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RESEARCH ARTICLE

Empowering Research Ecosystems: Profiles and Bibliometrics Analysis of Research Officers at Universiti Malaya

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ABSTRACT

The future trajectory of Universiti Malaya (UM) as a prominent regional research institution in Malaysia is intricately intertwined with the expertise and contributions of its research workforce, including the Research Officers (ROs). Given the pivotal role played by ROs in UM's research and innovation landscape, this paper briefly highlights an overview of their general roles in empowering UM's research and innovation landscape. The UM's ROs were profiled according to their gender, educational background, position, and grade. The study employs bibliometric analysis using data from the Scopus database to examine the scholarly output of ROs, focusing on their H-index, research fields, and the number of scientific publications produced between 2018 and 2022. The bibliometric impact analysis was performed by focusing on the citation of the publications, joint-publications network, and correlation of publications' contribution between the ROs over all the researchers in UM. The profile analysis indicates that ROs in UM are dominated by females, with postgraduate education qualification, and mostly holding entry-level positions (grade 41). The impact analysis shows that UM's ROs had an international network with 27% of their publications being jointly authored with international collaborators. They consistently contribute dto scholarly output by showing a coherent trend with the overall publication of UM. This work highlights the significant role of ROs in a Malaysian research university, setting the benchmark for other national universities in enhancing the credibility of ROs in achieving research and innovation excellence.

Keywords: Research officers, Roles, Profiles, Research impact, Universiti Malaya, Scopus, bibliometric analysis.

1. Introduction

1.1 Overview

The age of globalisation necessitates that Malaysia adapts and accommodates new realities, particularly within the realm of education. This underscores the immediate requirement for a more innovative workforce capable of generating prosperity within the nation, with the goal of enhancing the overall quality of life. With strong aspirations to be at par with other world-class universities, five research universities which are Universiti Malaya (UM), Universiti Kebangsaan Malaysia (UKM), Universiti Sains Malaysia (USM), Universiti Putra Malaysia (UPM) and Universiti Teknologi Malaysia (UTM) (Saadatian et al., 2009) are being closely scrutinised for their capability to mitigate diverse challenge (Mohamad Sheriff & Abdullah, 2017).

One prevailing challenge is the utilisation of human capital to produce impactful results that will improve university performance (Salau et al., 2016; Kucharčíková, Tokarčíková, & Blašková, 2015), especially in promoting research and development (R&D) growth to produce outputs, results, and generation of income for the university. To foster a culture of R&D in Malaysia, the Public Services Department, responsible for overseeing human capital in the public or civil service sector (Johari &Yahya, 2019), has established a flexible category of career positions known as Research Officers (ROs) and Social Research Officers (SROs).

The ROs are responsible for conducting R&D tasks, providing expert services, and training, legal services based on their areas of expertise. They also have to publish articles in relevant fields. Meanwhile, the SROs are responsible for carrying out research activities, and operational tasks related to social marketing, such as advertising for educational purposes, publishing and the dissemination of knowledge, as well as providing professional and community services (Suruhanjaya Perkhidmatan Awam Malaysia, 2020). Overall, both positions are placed strategically in ministries, government agencies, and various government departments that require R&D work.

Due to the specialised and specific job roles of ROs, these positions were deemed particularly well-suited for placement within Malaysian Research Universities (MRUs). As one of the recognized MRUs, Universiti Malaya is tasked with expanding its research and commercialisation activities due to the relationship between economic growth and R&D activities (Tan & Md. Noor, 2013). UM employs research management and governance practices to bolster and further improve the existing research management and governance, aligning with the Malaysian government's goal of attaining high-income nation status (Md Kasim et al., 2021). Within UM, ROs were categorised as professional staff, typically situated in research centres and research management offices, assuming various significant roles and responsibilities. Professional staff in a university play a crucial and diverse role in supporting the institution's mission and overall functioning (Veles et al., 2023). In fact, the Malaysian Department of Higher Education Strategic Plan 2018 – 2022, aimed at advancing human capital development by transforming higher education (Department of Higher Education, Ministry of Higher Education, 2023). This plan seeks to address the nation's development requirements and elevate its standing on the global stage by prioritising and bolstering the culture of R&D and enhancing teaching and learning across all segments of society.

1.2 Bibliometric Analysis

The Scopus database is exceptionally suitable for bibliometric analysis due to its comprehensive coverage of scholarly publications, spanning various disciplines and encompassing a vast global research landscape (Burnham, 2006). Its extensive indexing includes a wide array of academic journals, conference proceedings, and patent literature, making it a valuable resource for assessing research output and impact (Pranckutė, 2021). Scopus provides detailed citation data, allowing for the analysis of citation patterns and collaborations, thus facilitating the evaluation of research influence and trends. Its user-friendly interface and search functionalities further enhance its utility in conducting bibliometric studies, enabling researchers to extract valuable insights into academic productivity, collaboration networks, and research trends, making it an indispensable tool for bibliometric analysis (Ghani et al. 2022). Scopus-based bibliometric analysis has been employed to understand the trends of academic publication in a case study of Malaysian research universities (Mohd Sarjidan and Md Kasim 2023).

1.3 Importance of the Study

Several studies on the professional staff in universities have been previously carried out. Baltaru (2019) evaluated the impact of changes in the ratio of professional staff to students (from 2003 to 2011) on subsequent university performance, utilizing a sample of 100 British institutions. It was observed that institutions with a slight increase in professional staff have elevated degree completion rates. Nevertheless, no notable variations were found regarding research quality, high honours degrees, or graduate employability.

