Study on university research performance based on systems theory: systematic literature review

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Abstract: This paper reports on the systematic literature (SLR) to synthesise research on university research performance using a systematic methodology. We carried out a rigorous screening process to obtain a final sample of 59 quality papers published in 33 journals. These studies have been reviewed with a systems theory-based perspective in organisations, without neglecting to

review several matters relating to significant journal publications, active researchers, the most widely used methods, and the countries where they are located. Finally, we provide suggestions for further research on research performance, especially those related to the influencing input-process-output-productivity-outcome variables. This perspective provides an effective fit with the context of research performance measurement models in universities and helps to capture the full spectrum of research institutes in universities. Thus, a new challenge arises to develop a national performance evaluation model in higher education research institutions that is adapted to the policies and strategies of each country.

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1   Introduction and literature study

Performance is the result of work that has a strong relationship with the organisation's strategic goals, customer satisfaction, and contributing to the economy (Armstrong, 1994). Higher education institutions believe that their competitive position to the government can be improved by good performance (Hazelkorn, 2008). One priority sector for universities is research, where good research also has an impact and can

contribute to improving the overall quality in the teaching and learning process (Artés et al., 2017).

Therefore, in this literature study, we wish to identify and analyse the factors affecting, research trends, datasets, methods, and frameworks used in university research performance.

Performance according to Kamble and Wankhade (2017) is one of key factor that affect productivity. It affects productivity along with human resource management, organisational culture, production methodology, and management strategy. Wartini et al. (2021) showed that 'organisational performance' is affected by 'leadership commitment' and 'continuous improvement' positively. Their study was performed in Semarang City Indonesia with the unit analysis was university leader. While Lotfi et al. (2020) found in oil company that organisation performance is affected mainly by talent management process.

In improving performance, Buchner (2007) highlights several things to do a good management process:

- Clearly defined organisational goals are a must. Good performance management starts from setting goals with measurable performance results, which focus on priorities, strengthening the achievement process, increasing human resource capacity, and also strengthening goals (Latham and Locke, 1979).

- Build a good ecosystem in the organisation. Carver and Scheier (1981) focused on feedback to build a good work ecosystem. This ecosystem can be represented by top management support, workforce commitment, and people management, workplace organisation, as proven by Singh et al. (2019). The feedback that is part of the evaluation is a substantial part of the performance management process.

- Increase the motivation of everyone in the organisation. Bandura (1982) argues that developing and strengthening positive self-confidence in staff is part of performance management. The three key elements are the work environment itself, what is being planned, and what has been done. Motivation is also proven by Lotfi et al. (2020) affect performance through talent management process.

Miller and Rice in 1967 stated that organisations should be treated as open systems that convert inputs into outputs in the environment (external and internal) on which they depend (Blackburn et al., 1968). Thus, a performance management model based on input-process-output, and even outcome, is built, which assesses all the contributions that individuals make to the system. This is in line with previous research which states that institutional performance is the result achieved from the behaviour of organisational members (Gibson et al., 2012).

Research activity is a production process in which the input consists of resources (tangible resources such as research equipment, and materials and intangible resources such as knowledge accumulation) produces outputs such as new knowledge, which has a complex character of tangible properties (publications, patents, seminars and conferences, and databases) and intangibles (tacit knowledge or socio-economic impact) so that the dominant indicator of research performance becomes very important. Excellent indicators are practical tools for improving research performance, achieving specific goals and strategic objectives in universities (Bucur et al., 2016).

There are at least four aspects of research performance according to Phillimore (1989), namely: output or product of research; impact as a result of the continued output of the community; quality as a 'benefit' of research results; and utility, i.e., the potential 'exploitation' of the search (e.g., by industry). The function of research results in the form of new knowledge has a multi-input and multi-output character, where the significant efficiency indicator of each production unit (individual, research group, department, institution, field and country) is productivity (Abramo and D'Angelo, 2014). Meanwhile, Brown and Svenson (1988) defined Research and Development (R&D) as a system consisting of inputs, processes, and outputs, wherein measuring the productivity of an R&D it is necessary to measure these variables. While Dill and Soo (2005) compared the measures of the five rankings and divided the measures into input, process, and output measures.

An existing study also divides the performance indicators into four categories of input, output, outcome, and process, and clusters them into two quantitative and qualitative indicators (Alomary, 2020). Inputs and outputs are categorised as quantitative indicators, while outcomes and processes are qualitative indicators. In operation management, productivity is the relationship between inputs and outputs, where there is a transformation process that underlies the occurrence of outputs from inputs (Schroeder and Goldstein, 2016).

There are several characteristics of inputs and outputs in the evaluation of research performance. It can be described as output indicators (research outputs), processes (academic governance), institutional assessment of the curriculum, inputs (research funds), and institutional nature (institution-specific capacity and capability) (Çakır et al., 2015). Study at universities in India and China determined the division of measurement categories on primary and secondary bibliometric indicators in the form of input, output, excellence, outcome, and productivity (Savithri and Prathap, 2015).

Research activities lead to broader outputs, outcomes and impacts, which can serve to tell us whether research has been effective. Thus, information about inputs, research processes and outputs, outcomes, and impacts can all serve to determine whether research is achieving a particular goal, reaching a particular beneficiary, or addressing a particular need (Hinrichs-Krapels and Grant, 2016).

