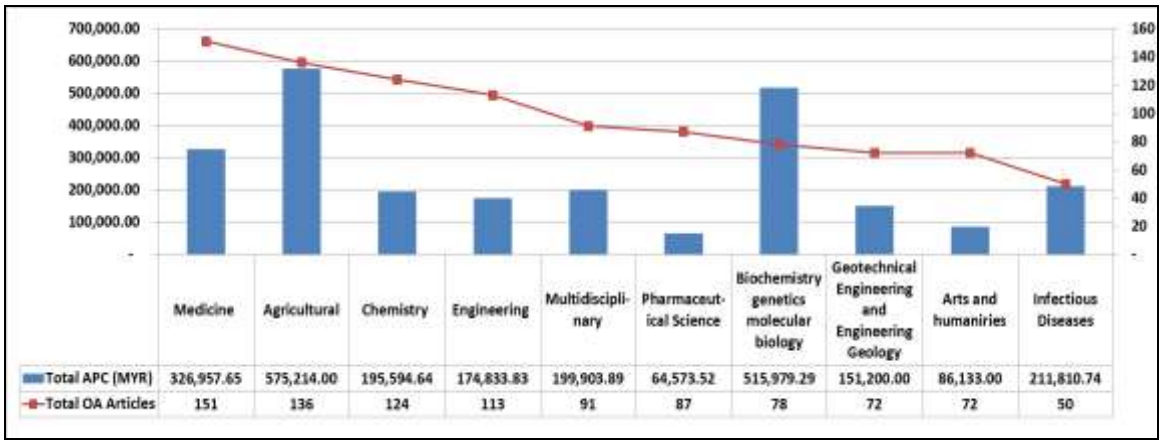
TABLE 3: Total cost of APC for USM OA publications (2013-2015)

APC Model	APC Range (MYR)	Total Article Titles	Total APC (MYR)	Average APC For Each Article (MYR)
GOLD/HYBRID	9000 and above	143	1,368,371.32	9,569.03
	6,000 to 8,999	294	2,146,283.98	7,300.29
	3,000 to 5,999	132	574,353.69	4,351.16
	1,000 to 2,999	344	561,276.9	1,631.61
	1 to 999	352	192,764.09	547.63
GREEN	0	249	0.00	0.00
	unknown	287	-	-
	TOTAL	**1,801**	**4,843,049.98**	**2,689.09**

Meanwhile, there were more variant discoveries about USM's APC expenditure as specific details were studied. The study discovered the total cost of APC for number of OA articles written by USM researchers based on SCImago subject categories, OA journal title names, USM authors and USM schools.

First, majority of USM researchers published articles in OA journals were based on science subject categories (as shown on Figure 9). The most active USM researchers that highly published OA journal articles were from Medicine research field with total amount of 151 articles. The spending amount for APC has cost USM about USD 77,847.06/MYR 326,957.65. On the other hand, the most expensive APC expenses paid by USM was Agriculture's researches with total amount USD 136,955.71/MYR 575,214.00. However, it was recorded as the second highest published OA articles (136 articles). Next, the second highest APC paid by USM were for the Biochemistry Genetics Molecular Biology's researchers. It cost USM to pay APC in total amount USD 122,852.22/MYR 515,979.29. Surprisingly, there was a huge gap record in terms of publication outputs. The number of articles wrote by USM researchers in OA journals of Biochemistry Genetics Molecular Biology subject category showed 78 articles only. This shows that USM researchers need to pay high APC when publish an article in Biochemistry Genetics Molecular Biology OA Journals compared to others. It cost USM to pay an average of USD 1,575.03/MYR 6,615.12 to publish one article in the stated subject category of OA journals.