Gander (2018) conducted a study on the job requirements, values, attitudes, and behaviours of university professional staff members utilizing a modern career profile framework. His findings, which were based on a mixed methods study design, enhanced the professional profile hypothesis by emphasizing individual demands, associated behaviours, and outcomes, while proposing that several psychological factors influence career behaviours. In another study, this time on the psychological contracts of university professional staff, Gander (2023) found that the expectations of psychological contracts for modern professional characteristics were among the most significant predictors of psychological contract violation, in conjunction with satisfaction.

Other studies focus on the skills of professional research staff, and among them was one by Berman and Pitman (2010) who examined the degree to which universities, which advocate for the importance of generic skills among research degree candidates, leverage the research and transferable skills of PhD graduates who are employed as professional staff within the university sector. Their findings found that research-trained professional workers at an Australian university were effectively applying their research and general abilities in management positions, therefore benefiting the institution.

Despite a significant cohort of professional research staff in the university, there is a dearth of studies about ROs in the Malaysian landscape. The importance of this study is underscored by its primary objectives, which revolve around shedding light on the roles, profiles, contributions, and impacts of ROs within academic institutions. By examining the ROs in-depth, this study provides valuable insights into their organisational structure, functions, and the contributions they make to the R&D landscape. Such insights are not only crucial for enhancing the internal operations of ROs but also hold broader

implications. As the study aspires to become a reference point for the formulation and design of R&D policies in universities, it offers insights that may guide and shape the strategic direction of research initiatives within the academic sphere.

1.4 Roles of Research Officers at Universiti Malaya

MRU needs to continue to evolve to become more competitive, driving the remaining challenges in education, inter- and transdisciplinary research and innovation, career development, and governance (Ramli et al., 2013). Moreover, MRU has played a role in relation to university-based incubators in facilitating the entrepreneurial process (Liow & Wong, 2021). In line with the development of MRUs, the role of a RO in most RUs has become increasingly important in today's complex and competitive academic landscape (Mohamad Sheriff & Abdullah, 2017). At UM, ROs play an increasingly important and integrated role in managing research activities and shaping institutional policies and strategies to meet the growing complexities and demands of modern research environments. From the job description analysis of 70 ROs, we have summarised the role of the ROs at UM into eleven (11) main pillars as explained in the following sections.

1.4.1 Grant Acquisition and Management

ROs are responsible for identifying and securing various types of research funding including government, industry, private, and international grants, assisting research centres and researchers/academicians in preparing grant applications, ensuring compliance with funding guidelines, and pre- and post-award as well as non-financial management. In an era of shrinking public funding and increasing competition, RO's ability to navigate the intricacies of grant applications and develop successful proposals is critical in maintaining research programs (Sato et al., 2021).

1.4.2 Writing, Editing, and Manuscript Submission

The ROs are usually involved in writing research papers, reports, or articles. This includes drafting manuscripts, creating figures and tables, and adhering to the publication guidelines. This also includes assisting in submitting research papers to targeted journals, conferences, or other publications which involves preparing the cover letters, tracking submission progress, and dealing with any reviewer comments. (Ecarnot et al., 2015).

1.4.3 Collaboration and Partnership

Most research universities are fostering interdisciplinary research collaborations to address complex and real-world problems (Azman et al., 2019). ROs serve as intermediaries in connecting researchers/ academicians from different disciplines, facilitating interdisciplinary projects, supporting cross-disciplinary work, and helping to negotiate agreements. They coordinate the collaborative processes and ensure researchers have the resources and support to effectively pursue cross-disciplinary engagement.

1.4.4 Research Consultancy and Special Service

The role of ROs extends across multiple dimensions, including providing consultancy services, delivering specialised expertise, and conducting comprehensive characterisation and analytical assessments for both internal and external researchers affiliated with the university. In this capacity, the RO plays a

pivotal role in assisting and supporting the research landscape in university by delivering expert guidance, tailor-made solutions, and rigorous investigative work to meet the needs of researchers within and outside the institution (Quaglione et al., 2015).

1.4.5 Compliance and Regulations

With the growth in interdisciplinary and interinstitutional research, there is a greater need to navigate complex regulatory and ethical considerations. ROs assist in ensuring that research activities meet legal and ethical standards, including human subjects' protection, animal welfare, and intellectual property rights (Roets, 2017).

1.4.6 Research Strategy and Capacity Building

The ROs contribute to the development and shaping of the university's research strategies by identifying emerging trends and opportunities in various fields. By keeping an eye on the broader research landscape, ROs help institutions align their efforts with evolving priorities, and provide input on how best to allocate resources. By engaging in training and capacity-building efforts with stakeholders, the University's management can enhance their understanding and application of research in policy and decision-making. (Hellström, 2018).

1.4.7 Technology Transfer and Commercialisation

Promoting the commercialisation of research outcomes and fostering innovation are key components of RO roles. They help bridge the gap between academic research and potential real-world applications, fostering innovation and economic development (Brantnell & Baraldi, 2022).

1.4.8 Data and Analytics

With the increasing importance of data-driven decision-making, ROs play a role in analysing and interpreting research data to inform strategic decisions and provide insights into research performance. They assist in tracking and reporting progress and outcomes and evaluating the impact of research projects. This information is important for accountability, assessing the return on investment, and demonstrating the university's contribution to knowledge and society (Unwin, 2020).

1.4.9 Advocacy and Outreach

ROs are often involved in advocacy efforts to encourage research interest and gain support from government bodies, industry players, and the public. This enables the university to communicate its research achievements and its societal impact to various stakeholders (Buenestado-Fernández et al., 2019).

