



A bibliometric analysis of articles on innovation systems in Scopus journals written by authors from Indonesia, Singapore, and Malaysia

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Abstract

Purpose: The aim of this study was to analyze the bibliometric characteristics of articles on innovation systems published in Scopus-indexed journals by authors with Indonesian affiliations from 1998 to 2019, in comparison with those published by authors from Singapore and Malaysia. **Methods:** We conducted a bibliometric and content analysis of publications in the Scopus database. A total of 138 articles from Indonesia, 209 articles from Singapore, and 309 articles from Malaysia were analyzed. They were classified by publication year, authors, co-authors' country, affiliation, keywords, and journal title.

Results: Authors with affiliations from Malaysia were more productive than authors from Singapore and Indonesia during 1998 to 2019. In terms of the quality of papers, Singapore had more productive authors than Malaysia and Indonesia based on the citation frequency.

Conclusion: Although fewer articles on innovation systems were published by authors from Indonesia than by those from Malaysia and Singapore, the recent increase in the number of publications by Indonesian authors suggests that number of articles from Indonesia will soon surpass those from the other two countries. International collaboration will help accelerate the number of publications.

Keywords

Bibliometric; Scopus; Innovation systems; Comparative study; Publications

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Introduction

Background/rationale: Over the last 21 years, there has been a substantial rise in the number of Indonesian scientific papers published in Scopus and the Web of Science. Data from Scima-

go for the last two decades show that the number of publications from Indonesia increased five-fold in all subject areas (157,912 documents). The comparative analysis conducted by Wiryawan [1] showed that in 2010, the number of publications was only 2,903, but it increased sharply to 44,743 papers in 2019.

Objectives: This study aimed to analyze the bibliographic characteristics and content of Indonesian papers on innovation systems published in Scopus-indexed journals from 1998 to 2019. This topic is part of the study of science, technology, and innovation systems [2]. Furthermore, the findings were compared with data from Singapore and Malaysia to provide additional context.

Methods

Ethics statement: This was not a human subject study; therefore, neither institutional review board approval nor informed consent was needed.

Study design: This was a literature database-based descriptive bibliometric study.

Data source/measurement: In this study, the researchers utilized methods that have been successfully applied in a variety of previous bibliometric and content analyses of publications in international databases [3]. The Scopus database was searched on April 20, 2020, using the search option “affiliation country” with “Indonesia” and “Singapore” and “Malaysia” as the country names. For the search option of “subject area,” the researchers used “social sciences,” and chose “Business, Management and Accounting,” and “Economics, Econometrics and Finance,” and “Arts and Humanities” and “innovation system” to search within the results. The search was limited to papers from 1998 to 2019, and yielded 138 articles (Indonesia), 209 articles (Singapore) and 309 articles (Malaysia) in English. A detailed analysis of the bibliographic data was performed, including publication year, affiliations, authors, and co-authors from foreign countries, journals, keywords, and citations.

We measured the number of papers on innovation systems that had been written annually over the last 21 years to analyze the countries of co-authors contributing to papers from Indonesia. We also investigated the higher education institutions and research institutions in Indonesia that accounted for most of the papers. We also listed Scopus-indexed journals where articles on innovation systems by Indonesian authors were published. Finally, we illustrated the keywords commonly used in the literature and analyzed the papers that had been written in different sub-fields of innovation programs.

For comparisons among Indonesia, Singapore, and Malaysia, the researcher conducted comparisons of 1) the number of

publications based on the year of publication, 2) the institutions that produced the most papers, 3) co-authors’ affiliations based on country, 4) the journals where the articles were published, 5) the top 3 authors from each country, and 6) classifications of the keywords used in innovation system papers.

Results

Bibliographic characteristics and content of Indonesian papers

In the bibliographic and content analysis of 138 articles, the articles were categorized by year of publication, international co-authors, organizational affiliation, journal title, keywords, category, and citation frequency. A steady rise in publications occurred from 1999 to 2011, followed by an increasing number of articles released annually between 2013 and 2019. The number of articles has risen significantly in recent years. From 1998 to 2019, the number of articles increased fourfold.

Although almost 150 research institutions in Indonesia were listed for the authors of the 138 papers, the institution with the highest number of papers accounted for 9.42% of the papers. Fig. 1 presents identifies the top 10 organizations with the most publications on innovation systems.