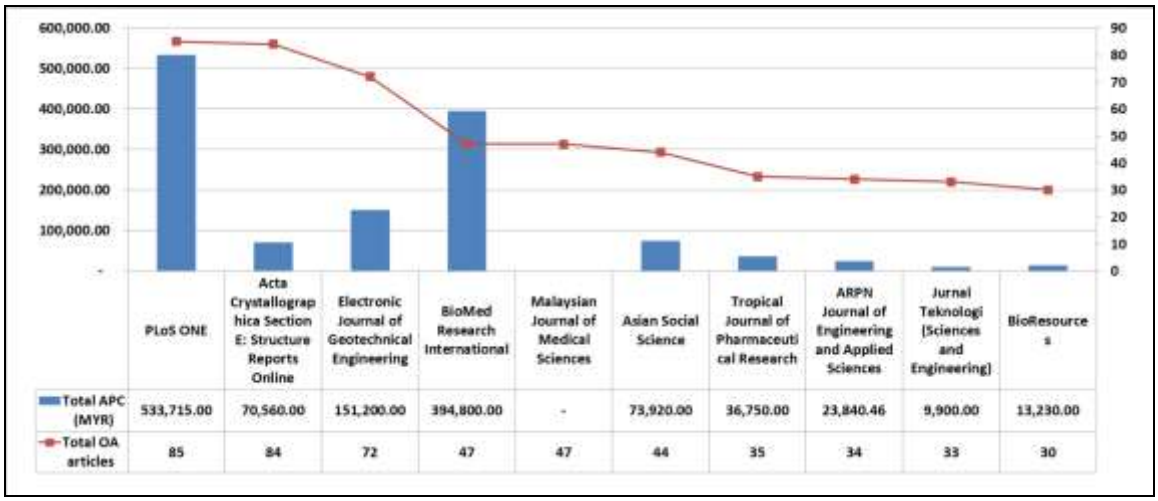
FIGURE 9: Total cost of APC for USM OA publications according to top 10 subject categories in SCImago (2013-2015)



Next, from Figure 10, USM researchers highly favour to publish OA articles in PLoS One (85 articles) compared to other OA journal titles with total cost of USD 127,075/MYR 533,715. Moreover, the study also found that USM researchers paid highly for APC to BioMed Research International compared to the other journal title, which cost USD 94,000/MYR 394,800 during the year 2013 until 2015. However, among the top 10 highest number of articles published by USM researchers based on journal titles showed

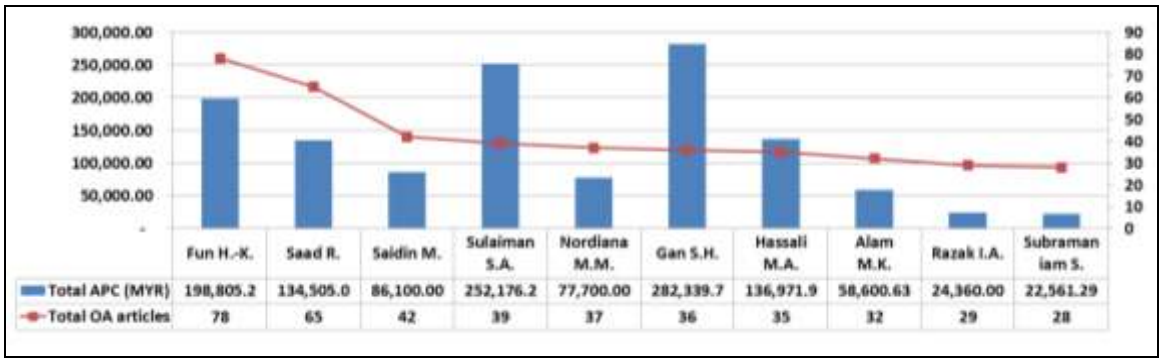
that one journal title have zero APC. There were known as Malaysian Journal of Medical Sciences.

FIGURE 10: Total cost of APC for USM OA publications according to top 10 journal titles (2013-2015)



As shown on Figure 11, these were the top 10 authors published articles in OA journals. Gan S.H. was the top among USM authors that highly paid APC to publish OA articles (USD67,223.75/MYR 282,339.75). Meanwhile, Fun H.-K. successfully published the highest number of publications (78 articles) with an average cost of APC (USD606.85/MYR 2,548.78 per article) compared to other top 10 authors.