1.4.10 Managing Research Infrastructure

In today's technology-driven world, ROs are also involved in managing research technology and infrastructure. They assist and provide support for research infrastructure including research computing, space, equipment, and shared research facilities. As an entrepreneurial university, UM needs to establish a strategic direction for leadership in developing large-scale research infrastructure (Rådberg & Löfsten, 2023).

1.4.11 Policy Development

Research policies establish the essential framework for the effective and efficient management of research within higher education institutions and academic programs (Millones-Gómez et al., 2021). In UM, ROs contribute to policy development and formulation by providing evidence-based insights and recommendations. They help identify policy gaps, assess the impact of existing policies, and propose new policy solutions for the betterment of society.

2. Methodology

2.1 Data collection

The data collection timeline for this study was meticulously executed to ensure the accuracy and reliability of the gathered information. Initially, on March 8, 2022, a comprehensive list of ROs at UM was obtained. Subsequently, on January 3, 2023, the list was reviewed, and out of the initially identified 74 staff, only 70 were considered for analysis, as four of them had resigned before the conclusion of 2022. Access to the Scopus database, a vital resource for data collection, was granted on January 9, 2023. In addition, UM's ROs profile was extracted from the publicly available UMExpert database (https://umexpert.um.edu.my/).

The data collection process involved searching Scopus profiles for the 70 retained ROs. Among these, 58 individuals (83 %) were found to have active Scopus profiles, from which data, including documents published and citation counts, was gathered for the period spanning 2018 to 2022. It's important to note that documents classified as "Erratum" were excluded from the data.

To maintain data accuracy, in cases where multiple Scopus profiles were associated with the same individual, a merging process was implemented. Subsequently, the collected data underwent a comprehensive analysis, with a primary focus on assessing the research output and impact of the ROs at UM during the specified 2018-2022 timeframe. This analysis involved the application of various statistical methods to identify trends, correlations, and patterns in the research productivity and impact of the ROs.

2.2 Data analysis

The analysis in this study employed a multifaceted approach to assess various aspects of ROs at UM. In profiling the individuals, key attributes such as gender, educational background, current position, grade, and H-index were examined, providing insights into the composition of the academic community. Scholarly activity was scrutinised, focusing on their respective fields of research and the number of publications, shedding light on their research productivity and areas of expertise.

Furthermore, the impact delivery from the ROs was evaluated by considering their research publication citation counts and examining co-authorship patterns, which shed light on collaborative efforts in research. These two impact-related metrics served as indicators of the influence and collaborative engagement of these professionals in the academic and research domains. Collectively, this analytical approach offered a thorough understanding of the ROs' profiles and their contributions to research and collaborative initiatives at both local and global levels.

2.3 Limitations

However, it is essential to acknowledge certain limitations in this research. Firstly, the analysis is contingent on the data available in the Scopus database and may not encompass research outputs that are not indexed in Scopus. Furthermore, the study is confined to the designated time frame of 2018 to 2022 and may not account for earlier or later publications and citations. Next, this study excludes several critical data sources due to limited access, such as research project and grant databases, awards, and recognition, as well as intellectual properties and commercialisation. These exclusions may impact the comprehensiveness of the findings and limit a holistic assessment of the ROs' contributions and impact.

3. Results and Discussion

3.1 Profile Analysis

In UM, the profile of ROs reflects a diverse and dynamic workforce. **Figure 1(a)** shows the gender distribution among ROs with a relatively balanced representation of males constituting 24.34 % and females comprising 46.66 % of the total. The educational qualification of these professionals varies, with 9.13 % holding bachelor's degrees, 31.44 % possessing master's degrees, and 30.43 % having attained a PhD, reflecting a substantial number of highly qualified individuals (**Figure 1(b)**). In terms of job roles, ROs dominate the landscape, constituting 58.83 % of the positions. Social ROs make up 11.16 %, while Research Managers form a smaller segment at 1.1 % (**Figure 1(c)**). This distribution indicates a hierarchical structure within research-related roles, with the majority actively involved in the execution and management of research projects. Notably, a significant proportion of UM ROs (87%) possess postgraduate qualifications.

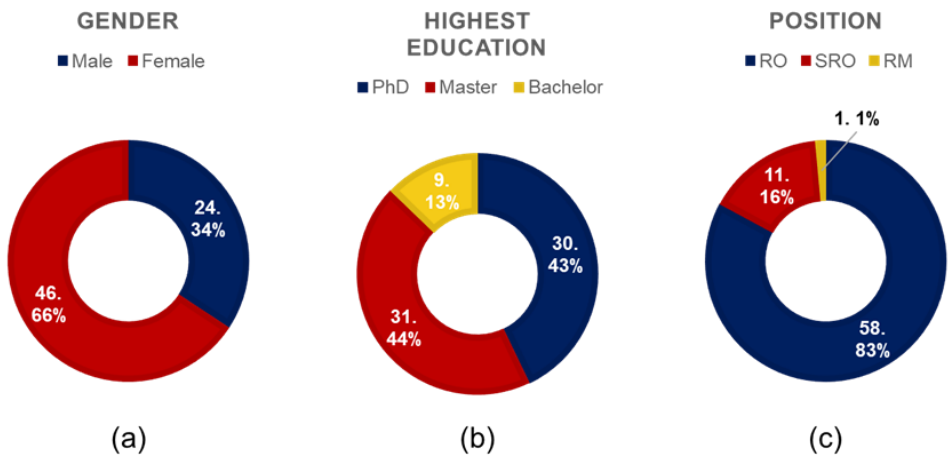


Figure 1: Composition of (a) gender, (b) highest education, and (c) management and professional position of UM's Research Officer (RO), Social Research Officer (SRO), and Research Manager (RM).