Many topics of research performance in universities published are different and complex so that the comprehensive picture of research on the current state of affairs that exists today is missing. This literature review aims to identify and analyse research trend maps in significant publishing journals, actively contributing researchers, methods, and countries as research locations. Besides that, the main obsession to recognise is the factors that affect research performance by using the perception of systems theory.

2   Research methods

This paper reports a systematic literature review (SLR) for synthesising research performance in university. We selected an SLR as the method for conducting a literature study that can be used as a process of identifying, assessing, and interpreting all existing research evidence to provide answers to specific research questions (Kitchenham et al., 2009).

SLR is a research methodology for reviewing the previous promising literature, including for the field of management research, by adopting a replicable, scientific and
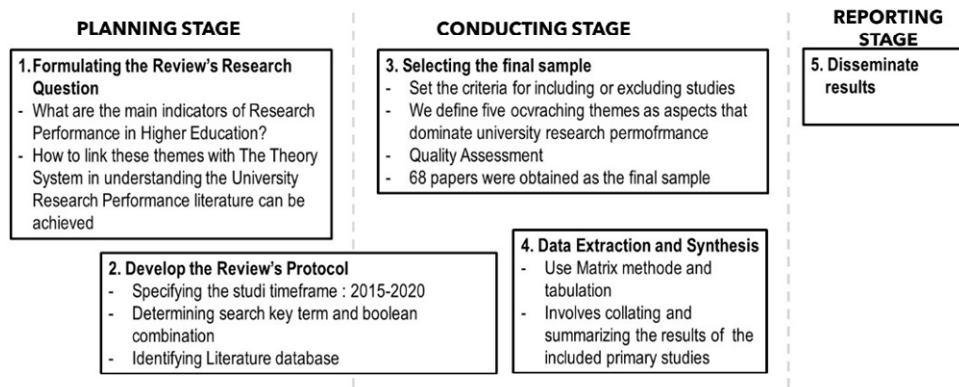
transparent process (Tranfield et al., 2003). Thus, the core goal of SLR is to reduce the risk of bias and increase transparency at every stage of the review process by relying on explicit and systematic methods in the selection and inclusion of studies, to assess the quality of studies, and to summarise them objectively (Liberati et al., 2009; Petticrew 2001).

In answering research questions, SLR provides a structured method and has helped in better understanding and monitoring research practice in our research area, even has also bridged disciplinary boundaries so that it has been able to reach communities from various disciplinary areas.

3 The process of the systematic review

Figure 1 describes the process of the systematic review that has been carried out to achieve the objectives of this study. The first step has been started by identifying the research questions. The first thing that needs to be inventoried is the journals that contain articles related to research performance in universities. It is necessary to identify the most significant journals in the university research performance field. We have identified the most active and influential researchers in university research performance field.
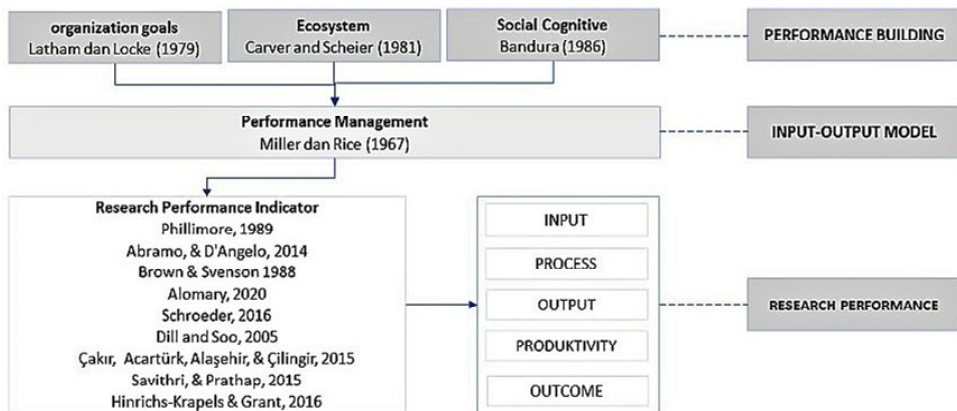
Figure 1 Process of review

PLANNING STAGE

1. Formulating the Review's Research Question
- What are the main indicators of Research Performance in Higher Education?
- How to link these themes with The Theory System in understanding the University Research Performance literature can be achieved

2. Develop the Review's Protocol
- Specifying the studi timeframe : 2015-2020
- Determining search key term and boolean combination
- Identifying Literature database

CONDUCTING STAGE

3. Selecting the final sample
- Set the criteria for including or excluding studies
- We define five ocvraching themes as aspects that dominate university research permofrmance
- Quality Assessment
- 68 papers were obtained as the final sample

4. Data Extraction and Synthesis
- Use Matrix methode and tabulation
- Involves collating and summarizing the results of the included primary studies

REPORTING STAGE

5. Disseminate results

Source: Adapted from Tranfield et al. (2003), Krauss et al. (2020) and Wahono (2007)

Then we need to know the current methods proposed by the researchers to solve the research problem. For that reason, we have identified the most frequently used methods for university research performance. We also have identified countries that are used as units of analysis from the previous literature.

Lastly, we have tried to identify and classify research topics in research performance based on factors or variables that influence it with a systems theory approach. As mentioned in the introduction section, we have grouped the variables based on input, process, output, productivity, and outcome and summed it up in Figure 2.