Many of the 138 papers were written in collaboration with authors from other countries. Fig. 2 presents the top 10 countries of co-authors contributing to papers from Indonesia; the Netherlands and Japan accounted for 7.97% and 5.07% of the total articles, respectively. Authors from two other countries (Australia and Malaysia) contributed to five publications, respectively. Authors from four countries (France, Germany, Philippines, and the United States) contributed to three publications, respectively. Authors from Kenya and Italy contributed two publications each. Authors from the following 14 countries contributed one publication each: Brazil, Burkina Faso, Colombia, Denmark, Ecuador, Ethiopia, Finland, Lithuania, Norway, South Korea, Spain, Taiwan, the United Kingdom, and Vietnam. Several authors used both a foreign affiliation and an Indonesian affiliation, which was counted as a co-author’s affiliation with an institution in a foreign country.

The researcher also identified the foreign institutions from which co-authors collaborated with Indonesian researchers to publish papers on innovation systems. As shown in Suppl. 1, the Netherlands accounted for three of the top five institutions, while Switzerland and Malaysia each had one institution.

In addition, the titles of the journals that published articles on innovation systems written by Indonesian authors were tabulated. Suppl. 2 presents a list of six journals with three or more innovation system papers by Indonesia authors. The majority of these journals were Scimago Q3 journals in the subject area of innovation systems, while two were Q2 journals and one was a Q4 journal. In addition to the journals on