The positions of ROs are categorised into different grade levels, reflecting a structured hierarchy within the institution. In which the grade of Q41/N41 is equivalent to an entry-level position, where Q43/Q44/ N44 is parallel to a senior officer position, Q47/Q48 refers to a manager position, and Q52/Q54 corresponds to a senior manager position. **Figure 2** displays the distribution of UM's ROs according to position grade indicating a diverse range of responsibilities and expertise across various grades. Among these, Grade Q41 is the most prevalent, with 24 ROs falling into this category, signifying a substantial workforce engaged in research activities at a foundational level. Following this, Grade Q44 accommodates 11 ROs, while Grade Q43 and Grade Q48 each have 8 and 7 individuals, respectively. Smaller groups exist in Grades Q54 and Q47, with 2 ROs in each grade. Grade Q52 encompasses 5 ROs, adding to the multifaceted composition of the research workforce at UM. For the category of SROs, the distribution is similarly structured by grade. Three individuals hold the N44 grade, indicating a specialised role within this category. Eight Social ROs are in the N41 grade, suggesting a slightly larger cohort engaged in more foundational aspects of social research and as early career researcher or manager. This distribution showcases the institution's commitment to structuring its workforce in a way that accommodates varying levels of experience based on expertise position and responsibilities within the field of research and management, ensuring a comprehensive and well-rounded research ecosystem.

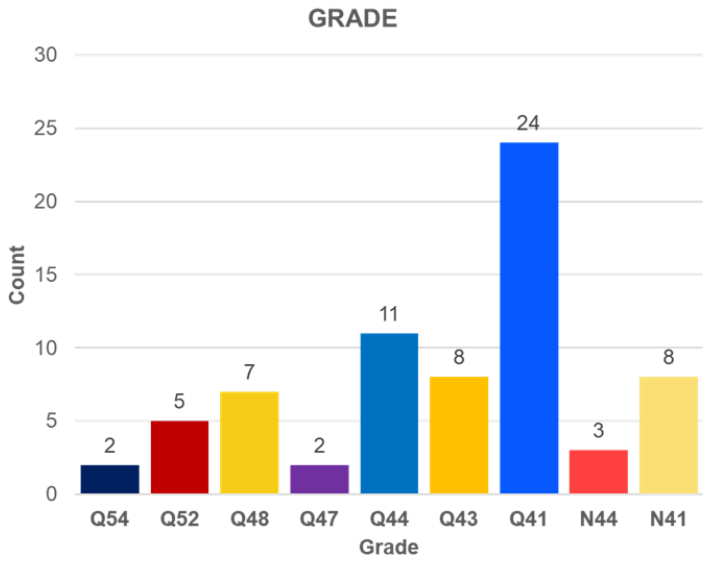


Figure 2: Number of ROs according to position grade in UM.

The h-index distribution among ROs at UM provides insights into the productivity and impact of their scholarly output (**Figure 3**). A significant number of ROs, 31 individuals to be precise, fall within the h-index range of 0 to 5. This suggests that a substantial number of researchers are at the early stages of their research careers or have a focused body of work with moderate citation impact.

In the h-index range of 6 to 10, there are 16 ROs, indicating a cohort that establishing an impactful scholarly profile. This group likely includes individuals whose research has garnered attention and

citations within the academic community. Moving further up the h-index scale, 9 ROs have achieved h-index in the range of 11 to 15, signifying a higher level of influence and recognition for their scholarly contributions. Additionally, a smaller yet distinguished group consists of a single RO with h-index in the range of 16 to 20, reflecting a notable impact in their respective fields. Notably, one RO at UM boasts an h-index exceeding 20, underscoring an exceptional level of scholarly influence and recognition. This achievement likely represents the contributions of a highly esteemed researcher whose work has made a significant impact in their field. Overall, the distribution of h-indices among ROs at UM reflects a diverse spectrum of scholarly impact, encompassing both emerging talents and established experts within the institution.