Figure 2   Summary of theory building

Then, it is formulated that the research questions in this literature study are:

1   Which journal is the most significant?

2   Who are the most active and major contributors to the topic of research performance in the university field?

3   What kind of methods are used most often for research performance in university field?

4   Which country is the most frequently referenced as the unit of analysis in the study?

5   What are the research topics of higher education research performance which are grouped based on the theoretical systems theory?

In developing the review's protocol, we started by specifying the database to use, and we have chosen Scopus because they provide wide coverage of literature in the area under study. Using the search engine of this database, we identified three overarching terms to act as umbrella terms namely 'research', 'performance', and 'university'. Then we used the Boolean operators 'odds ratio (OR)' and 'AND' to combine the various keywords and establish our combinations of search terms that include the following: 'research performance' in and (university or 'higher education'). The search was limited by the year of publication in 2015 – September 2020, and limited only articles journal papers published in English. In this second step, 315 initial samples have been obtained.

In selection the final sample step, we have read the title and abstract, including an introduction if needed on each of the 315 initials of the paper. Then we excluded samples that are not related to the research objectives and questions, so that 167 samples were obtained.

The inclusion criteria used were a study with a university unit of analysis using large- or small-scale data sets. A study that discusses and compares research performance, and the factors that influence it, categorised in reputable journals that have a minimum quartile 2 (Q2) in the year the article was published as a quality assurance process to find the best article; including adapting five overarching themes as aspects that dominate the university's research performance.

Meanwhile, the exclusion criteria used were studies discussing research performance datasets, methods, frameworks in a context other than university. Finally, it was resulted final sample that consisted of 68 articles which we used to perform the analysis.

The analysis process has been carried out using Excel spreadsheet with matrix and tabulation techniques (Miles and Huberman, 1994). It was performed by reading through the entire article and matching the needs of the research questions in the first step and summarising it into a separate document.

We have grouped 68 articles into five groups: input, process, output, productivity and outcome. Inputs are the 'givens' of the system, in the form of the materials the organisation has to work with and the context in which it conducts its work. As such, they place demands and constraints on systems (Nadler and Tushman, 1980). The scope of the input variables are research resources in universities, both in terms of human and financial resources (Çakır et al., 2015), as well as facilities (Hassanain et al., 2020).

Process is all the efforts that convert input into an output (Brown and Svenson, 1988). Ryan and Hurley conducted a study and summarised several previous studies related to ecosystems that affect effective research. These aspects include management or organisation and leadership (Ryan and Hurley, 2007). Meanwhile in other studies, the aspects that affect the excellence of research results are collaboration (Wuchty et al., 2007; Etienne and Snyder, 2000), both international collaboration (Abrahams et al., 2019; Sarwar and Hassan, 2015), industrial cooperation (Lee, 2000; Perkmann and Walsh, 2009; Gulbrandsen and Smeby, 2005) and other collaborations (Richard et al., 2003; Stvilia et al., 2010; Tsai et al., 2014). Another aspect that affects research performance related to the process is the characteristics of the university which include location and status (Erkoc, 2015), as well as the field of science contained in the university (Abramo et al., 2014; Sabharwal, 2013).

Output is what the organisation produces (Nadler and Tushman, 1980), a result that can be measured directly, and is a direct consequence of the activities carried out (Alomary, 2020). The scope of research output for evaluation can be in the form of journal and conference articles, books, book chapters, edited books, patents, designs, artefacts, software, exhibitions, and compositions (Koya and Chowdhury, 2017).

Productivity is how effective an organisation uses its resources to achieve its goals (Pritchard et al., 2008). While another statement is that productivity is the main indicator in each production unit (individual, research group, department, institution, field, and country), and in simple terms it is the output produced in a certain period per unit of production factors that used to produce it (Abramo and D'Angelo 2014).

Outcomes usually do not focus on numerical data (as does output), but measure processes and result in terms of quality and impact (Alomary, 2020). While research impact is defined as having an effect, benefit, or contribution to economic, social, cultural, and other aspects of the lives of citizens and society beyond contributions to academic research (Barnes, 2015). Therefore, in this case, we combine impact into the outcome category, so the scope of outcomes includes the impact of publications in the form of citations (Gonzalez-Brambila et al., 2013; Hien, 2010), licenses (Motohashi and Yun 2007; Azagra-Caro et al., 2006), and also social and economic impacts (Muscio, 2010; Pavitt, 2000).

4   Results and discussion

Figure 3 shows a brief description of the distribution of 68 articles every year. We can see that the topic is still very relevant today where the trend continues to increase. Although in 2020 the number dropped significantly, this is still understandable because of the data collection process only up to September 2020.