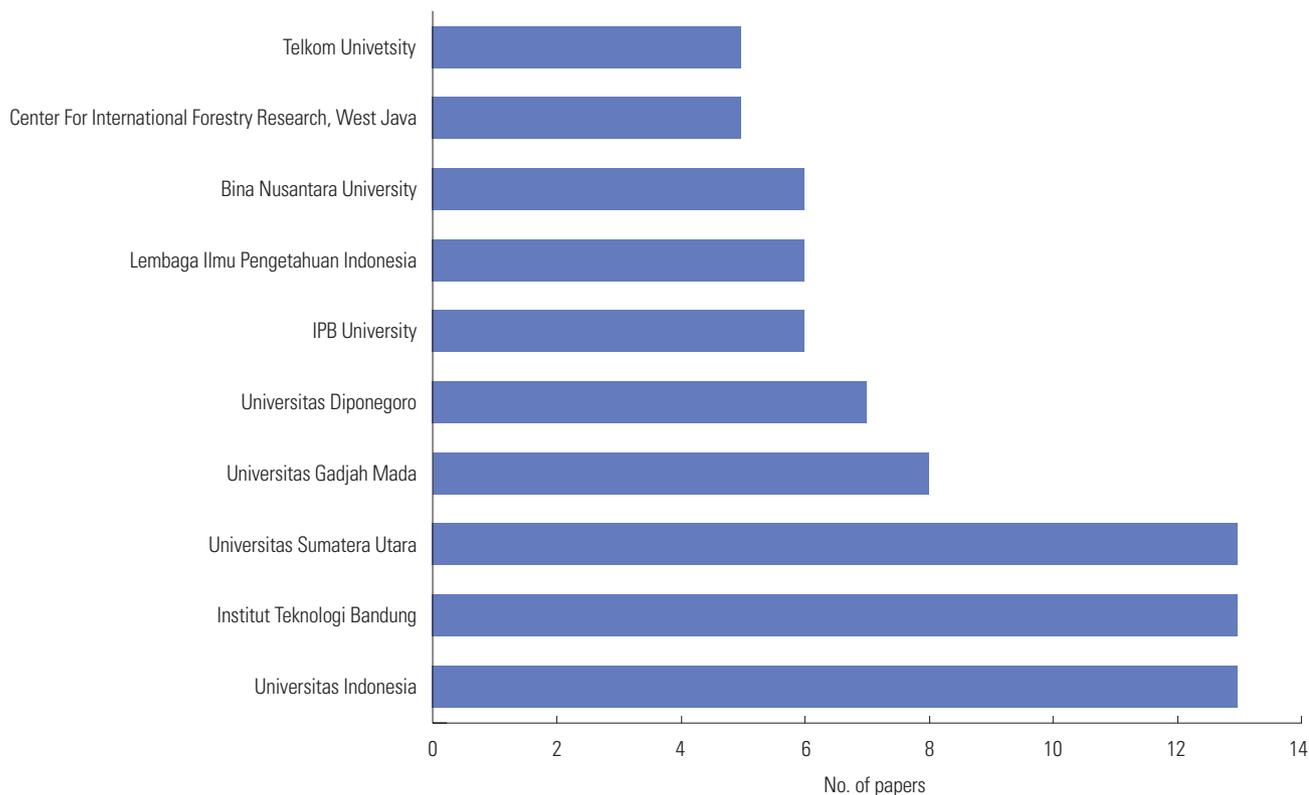


Fig. 1. Top ten institutions from Indonesia that produce most paper in Scopus database on innovation system from 1998 to 2019.

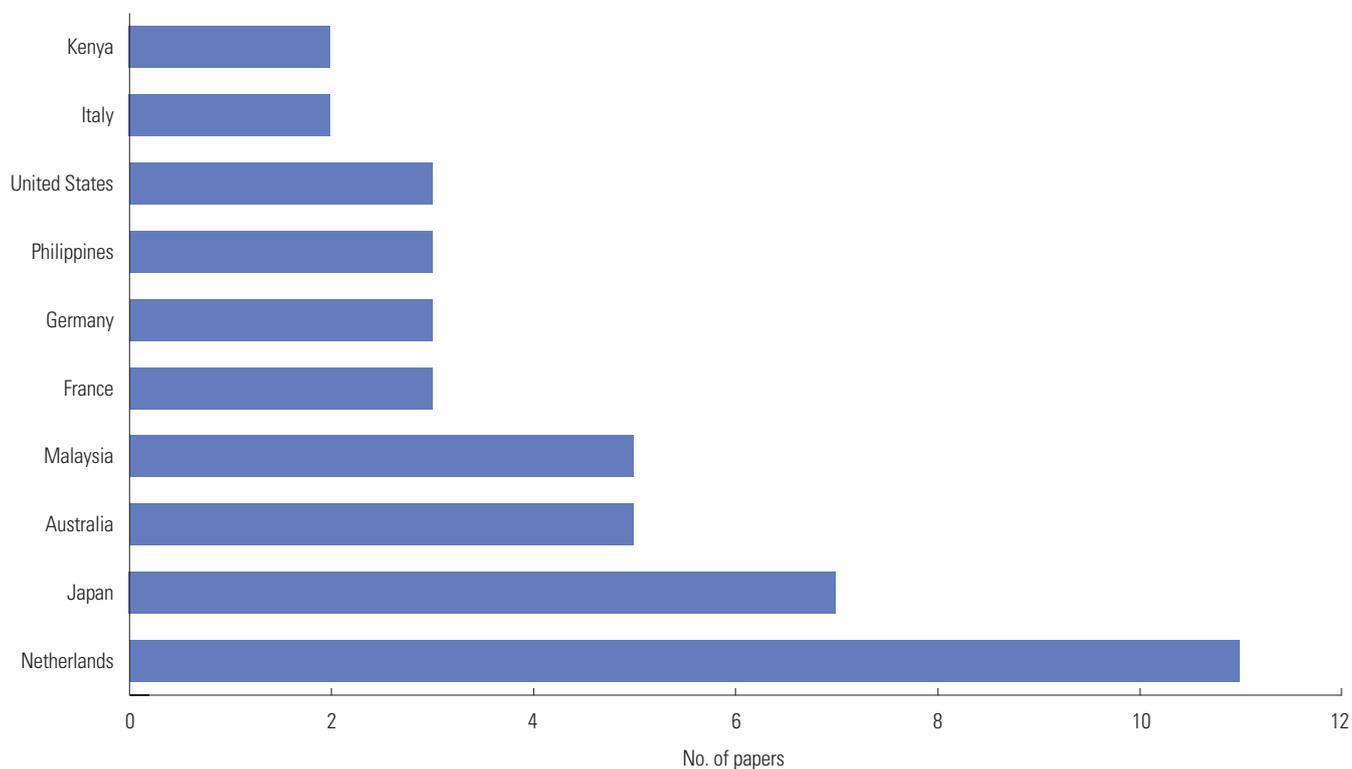


Fig. 2. Top ten foreign countries in which the co-authors with most papers in Scopus database on innovation system affiliated with Indonesia authors from 1998 to 2019.

this list, there were 22 other journals in which two papers on innovation systems were published by authors working at Indonesian research institutions.