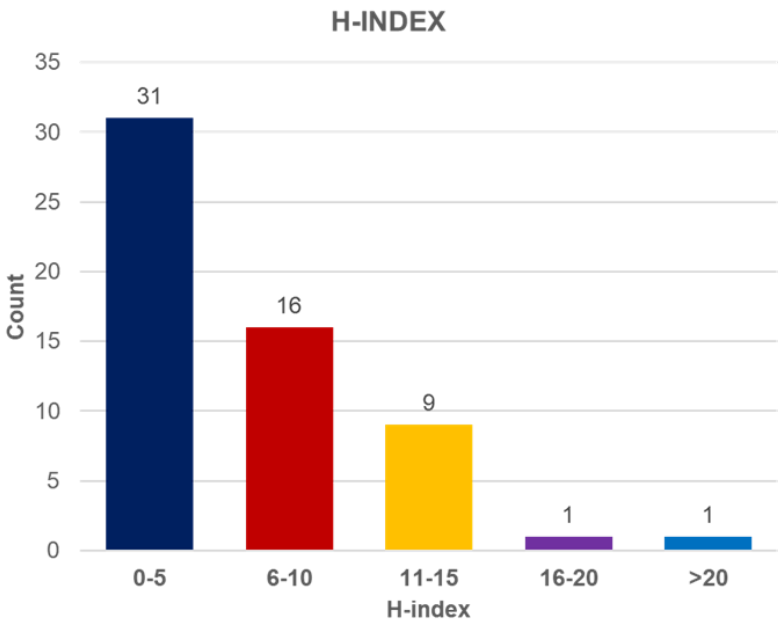
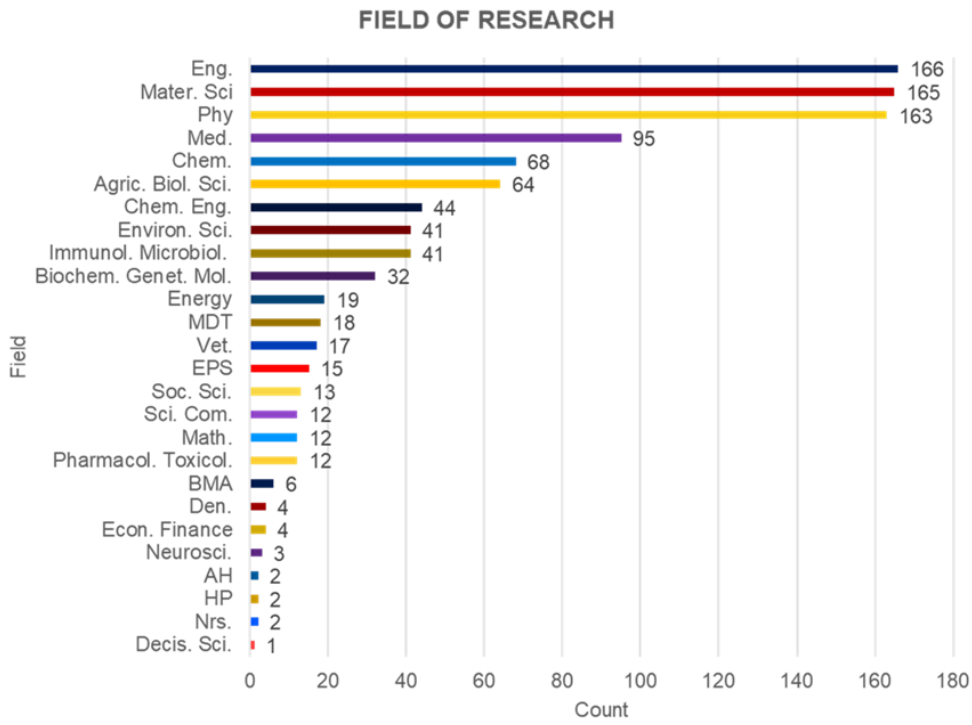


Figure 3: Number of ROs according to H-index in UM.

Figure 4 portrays UM's ROs who have made significant contributions to a diverse array of fields, as evidenced by their publication output from the year of 2018 to 2022. The top five fields of publication by UM's ROs counted in this work timeframe were Engineering, Material Science, Physics, Medicine, and Chemistry. The top three fields; Engineering, Material Science, and Physics recorded a close gap of 166, 165, and 163 counts respectively. It can be observed and analysed that these three fields are related to the contribution of ROs from the Photonic Research Centre (PRC) and are ranked the top three in the document count (**Table 1**). This output reflects a commitment of UM's ROs to advancing technological solutions and addressing challenges within the physics-related discipline in the practice of material application and development as well as technological device mechanisms.



Field	Abbreviation	Count	Field	Abbreviation	Count
Engineering	(Eng.)	166	Earth and Planetary Sciences	(EPS)	15
Materials Science	(Mater. Sci)	165	Social Sciences	(Soc. Sci.)	13
Physics and Astronomy	(Phy)	163	Computer Science	(Sci. Com.)	12
Medicine	(Med.)	95	Mathematics	(Math.)	12
Chemistry	(Chem.)	68	Pharmacology, Toxicology and Pharmaceutics	(Pharmacol. Toxicol.)	12
Agricultural and Biological Sciences	(Agric. Biol. Sci.)	64	Business, Management and Accounting	(BMA)	6
Chemical Engineering	(Chem. Eng.)	44	Dentistry	(Den.)	4
Environmental Science	(Environ. Sci.)	41	Economics, Econometrics and Finance	(Econ. Finance)	4
Immunology and Microbiology	(Immunol. Microbiol.)	41	Neuroscience	(Neurosci.)	3
Biochemistry, Genetics and Molecular Biology	(Biochem. Genet. Mol.)	32	Arts and Humanities	(AH)	2
Energy	(Energy)	19	Health Professions	(HP)	2
Multidisciplinary	(MDT)	18	Nursing	(Nrs.)	2
Veterinary	(Vet.)	17	Decision Sciences	(Decis. Sci.)	1

Figure 4: The number of ROs' fields of research contributed to the publications from 2018 to 2022 from the Scopus database.

Table 1 highlights the top ten authors among UM's ROs, ranked by their prolific publication output from 2018 to 2022. The results reflect a diverse range of expertise and contributions spanning various research centres and disciplines. Dr. Muhamad Zharif Samion leads with the highest document count of 55 publications. Notably, the top three authors are affiliated with the Photonic Research Centre (PRC), underscoring significant contributions in the fields of Engineering, Materials Science, and Physics, as illustrated in **Figure 4**. The list in **Table 1** also reflects the hierarchical distribution of academic qualifications and gender representation. Among the top ten authors, men dominate, with only one

female researcher, Dr. Siti Aisyah Reduan, included. Additionally, while nine authors hold doctoral degrees, one author, Mr. Khor Chee Sieng, has a master's degree. The h-index values of these top contributors exhibit a diverse range, spanning from 6 to 21, highlighting varying levels of scholarly impact among UM's leading researchers.