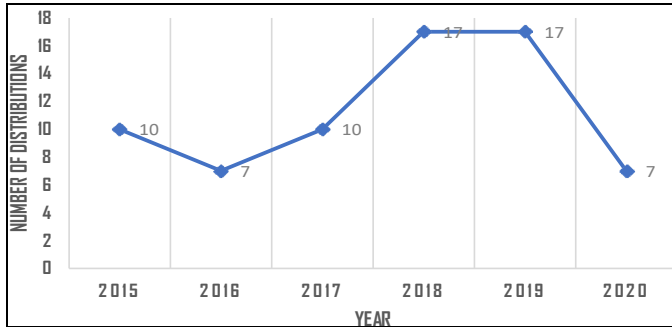**Figure 3**   Number of study selected per year (see online version for colours)

Figure 4   Journal publications and distribution of selected studies (see online version for colours)
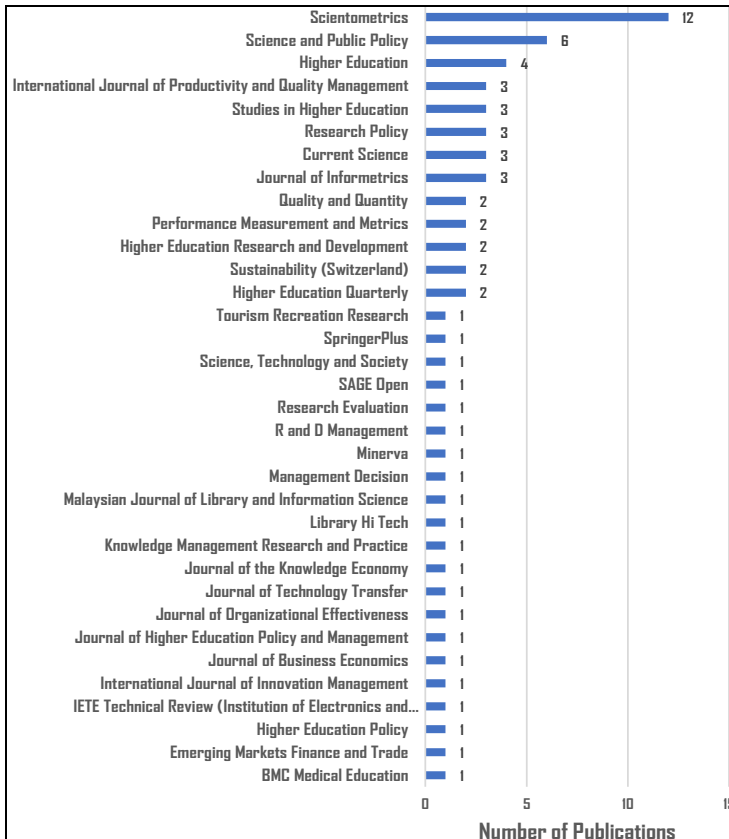
Table 1   Journal quartile, *SJR*, IF and H-Index of selected journals

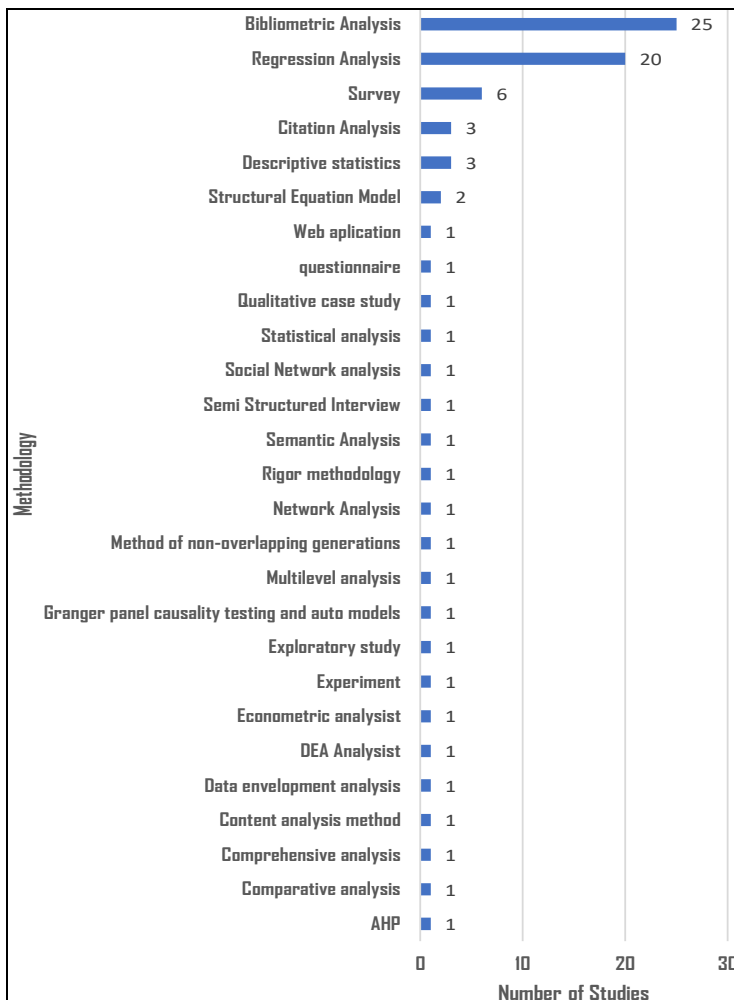| Year	Source title	Journal quartile in Scopus	SJR rank	Impact factor	H-Index
2019	*BMC Medical Education*	Q1 – education	0.831	2,372	68
2015	*Current Science*	Q1 – multidisciplinary	0.324	0.644	118
2016	*Current Science*	Q2 – multidisciplinary	0.289	0.672	118
2019	*Emerging Markets Finance and Trade*	Q1 – economic, econometric	0.444	1,328	34
2016	*Higher Education*	Q1 – education	1.596	2,204	99
2019	*Higher Education*	Q1 – education	1.731	3,446	99
2020	*Higher Education*	Q1 – education	1.900	4.634	99
2019	*Higher Education Policy*	Q2 – education	0.625	1,754	42
2016	*Higher Education Quarterly*	Q2 – education	0.59	0.980	42
2018	*Higher Education Quarterly*	Q2 – education	0.851	0.939	42
2018	*Higher Education Research and Development*	Q1 – education	1.294	1,976	70
2020	*Higher Education Research and Development*	Q1 – education	1.675	3,848	70
2015	*IETE Technical Review (Institution of Electronics and Telecommunication Engineers, India)*	Q2 – electrical and electronic	0.415	1,495	33
2015	*International Journal of Innovation Management*	Q1 – management of technology and innovation	0.428	1,019	44
2018	*International Journal of Productivity and Quality Management*	Q2 – business, management and accounting	0.345	1.283	26
2019	*International Journal of Productivity and Quality Management*	Q2 – business, management and accounting	0.450	1.494	26
2018	*Journal of Business Economics*	Q2 – econometric	0.378	1,506	21
2018	*Journal of Higher Education Policy and Management*	Q2 – education	0.808	1,582	42
2016	*Journal of Informetrics*	Q1 – management science and operation research	1.848	3,029	76
2017	*Journal of Informetrics*	Q1 – management science and operation research	2.06	4,530	76
2020	*Journal of Informetrics*	Q1 – management science and operation research	1.605	5.107	76
2018	*Journal of Organizational Effectiveness*	Q2 – hr management	0.781	3,027	14
2017	*Journal of Technology Transfer*	Q1 – business and international management	1.358	3,316	79