The researcher of this study also listed the top 10 authors from Indonesia, and found that two authors from Indonesia had published nine papers on innovation systems. One author published five papers, and another author published four papers. The remaining six authors published three papers each, and only one author published two papers (Suppl. 3).

From the list of the top 10 papers with the most citations from Indonesian authors (Suppl. 4), the three most cited papers were “Critical success factors of downstream palm oil-based of Small and Medium Enterprises (SME) in Indonesia” published in the *International Journal of Economic Research* in 2016 with 88 citations; “Identification of factors of failure in Barisan Mountains Agropolitan area development in North Sumatera–Indonesia” published in the *International Journal of Economic Research* in 2016 with 77 citations, and “Bibliometric analysis of absorptive capacity” published in the *International Business Review* in 2017 with 56 citations.

The researchers identified common keywords that were utilized in the 138 articles (Suppl. 5). Keywords such as “innovation” and “Indonesia” appeared most often. The researchers further analyzed the use of the keyword “innovation” in subfields such as business, mobile technology, and national innovation systems and the use of the keyword “Indonesia” in the subfields of innovation, productivity, and technological

development. This analysis demonstrated that authors from Indonesia produced numerous papers under the themes of business, mobile technology, national innovation systems, productivity, and technological development.

Comparison with data from Singapore and Malaysia

The number of papers on innovation systems written by authors affiliated with institutions in Indonesia significantly increased in the last 21 years, especially since 2013. However, the productivity of Indonesian authors on this topic is lower than that of authors from Malaysia (Fig. 3).

The National University of Singapore (129 papers) was found to be the most productive institution for articles on this topic published in Scopus-indexed journals in the last 21 years (Table 1), followed by the University of Malaya (106 papers) and Universiti Teknologi Malaysia (35 papers).

Of note, Australia was the only country that was one of the top five foreign countries in terms of co-authors for Indonesia, Singapore, and Malaysia (Table 2). The greatest collaborative productivity in publishing papers on innovation systems in international journals was found for the United States (31 papers for Singapore). This figure is higher than that of the Netherlands, with 11 papers (the top country of co-authors for papers from Indonesia), or the United Kingdom, with 20 papers (the top country of co-authors for papers from Malaysia).

Authors with affiliations from Singapore published many of their papers in Q1 Scopus-indexed journals (Table 3), unlike