Table 1: Top 10 UM's ROs with the highest number of publications from 2018 to 2022, based on data from the Scopus database.

Author	Placement	Position	Highest Academic Qualification	H-Index	Document Count (2018-2022)
M.Z. Samion	Photonic Research Centre (PRC)	RO	PhD	13	55
M.F. Ismail	Photonic Research Centre (PRC)	RO	PhD	17	53
S.A. Reduan	Photonic Research Centre (PRC)	RO	PhD	15	39
C.D. Chen	Deputy Vice-Chancellor (Research & Innovation)	RO	PhD	21	34
S.K. Loong	Tropical Infectious Diseases Research & Education Centre (TIDREC)	RO	PhD	9	30
M.K.A Zaini	Photonic Research Centre (PRC)	RO	PhD	6	29
K.M. Lee	Deputy Vice-Chancellor (Research & Innovation)	RO	PhD	14	26
V. Balakrishnan	Pusat Pengkhususan Tenaga Kuasa Termaju UM (UMPEDAC)	RO	PhD	12	26
C.S. Khor	Tropical Infectious Diseases Research & Education Centre (TIDREC)	RO	Master	10	23
M.Z. Kufian	Faculty of Science	RO	PhD	14	19

3.2 Impact Analysis

As portrayed in **Figure 5** between the years 2018 and 2022, there has been a discernible upward trend in both publications and citations, indicating a growing interest and recognition of the work produced. In 2018, a total of 88 publications were produced, accompanied by 38 citations. While the number of publications was relatively modest, the citation count suggests a certain level of impact and influence within the academic community.

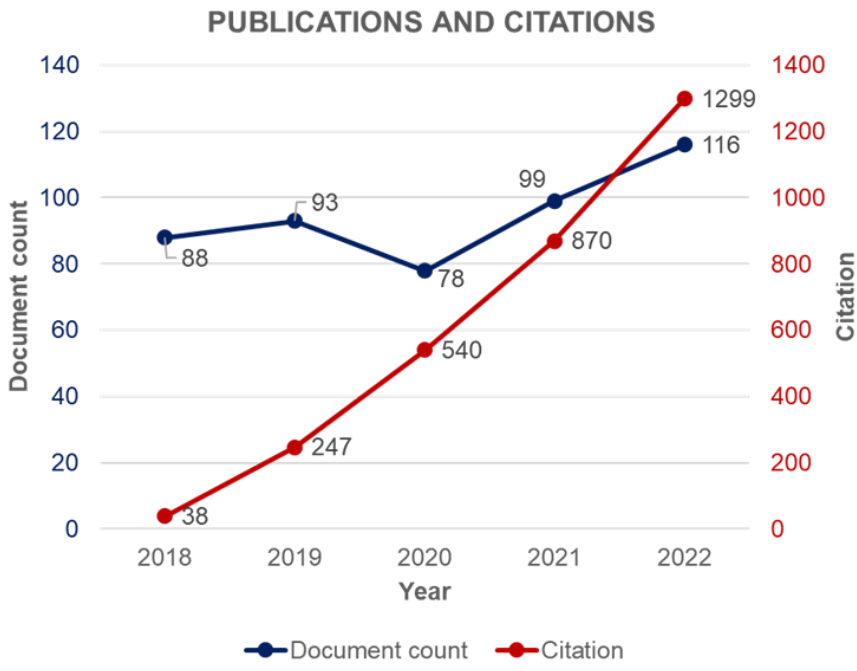


Figure 5. Document count and citation metrics for publications contributed by ROs at UM from 2018 to 2022, based on data from the Scopus database.

The following year, 2019, saw a notable increase in both publications and citations. The number of publications rose to 93, indicating a continued commitment to research output, while the citations experienced a substantial leap to 247. This significant rise in citations suggests that the research from the previous year gained traction and recognition within the scholarly landscape. In 2020, despite a slight dip in the number of publications to 78, there was a remarkable surge in citations to 540. This suggests that the quality and impact of the research output may have compensated for the slight reduction in quantity. The increased citations could also be indicative of the growing relevance and applicability of the work to the wider academic community.

The year 2021 witnessed a resurgence in both publications and citations. The number of publications reached 99, signalling a renewed vigour in research productivity. The citations, however, saw a substantial jump to 870, indicating that the research output not only continued to be prolific but also

garnered increased attention and acknowledgment. The trend continued into 2022, with a further increase in both publications and citations. A total of 116 publications were produced, showcasing a commitment to expanding the breadth of research. The citations skyrocketed to 1299, marking a significant elevation in the impact and recognition of the scholarly work. This suggests that the research conducted in 2022 continued to build upon the momentum of the previous years, solidifying its position as a notable contributor to the academic discourse.

Between 2018 and 2022, ROs at UM have produced numerous highly influential and widely cited publications (Table 2). Leading the list is a 2019 review article authored by Dr. Cheah Mei Yee, titled 'Sustainability of Direct Biodiesel Synthesis from Microalgae Biomass: A Critical Review', published in the *Journal Renewable and Sustainable Energy Reviews*. With an impressive 209 citations, this work underscores the critical importance of sustainable biodiesel synthesis and establishes Dr. Cheah as a leading authority in the field. The analysis of the top four most-cited documents in Table 2 reveals that review articles dominate, consistently garnering high citation counts. Review papers provide a comprehensive overview of a specific field, summarising existing literature, key developments, and current trends. Their value lies in serving as a one-stop resource for researchers seeking to understand the state of knowledge in a given area, which explains their significant citation impact.