Table 1   Journal quartile, *SJR*, IF and H-Index of selected journals (continued)

Year	Source title	Journal quartile in Scopus	SJR rank	Impact factor	H-Index
2020	*Journal of the Knowledge Economy*	Q2 – economic	0.482	2,127	27
2017	*Knowledge Management Research and Practice*	Q2 – management technology and innovation	0.445	1,467	38
2019	*Library Hi Tech*	Q2 – library and information science	0.427	1,843	38
2015	*Malaysian Journal of Library and Information Science*	Q2 – library and information science	0.353	0.925	24
2019	*Management Decision*	Q2 – management science and operational research	0.826	3,180	98
2019	*Minerva*	Q1 – education	0.903	2,109	40
2019	*Performance Measurement and Metrics*	Q2 – information science	0.43	1,026	22
2018	*Quality and Quantity*	Q2 – social science	0.421	1,310	57
2019	*Quality and Quantity*	Q2 – social science	0.498	2,214	57
2017	*R and D Management*	Q2 – management technology and innovation	0.822	2,163	102
2015	*Research Evaluation*	Q1 – education	0.875	1,967	49
2017	*Research Policy*	Q1 – management technology and innovation	3.688	5,552	238
2019	*Research Policy*	Q1 – management technology and innovation	3.246	6,458	238
2020	*Research Policy*	Q1 – management technology and innovation	3.666	8,294	238
2020	*SAGE Open*	Q2 – social education	0.357	1,536	32
2016	*Science and Public Policy*	Q2 – management, evaluation, policy and law	0.712	1,928	65
2017	*Science and Public Policy*	Q2 – management	0.700	1.6	65
2018	*Science and Public Policy*	Q2 – management	0.695	1.575	65
2019	*Science and Public Policy*	Q2 – management	0.771	1,774	65
2016	*Science, Technology and Society*	Q1 – multidisciplinary	0.427	1,526	22
2015	*Scientometrics*	Q1 – library and information science	1.149	2,577	116
2017	*Scientometrics*	Q1 – information science	1.125	2,878	116
2018	*Scientometrics*	Q1 – information science	1.113	3,296	116
2016	*SpringerPlus*	Q1 – multidisciplinary	0.447	1,310	52
2018	*Studies in Higher Education*	Q1 – education	1.888	3,058	104
2020	*Studies in Higher Education*	Q1 – education	1.744	3,823	104
2019	*Sustainability (Switzerland)*	Q2 – management	0.581	2,964	85
2018	*Tourism Recreation Research*	Q2 – management, monitoring policy	0.884	1,250	44

Table 2   Influential researchers and number of studies

No.	Name	First author	Non-first author	Total
1	G. Abramo	4		4
2	L. Aldieri	2		2
3	G. Prathap	2		2
4	C.A. D'Angelo		4	4
5	C.P. Vinci		2	2

Figure 5   Methods used in research performance in university (see online version for colours)

The journals that publish the research performance in universities can be seen in Figure 4, followed by Table 1 which conveys Journal Quartile in Scopus, *Scimago Journal Rank* (SJR) value, impact factor (IF), and H-Index on the condition of the article published. Figure 4 shows that *Scientometric* in the subject category of library and information

science, and *Science and Public Policy* are the journals that most frequently publish the discussed topics.

Based on the subject category, as shown in Table 1, 'education' is the largest category of fields based on the *Scimago Journal* database and country rank (SJR), which publishes articles on research performance in universities with good SJR rank, impact factor and H-index followed by the category of management and technology management and innovation.