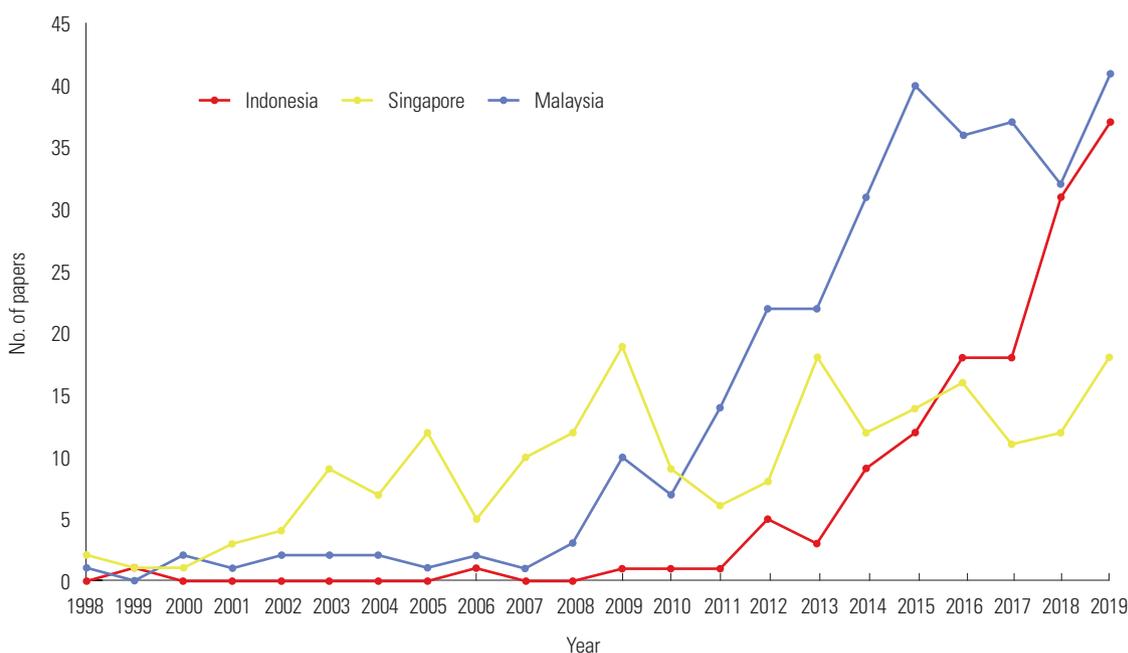


Fig. 3. Number of published papers on innovation system listed in Scopus database from Indonesia, Singapore, and Malaysia from 1998 to 2019 by years.

writers with affiliations from Indonesia, most of whom published papers in Q3 Scopus-indexed journals. Meanwhile, authors with affiliations from Malaysia had a tendency to publish papers in journals in all Scopus quartiles.

An author from Malaysia (Rasiah R from the University of Malaya, with 46 papers) had the highest productivity in terms of publishing papers on innovation systems in Scopus-indexed international journals (Table 4). The second-most pro-

Table 1. Top five institutions producing papers on innovation systems published in Scopus-indexed journals from Indonesia, Singapore, and Malaysia, from 1998 to 2019

Rank	Indonesia		Singapore		Malaysia	
	Institution	No. of papers	Institution	No. of papers	Institution	No. of papers
1	Universitas Indonesia	13	National University of Singapore	129	University of Malaya	106
2	Institut Teknologi Bandung	13	Nanyang Technological University	27	Universiti Teknologi Malaysia	35
3	Universitas Sumatera Utara	13	NUS Business School	15	Universiti Kebangsaan Malaysia	30
4	Universitas Gadjah Mada	8	NUS-Lee Kuan Yew School of Public Policy	14	Universiti Sains Malaysia	23
5	Universitas Diponegoro	7	Singapore Management University	13	Universiti Teknologi MARA	15

Table 2. Top five foreign countries of co-authors of papers on innovation systems published in Scopus from Indonesia, Singapore, and Malaysia, from 1998 to 2019

Rank	Indonesia		Singapore		Malaysia	
	Country	No. of papers	Country	No. of papers	Country	No. of papers
1	Netherlands	11	United States	31	United Kingdom	20
2	Japan	7	China	14	Australia	17
3	Australia	5	United Kingdom	13	China	14
4	Malaysia	5	Canada	12	United States	14
5	France	3	Australia	11	Netherlands	11

Table 3. List of Scopus-indexed journals where three or more papers on innovation systems were published by authors from Indonesia, Singapore, and Malaysia authors from 1998 to 2019

Rank	Indonesia		Singapore		Malaysia	
	Journal	No. of papers	Journal	No. of papers	Journal	No. of papers
1	<i>International Journal of Economic Research</i> (Q4)	6	<i>Research Policy</i> (Q1)	8	<i>Asia Pacific Business Review</i> (Q2)	10
2	<i>International Journal of Technology</i> (Q2)	4	<i>International Journal of Technology Management</i> (Q1)	5	<i>Advanced Science Letters</i> (Q4)	8
3	<i>Journal of Applied Economic Sciences</i> (Q3)	4	<i>International Journal of Entrepreneurship and Innovation Management</i> (Q3)	4	<i>Asian Social Science</i> (Q3)	8
4	<i>Quality Access to Success</i> (Q3)	4	<i>Journal of International Business Studies</i> (Q1)	4	<i>Journal of Cleaner Production</i> (Q1)	8
5	<i>Asian Journal of Technology Innovation</i> (Q3)	3	<i>Scientometrics</i> (Q1)	4	<i>Scientometrics</i> (Q1)	7

Table 4. Comparison of the top three authors with innovation system publications from institutions located in Indonesia, Singapore, and Malaysia

Rank	Indonesia		Singapore		Malaysia	
	Author	No. of papers	Author	No. of papers	Author	No. of papers
1	Muda I (Universitas Sumatera Utara)	9	Wong PK (National University of Singapore)	29	Rasiah R (University of Malaya)	46
2	Suryanegara M (Universitas Indonesia)	5	Singh A (National University of Singapore)	8	Chandran VG (University of Malaya)	8
3	Aminullah E (Lembaga Ilmu Pengetahuan Indonesia)	4	Yeung HW (National University of Singapore)	8	Ng BK (University of Malaya)	8