Additionally, it is noteworthy that among the top four most-cited documents, two are centred on solar research, which has attracted more citations compared to other fields. This prominence can be attributed to the global emphasis on sustainable and renewable energy sources, particularly solar energy. As the world strives to transition from fossil fuels to address pressing challenges such as climate change and energy security, research in solar energy garners extensive attention and citation, reflecting its global relevance and significance.

Table 2 also shows that all the ten top-cited documents recorded are in Q1 journals. This is due to the Q1 journal being in the top 25% of their subject category, indicating a relatively high impact within their field. These journals are typically well-established, prestigious, and widely recognized within their respective fields (Yan & Li 2018). Researchers often prefer to publish in or cite articles from these journals to enhance the visibility and impact of their own work. Furthermore, Table 2 highlights that an author's H-index does not necessarily correlate with the high citation count of a specific work or, in this context, a highly cited document. Another notable factor is that early-career researchers, or those in the initial stages of their career journey, may possess a relatively high h-index due to a few impactful papers but may not have had sufficient time to accumulate a substantial total citation count. In this case, the top-cited document, with 209 citations, is authored by Dr. Cheah Mei Yee, who has a comparatively low H-index of 5. This discrepancy is likely attributable to her status as an early-career researcher, which reflects the initial phase of her academic contributions despite producing highly influential work.

Table 2. Top 10 cited documents authored by ROs in UM from 2018 to 2022, based on data from the Scopus database.

Document Title	Publication Year	Journal Title	Journal Rank	Citation	Author / RO	H-Index
Sustainability of direct biodiesel synthesis from microalgae biomass: A critical review	2019	Renewable and Sustainable Energy Reviews	Q1	209	M.Y. Cheah	5
Advances in approaches and methods for self-cleaning of solar photovoltaic panels	2018	Solar Energy	Q1	113	N.N. Adzman	3
Pyrethroid resistance in the dengue vector Aedes aegypti in Southeast Asia: Present situation and prospects for management	2018	Parasites and Vectors	Q1	77	C.D. Chen	21
Electron transport properties analysis of titanium dioxide dye-sensitized solar cells (TiO2-DSSCs) based natural dyes using electrochemical impedance spectroscopy concept: A review	2020	Solar Energy	Q1	62	M.S. Ali	7
Differentiation of chromoplasts and other plastids in plants	2019	Plant Cell Reports	Q1	55	N. Mohd Sadali	2
Facile one-pot solvothermal method to synthesize solar active Bi2WO6 for photocatalytic degradation of organic dye	2019	Journal of Alloys and Compounds	Q1	49	K.M. Lee	14
Physicochemical property enhancement of biodiesel synthesis from hybrid feedstocks of waste cooking vegetable oil and Beauty leaf oil through optimized alkaline-catalysed transesterification	2018	Waste Management	Q1	49	M.Y. Cheah	5
Removal of methylene blue dye by solvothermally reduced graphene oxide: A metal-free adsorption and photodegradation method	2019	RSC Advances	Q1	43	K.M. Lee	14
Effective photoreduction of graphene oxide for photodegradation of volatile organic compounds	2019	RSC Advances	Q1	37	K.M. Lee	14
A review of recent developments on kinetics parameters for glycerol electrochemical conversion – A by-product of biodiesel	2020	Science of the Total Environment	Q1	32	C.S. Lee	8

The data presented in **Figure 6** reveals a robust international networking landscape, with 320 international affiliations accounting for an impressive 27% of the total 1,177 affiliations during this period. This highlights the university's strong commitment to fostering global collaborations and contributing to the international scientific community. As anticipated, national networking constitutes a significant portion of UM's research landscape. During the same period, there were 857 national affiliations, representing 73% of the total affiliations. This distribution reflects a balanced approach between local and global collaborations, underscoring the ROs' active engagement in advancing both national and international research agendas. Such collaborations, whether local or global, play a pivotal role in improving the quality of research outcomes and impact. They are particularly crucial for research universities (RU) to secure external funding for their research projects, as noted by Amran et al. (2014).

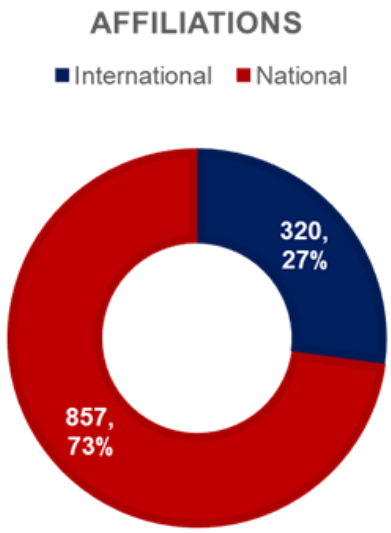


Figure 6. Percentage of national and international affiliations in publications authored by ROs in UM from 2018 to 2022 based on data from the Scopus database.

Figure 7 illustrates a global map highlighting countries (in blue) involved in publication collaborations with UM's ROs. Analysing the top 10 countries in these affiliations offers valuable insights into the geographical reach of UM's research network. Unsurprisingly, Malaysia leads with 474 affiliations, underscoring the university's active engagement in the national research ecosystem. Regionally, Indonesia ranks second with 73 affiliations, reflecting strong collaborative efforts within Southeast Asia. Internationally, the United Kingdom, with 40 affiliations, demonstrates UM's robust connections with Western academic institutions. Similarly, China and Taiwan, with 24 and 19 affiliations respectively, highlight the university's partnerships with prominent institutions in Asia. Additionally, Saudi Arabia, Japan, the United States, India, and France, each with 14 to 19 affiliations, contribute to the global diversity of UM's research collaborations. A study revealed that international media had induced high citation of Malaysian publications (Noorhidawati et al., 2017). It is highly encouraged for UM's ROs to proliferate research networking regionally or internationally as networking is the source of intellectual

resources such as research mentors or co-authors to assist RO in their research or publications completion (Mullen et al, 2008).