We identified the most active and best contributing researchers. Table 2 describes the details of researchers who contributed as first authors or co-authors by publishing two or more articles in Scopus Q1/Q2 journals from 2015 to 2020. In total more than 150 researchers contributed and were involved in 68 articles during that period. However, only five researchers authored two or more articles.

In the 68 reviewed articles, it was identified that bibliometric analysis and regression analysis were the most widely used methods to answer research questions and objectives. The distribution of the method that has been used can be seen in Figure 5. Bibliometric analysis and regression analysis are the most widely used methods. The total number of distributions in Figure 5 is more than the final sample size of 68 because there are several articles that use two methods to answer the questions and the purpose of their study.

We identified the most active and good contributing researchers. Table 2 describes the details of researchers who contributed as first authors or co-authors by publishing two or more articles in Scopus Q1/Q2 journals from 2015 to 2020. In total 150 researchers contributed and were involved in 68 articles during that period.

The distribution of countries used as the unit of analysis is even. It can be seen from Figure 6 that research performance in Italy was widely published in the 2015–2020 period in highly reputable Scopus journals as many as seven articles, followed by China and Australia each of four articles.

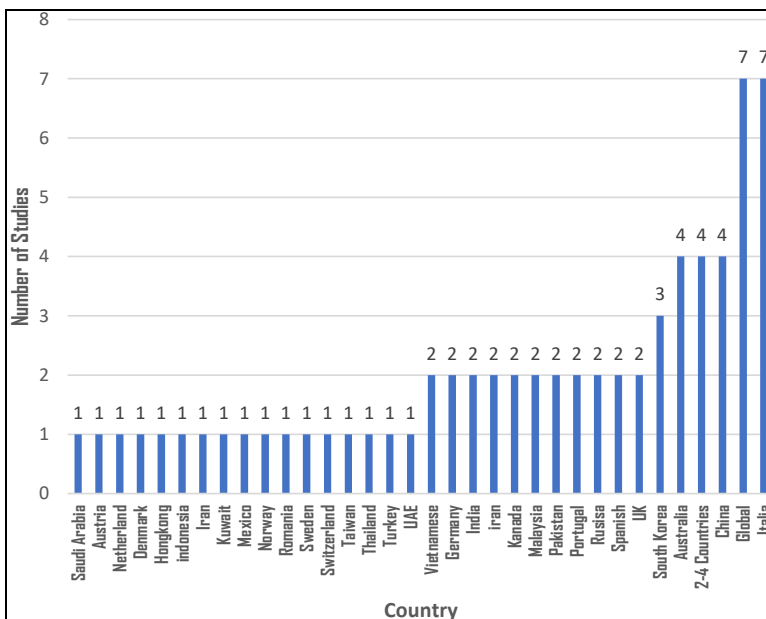**Figure 6**   Countries used as the unit of analysis (see online version for colours)

Table 3 Research topics related to grouping performance management

No.	Article title	Input	Process	Output	Productivity	Outcome
1	Benchmarking bibliometrics in … (O'Leary et al., 2015)	-	-	-	-	Citation
2	A bilateral comparison … (Guan and Wei, 2015)	-	Collaboration	Publication	-	Citation
3	Collaboration strategies … (Wang et al., 2015)	-	Collaboration	Publication	-	-
4	A quantity-quality composite … (Uddin and Singh, 2015)	-	-	Publication	-	Citation, H-Index
5	Assessment of research … (Siripitakchai and Miyazaki, 2015)	-	-	-	-	Citation
6	Application of h and … (Tahira et al., 2015)	-	-	Publication	Citation per publication	Citation, H-Index
7	Research performance evaluation … (Prathap and Ratnavelu, 2015)	Researcher	-	Publication	Publication per researcher	-
8	Organisational factors … (Verbree et al., 2015)	Researcher	Leadership	Publication	Publication per researcher; citation per publication	Citation
9	Does government funding … (Tahmooresnejad and Beaudry, 2015)	Funding	-	Publication; patent	-	Citation
10	Indian and Chinese higher education … (Savithri and Prathap, 2015)	Researcher	-	Publication	Publication per researcher	Citation
11	Building human resources … (Nguyen, 2015)	-	Management	-	-	-
12	The combined effects of … (Abramo et al., 2015)	Researcher	-	Publication	Proxy called fractional scientific strength	Citation
13	How diversity contributes … (De Saá-Pérez et al., 2015)	-	Status, field of study	Publication	-	-

Table 3   Research topics related to grouping performance management (continued)