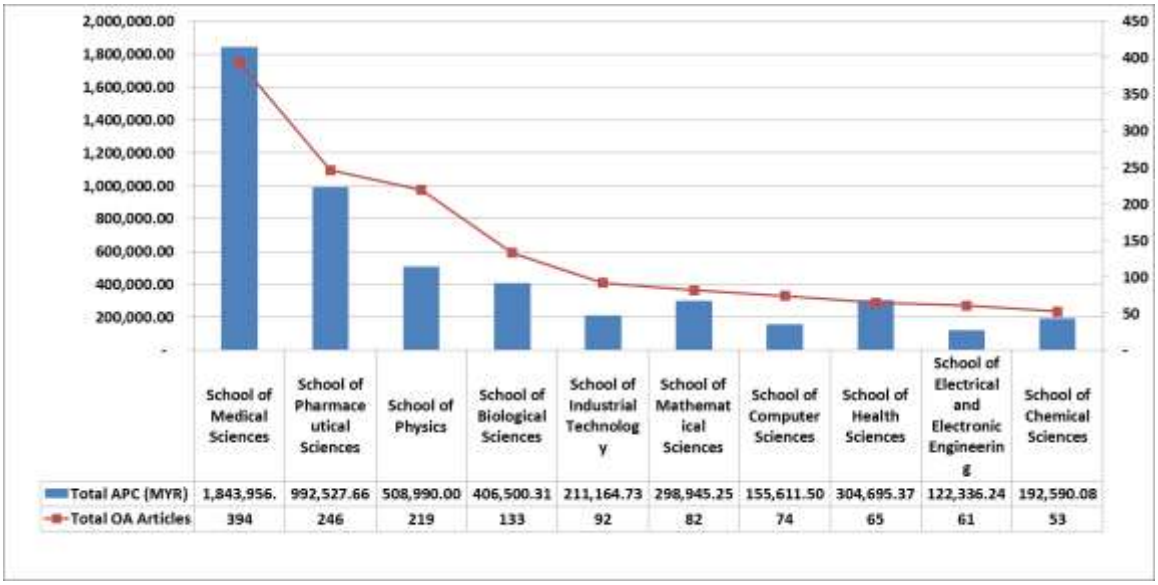
FIGURE 11: Total cost of APC for USM OA publications according to top 10 authors (2013-2015)



As shown in Figure 12, USM researchers from the School of Medical Sciences had the highest published articles in OA journals (394 articles) aligned with the highest paid for APC compared to other USM schools with total amount USD 439,037.36/MYR 1,843,956.91. The School of Pharmaceutical Sciences (246 articles) had total cost of APC paid at USD 236,316.11/MYR 992,527.66.

FIGURE 12: Total cost of APC for USM OA publications according to top 10 schools/centres (2013-2015)

.



Based on the results, it showed that USM should now reconsider to provide the fund on OA publishing on a more specific and critical based subject categories, journal title names, authors' background and school's name. The finding shows that budgeting can be more efficient by considering based on the stated allotment criteria. USM could map the funding on criteria that are more specific. For instant, USM researchers from Biochemistry Genetics Molecular Biology actually need huge funding to support APC at a time to publish OA articles in that subject journals. Despite the study is actually limited to rank Q1 and Q2 journals in this subject category, at least this study shows the costs incurred for them.

Furthermore, the United Kingdom (UK) Open Access Implementation Group (2012) (UK-OAIG) asserted that regardless of expensive or cheap the APC; the efficient process systems of APC is a crucial issue in OA publishing landscape so that it would provide wider values of OA publishing. The UK-OAIG is recommended to authors, research funders, universities and publishers for a greater standardization to facilitate more efficient process flows between themselves especially focusing on countering the issues on the development, implementation and adoption of good intermediary services for the better value of payment of APCs.

RECOMMENDATIONS

From the analysis that has been done, a few recommendations are illustrated as follows:

1. Measure the social impact of USM publications to know how their research can benefit the public.
2. Further investigate the motivations of authors in publishing OA journals through interview.
3. University has to promote OA in a number of ways such as:
    i. Mandates stipulating that USM researchers have to publish their works with sponsored by public funder in OA journals and focusing on Q1 and Q2.
    ii. Mandates stipulating that USM researchers have to deposit their 'pre-print' and 'post-print' to Repository@USM.
    iii. Providing dedicated funds for the payment of APCs in gold or hybrid journals.
    iv. Introduce Sanggar Sanjung Award for researcher that publish their works in OA with high impacts.
    v. Negotiate with more publishers to obtain 15% discount for APC as example the agreement with BioMed Central Supporter.

CONCLUSION

OA practice is growing its popularity and necessity. This paper examines several aspects in relation to OA publication such as publication productivity, citation impact, subject coverage, and publishing cost of USM as well as offer some insights into the trend of OA publication in USM.

In conclusion, it can be said that the OA publication of USM is growing and it has made important contributions towards the growth of total publications. This practice will make USM researchers' productivity more visible and accessible, thus increasing the impact of all conducted research. Therefore, as an Apex University, USM has to embrace OA publishing to increase competitiveness in University rankings.

REFERENCES

Bernius, S., & Hanauske, M. (2009, 5-8 Jan. 2009). *Open access to scientific literature - increasing citations as an incentive for authors to make their publications freely accessible.* Paper presented at the Hawaii International Conference on System Sciences.

Davis, P. M., Lewenstein, B. V., Simon, D. H., Booth, J. G., & Connolly, M. J. L. . (2008). Open access publishing, article downloads, and citations: randomised controlled trial. *BMJ, 337*.