Table 5. Comparison of keywords in publications on innovation systems from authors at institutions located in Indonesia, Singapore, and Malaysia

Indonesia		Singapore		Malaysia	
Keyword	No. of papers	Keyword	No. of papers	Keyword	No. of papers
Innovation	29	Innovation	46	Malaysia	58
Indonesia	22	Singapore	28	Innovation	49
Mobile technology	5	Asia	21	Research and development	15
Creative industry	4	Eurasia	19	China	14
Entrepreneurship	4	Singapore (Southeast Asia)	17	Knowledge management	13
National innovation systems	4	Public policy	13	Sustainability	13
Organizational learning	4	Southeast Asia	13	Technological development	13
Productivity	4	Globalization	12	Human capital	12
Research and development	4	Technology	12	Industry	12

Table 6. Comparison of the number of published papers on innovation systems and the number of citations

	No. of published papers	No. of citations	Quality of the papers
Indonesia	138	792	5.74
Singapore	209	6,581	31.49
Malaysia	309	2,825	9.14

ductive author was from Singapore (Wong PK from the National University of Singapore, with 29 papers), followed by an author from Indonesia (Muda I from the University of North Sumatra, with 9 papers).

Authors from Indonesia and Malaysia tended to publish papers with keywords such as “research and development” (Table 5). Authors from Singapore had more highly cited papers than authors from Malaysia and Indonesia (Table 6). Based on Scopus data from 1998-2019 for papers in the innovation system field, papers from Singapore-affiliated authors had the most citations (6,581 citations of 209 articles), followed by Malay-

sia-affiliated authors (2,825 citations of 309 articles), and Indonesia-affiliated authors (792 citations of 138 articles).

Discussion

Interpretation: There is a strong demand for scientific publications, in line with the policy that requires lecturers, researchers, and doctoral students to publish in international journals as a prerequisite for promotion and graduation. Additionally, several international publication incentive programs are provided by a budget allocation from the Ministry of Research and Technology, the Ministry of Finance, and some research institutions [4]. However, Indonesia produced at least 138 papers related to innovation systems from 1998 to 2019. In contrast, Singapore and Malaysia produced 209 and 309 papers, respectively. Based on these results, authors affiliated with institutions in Malaysia were the most productive in writing papers on innovation systems in the last 21 years when compared to authors from Indonesia and Singapore. Papers of cooperation with foreign researchers (58, 42.0%) contributed to the number of papers from Indonesia (Fig. 2).

Therefore the support of long-term exchange programs with foreign researchers by the Indonesian government will be a good incentive for Indonesian researchers even in the field of the innovative system. The rapid increase of papers on the innovative system in Indonesia from 2013 to 2019 may reflect the high economic growth rate of Indonesia, 5 to 6%, where the innovative system has been introduced to the Indonesian industries (Fig. 3). The citation frequency of papers from Indonesia-affiliated authors was lower than that from Singapore and Malaysia. It may be originated from the fact the application of the content to the industries or researches was not frequent. The content of papers from Indonesia should be strengthened for its application to other studies.

Conclusion: The results of this study provide an overview of the quantity and quality of papers on innovation systems produced by authors from Indonesia, Singapore, and Malaysia. Recent increase in the number of publication on innovative system by Indonesian authors suggest that number of articles from Indonesia will soon surpass those from Malaysia and Singapore. Future studies should analyze not only the number of publications, but also the content of the papers to obtain a more critical understanding of publications on innovation systems.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Supplementary Material

Supplementary file is available from the Harvard Dataverse at: <https://doi.org/10.7910/DVN/D79R7Y>

Suppl. 1. Top 15 foreign institution with which the co-authors of the most papers on Innovation System with Indonesia authors were affiliated.

Suppl. 2. List of journals where three or more papers on Innovation System by Indonesia authors were published.

Suppl. 3. Top authors from institutions located in Indonesia with Innovation System publications.

Suppl. 4. Top-cited papers from 1998 through 2019 according to the number of citations in Scopus (Indonesia authors).

Suppl. 5. Classification of keywords in innovation system papers in Scopus from Indonesia, from 1998 to 2019.

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