No.	Article title	Input	Process	Output	Productivity	Outcome
14	Research performance of AACSB … (Ke et al., 2016)	-	Status of university	Publication	Citation per publication	Citation
15	Mapping excellence and diversity … (Prathap, 2016)	-	Field of study	Publication	-	Citation
16	Performance indicators in … (Gaus and Hall, 2016)	-	Management/ organisation	-	-	-
17	A methodology to measure … (Abramo et al., 2016)	Researcher	-	Publication	-	-
18	The factors affecting … (Ryu et al., 2016)	Facility, researcher; funding	Leadership, management/ organisation, collaboration	Publication; patent	-	-
19	The complex relationship … (Muscio et al., 2016)	Funding	Management/ organisation, collaboration	Publication	-	Citation
20	Academic performance and … (Docampo and Cram, 2016)	Resources	-	Publication	-	Citation
21	PhD funding as a determinant … (Horta et al., 2016)	-	Management/ organisation, field of study, collaboration	-	Publication per duration	Citation
22	Evaluation of the quality and … (Bucur et al., 2016)	Researcher	Management/ organisation	Publication; patent	-	Citation, innovation
23	The determinants of research … (Bonaccorsi and Secondi, 2017)	Researcher	Collaboration	-	-	Citation
24	What drives university research … (Frenken et al., 2017)	Resources	Collaboration, location; field of study	-	-	Citation
25	Impelling research productivity … (Ceballos et al., 2017)	-	Management/ organisation	Publication	-	Citation
26	The effects of non-academic … (Gulbrandsen and Thune, 2017)	Researcher	-	-	-	-
27	Empirical study on influence of … (Zhang and Wang, 2017)	-	Collaboration	-	-	H-Index

Table 3   Research topics related to grouping performance management (continued)

No.	Article title	Input	Process	Output	Productivity	Outcome
28	Research performance and … (Artés et al., 2017)	-	-	-	-	Teaching quality
29	Changing proxies for … (Tung et al., 2017)	-	-	Publication	-	Citation, H-Index
30	Studies of national research … (Sørensen and Schneider, 2017)	-	Collaboration	-	-	Citation
31	University strategic research … (Nguyen and Van Gramberg, 2017)	-	Management/ organisation	-	-	Economic impact
32	Research performance and … (Croucher et al., 2017)	-	Management/ organisation	-	-	-
33	Assessing the performance of … (Perry, 2017)	-	-	Publication	Citation per publication	Citation
34	Performance-based research funding … (Zacharewicz et al., 2018)	Funding	-	Publication, patent	-	-
35	Measuring changes in publication patterns in a context of performance-based research funding systems … (Sīle and Vanderstraeten, 2018)	-	-	Publication	-	-
36	Benefit of the doubt approach to assessing the research performance … (Szuwarzyński, 2018)	Funding	Field of study	Publication	PhD student per research staff	Citation
37	Comparison of medical research … (Eskrootchi and Sanee, 2018)	-	-	Publication	Citation per publication	Citation, H-Index
38	In search of excellence: a case study … (Menter et al., 2018)	Funding	Management/ organisation	Publication	-	Citation
39	How to measure the performance … (Zharova et al., 2018)	Funding	Management/ organisation	-	Citation per publication	-
40	Research or management? … (Lou et al., 2018)	-	Management/ organisation	Publication	-	Citation

Table 3   Research topics related to grouping performance management (continued)

No.	Article title	Input	Process	Output	Productivity	Outcome
41	Comparative trends in … (Avanesova and Shamliyan, 2018)	Funding	Collaboration	Publication; patent	Citation per publication	Citation, economic impact, social impact
42	Understanding research strategies to … (Diezmann, 2018)	-	Leadership; collaboration	-	-	-
43	The effect of in-service training on employees' productivity in … (Mirrezaei et al., 2018)	-	Management/ organisation	-	-	-
44	Effect of organisational culture and organisational learning … (Rezaei et al., 2018)	-	Management/ organisation	-	-	-
45	A nation's foreign and domestic … (Abramo et al., 2018)	Researcher	-	Publication	Proxy called fractional scientific strength	-
46	The unintended consequences of … (Bak and Kim, 2018)	-	Management/ organisation	Publication	-	Citation
47	Research performance of Turkish … (Çokgezen, 2018)	-	-	Publication	-	-
48	European academic libraries … (Swiatek, 2019)	Library	-	-	-	-
49	Industry and leadership experiences … (Rybnicek et al., 2019)	-	Leadership	Patent	-	-
50	The research performance of Iranian … (Sadeghi-Bazargani et al., 2019)	Researcher	Collaboration, field of study	Publication	Citation per publication	Citation, H-Index
51	The interconnections of … (Degl'Innocenti et al., 2019)	-	-	-	-	License, income
52	Does public outreach impede … (Kassab, 2019)	-	-	Publication	-	Society engagement, citation

Table 3   Research topics related to grouping performance management (continued)

No.	Article title	Input	Process	Output	Productivity	Outcome
53	Financial support and university … (Lee and Kim, 2019)	Funding	-	Publication	-	-
54	Inbreeding and research … (Tavares et al., 2019)	Researcher	-	Publication	-	Citation
55	Patterns of the China-Africa research … (Eduan and Yuanqun, 2019)	-	Collaboration	Publication	-	Citation
56	Business research productivity … (Khalil and Khalil, 2019)	Researcher, funding	Field of study	Publication	-	-
57	The influence of personal and organisational factors … (Ghabban et al., 2019)	Researcher	Management/ organisation, collaboration	Publication	-	Citation
58	Scientific collaboration networks … (Sabah et al., 2019)	-	Collaboration	Publication	-	-
59	The effect of service on … (Tagliaventi and Carli, 2019)	-	Leadership	-	-	Society engagement
60	An investigation of impact of … (Aldieri et al., 2019)	-	Collaboration	-	-	Citation
61	Italy's national research assessment … (Grisorio and Prota, 2019)	Researcher	Location	-	PhD student per research staff; funding per research staff	Citation
62	Methods for assessing … (Kelly et al., 2019)	-	Collaboration	Publication	-	-
63	Research performance of … (Mukundan and Narayanan, 2020)	-	Collaboration, field of study	Publication	-	Citation
64	Potential of European universities … (Falk and Hagsten, 2020)	-	Management/ organisation	-	-	Citation
65	Comparison of research performance of … (Abramo et al., 2020)	Researcher	-	Publication	Proxy called fractional scientific strength	Citation