DeGroff, H. (2016). Open access and knowledge sharing: reflections on the Pathfinder projects and Open Access Good Practice initiative. *Insights, 29*(2), 133–139. doi: http://doi.org/10.1629/uksg.301

Gargouri, Y., Hajjem, C., Larivière, V., Gingras, Y., Carr, L., Brody, T., & Harnad, S. . (2010). Self-selected or mandated, open access increases citation impact for higher quality research. *PloS one, 5*(10).

Grouse, L. (2014). Open access medical publications. *Journal of thoracic disease, 6*(6), E133.

Hajjem, C., Harnad, S., & Gingras, Y. . (2006). Ten-year cross-disciplinary comparison of the growth of open access and how it increases research citation impact.

Harnad, S. a. B., Tim. (2004). Comparing the impact of open access (OA) vs. non-oa articles in the same journals. *D-Lib Magazine, 10*(6).

Ismail, M. I., Napiah, M. K. M., & Ismail, A. H. (2013). *Universiti Sains Malaysia Research Publication: A Bibliometric Study*. Paper presented at the ASIA-Pacific Library and Information Education and Practice (ALIEP, 2013), Pullman Khon Kaen Raja Orchid Hotel, Khon Kaen City, Thailand.

Kurtz, M. J., Eichhorn, G., Accomazzi, A., Grant, C., Demleitner, M. and Murray, S. S. (2005). Worldwide use and impact of the NASA Astrophysics Data System digital library. *Journal of the American Society for Information Science and Technology, 56*(1), 36-45. doi:10.1002/asi.20095

Lawrence, S. (2001). Free online availability substantially increases a paper's impact. *Nature, 411*(6837), 521-521.

MacKenzie-Cummins, P. (2012). Research show growing awareness and uptake of Open Access publishing by authors. Retrieved from https://www.intechopen.com/news/research-show-growing-awareness-and-uptake-of-open-access-publishing-by-authors

Mashroofa, M. M., & Senewiratne, W. (2016). Open access initiatives and institutional repositories: Sri Lankan scenario. *Annals of Library and Information Studies (ALIS), 63*(3), 182-193.

Masrek, M. N., & Yaakub, M. S. (2015). Intention to Publish in Open Access Journal: The Case of Multimedia University Malaysia. *Procedia - Social and Behavioral Sciences, 174*, 3420-3427. doi:http://dx.doi.org/10.1016/j.sbspro.2015.01.1013

Napiah, M. K., & Abrizah, A. (2016). *Publishing in the First Quartile: A Case of 50 Malaysian Prolific Scientists*. Paper presented at the International Conference on Libraries, University of Malaya, Kuala Lumpur.

Odlyzko, A. (2002). The rapid evolution of scholarly communication. *Learned Publishing, 15*, 7-19. doi:10.1087/095315102753303634

Poltronieri, E., Bravo, E., Curti, M., Ferri, M., & Mancini, C. (2016). Open access publishing trend analysis: Statistics beyond the perception. *Information Research, 21*(2).

Serrano-Vicente, R., Melero, R., & Abadal, E. (2016). Open access awareness and perceptions in an institutional landscape. *The Journal of Academic Librarianship, 42*(5), 595-603.

Solomon, D. J., & Björk, B.-C. (2012). A study of open access journals using article processing charges. *Journal of the American Society for Information Science and Technology, 63*(8), 1485-1495. doi:10.1002/asi.22673

Suber, P. (2012). *Open access*. Cambridge: The MIT Press.

Teplitzky, S., & Phillips, M. . (2016). Evaluating the impact of open access at berkeley: results from the 2015 survey of berkeley research impact initiative (brii) funding recipients. *College & Research Libraries, 77*(5).

United Kingdom (UK) Open Access Implementation Group. (2012). *The Potential Role for Intermediaries in Managing the Payment of Open Access Article Processing Charges (APCs)*. Retrieved from http://repository.jisc.ac.uk/4949/

USM TV. (2017). Perutusan Naib Canselor 2017. Retrieved from https://www.youtube.com/watch?v=VNxrK2JGaBs

Van Noorden, R. (2013). The True cost of science publishing. *Nature, 495*(7442), 426-429.

Wang, X., Liu, C., Mao, W., & Fang, Z. . (2015). The open access advantage considering citation, article usage and social media attention. *Scientometrics, 103*(2), 555-564.

Zainab, A. (2010). Open Access repositories and journals for visibility: Implications for libraries.