Table 3   Research topics related to grouping performance management (continued)

No.	Article title	Input	Process	Output	Productivity	Outcome
66	The effects of collaboration on … (Aldieri et al., 2020)	-	Collaboration	-	-	Citation
67	Evaluating the research performance … (Javed et al., 2020)	-	Status	Publication	-	Citation
68	Does the merger of … (Kang and Liu, 2020)	Resources	-	Publication	-	Social impact

There are seven articles based on unit analysis globally. Two authors compared the research performance of multiple countries across continents while four authors compared several European countries. In addition, one author compared China with Africa.

With an explanation in the introduction related to input, output process, productivity and outcome, we include 68 articles in the final sample into Table 3. Table 3 summarises that there are 27 articles measuring input variables on research performance and found that aspects of human and funding resources, and facilities are aspects that influence it. Likewise, there are 41 articles related to process variables (management/organisation, leadership, collaboration, university characteristic and field of study), 44 articles related to output variables (publication and patent), 15 articles related to productivity variables (citation per publication, publication per researcher, proxy called fractional scientific strength, publication per duration, citation per publication, and PhD student per research staff), and 44 articles related to outcome variables (citation, H-Index, innovation, teaching quality, economic impact, social impact, license, and income and society engagement).

This is in line with the previous study where input and process variables have a major impact on outcomes such as group performance with various indicators that exist in each of these variables (Littlepage et al., 1995). Cosmetatos and Eilon (1983) stated that an increase in productivity is a reflection of a performance. Control of process is an essential part of overall performance (Haponava and Al-Jibouri, 2010), where in the previous study, process variables are declared valid which contribute to operational and competitive performance (Alzoubi and Khafajy, 2015). Meanwhile, output and outcome are indeed part of the measurement of research performance, where the unit of measurement of output is more on the quantity, while the measurement of outcome is on its impact (Uddin and Singh, 2015).

Interesting result from this study find that the outcome indicators related to the university's mission to improve research outcomes that have economic (commercial) and social impacts (providing solutions to problems in society) have not been widely discussed. The current research mostly aimed at measuring citations as the impact of a publication as a standard for evaluating higher education research performance. This is an opportunity for the author and of course other researchers to explore in evaluating research performance in the area of economic and social aspects.

People's expectations of universities are now more than research visits, teaching, and public services. Universities should broaden their criteria to include patents, licensing, and commercialisation activities as important considerations for achievement, tenure, and career advancement, along with publication, teaching, and service (Sanberg et al., 2014).

This commercial interest can influence research performance and evaluation, as well as play an important role in future economic and social development (Pavitt, 2000), where social impact assessment has played an important role in several national evaluations (Bornmann, 2013), related to improving the overall quality of teaching (Artés et al., 2017), and is also positively influenced by involvement in community empowerment activities (Kassab, 2019).

5 Conclusions and future works

This paper is reported to be a systematic literature (SLR) to synthesise research in 2015 to 2020 on university research performance using a rigorous and systematic methodology through the process of identifying, reviewing, and interpreting all selected studies to provide answers to the research questions that have been formulated. Overall, the final 68 papers show some progress in understanding research performance in universities. The review illustrates the diversity of college contexts and the focus of research that has been carried out, and it shows that performance across universities is valuable research. However, there is a need for evaluation of research performance in improving the quality of higher education. With a variety of studies related to research performance, we conduct a review of this study with a systems theory-based perspective in organisations, especially in universities, by not disregarding to review several matters related to significant journal publications, active researchers, the most widely used methods, and countries that are becoming research locations related to research performance in universities.

We conclude that the SLR with the established method has several strengths and limitations. We include articles conducted in different countries with different characteristics, both in terms of policy, number, and type as well as the goals and strategies of each university, thus enabling us to capture the essence of the intellectual endeavour on the topic. Recognising this limitation, the various studies reviewed have been defined and measured in different ways. Although efforts have been made to address this discrepancy, we acknowledge that there are nuances that are overlooked in comparing the various studies that escape the limitations of publication bias. By focusing on studies published in one of the databases, and using the highest criteria and time constraints, it is possible to exclude relevant studies and limit creativity and innovation.

However, we believe that our SLR can make a meaningful contribution to theory and research. We have mapped the current research structurally as a viable research area. It has also reviewed significant journal publications, active researchers, the most widely used methods, and countries where research was conducted on research performance at universities to assist further research to develop knowledge in this area. Moreover, in the process of identifying and mapping various variables that need to be measured in evaluating research performance in universities. We selectively base a systems theory perspective in exploring research performance in universities. This perspective provides an effective fit with the context of research performance measurement models in universities and helps capturing the full spectrum of research performance evaluation in universities. The strongest picture of the review is how universities can encourage researchers to enter the realm of commercialisation or appropriate products or even have a social impact. Thus, a new challenge arises to develop a national performance

evaluation model in universities that is adapted to the policies and strategies of each country.

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