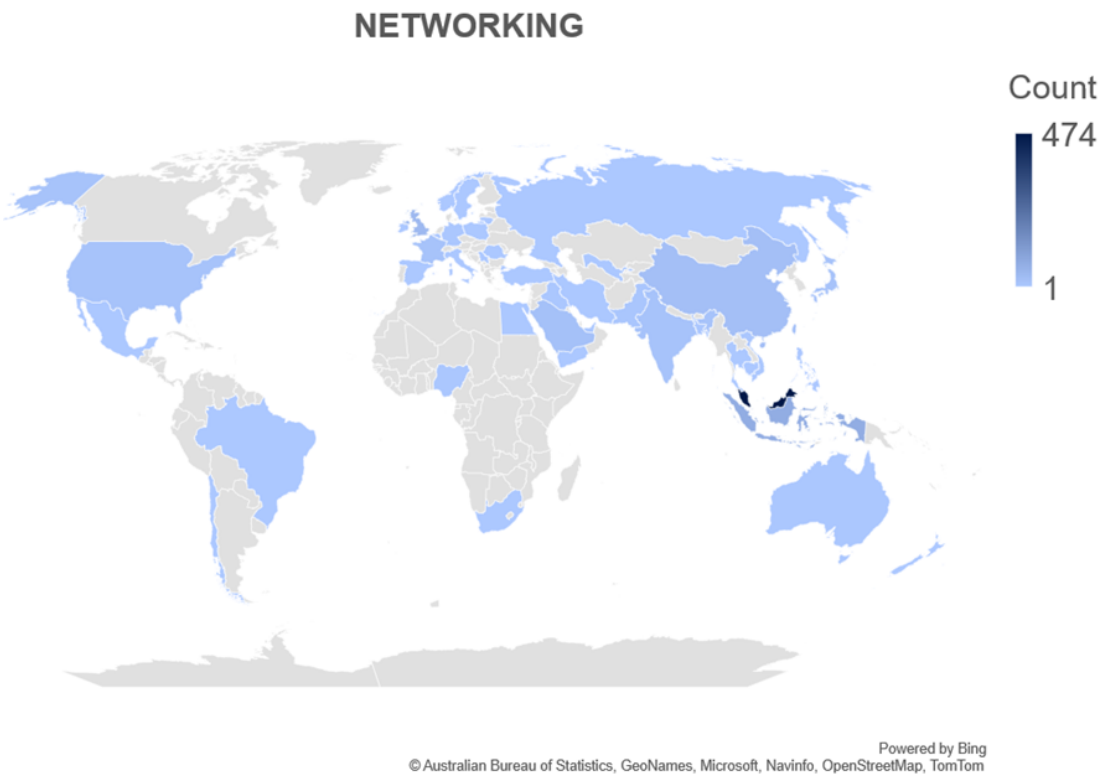
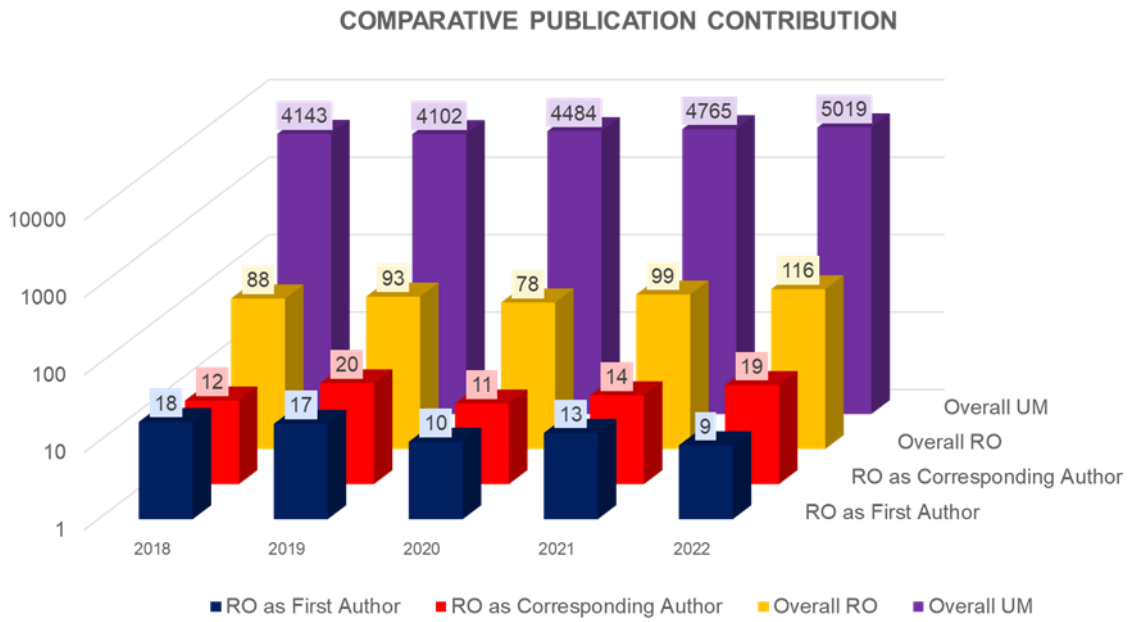


Figure 7. Map of publications networking collaboration by ROs in UM from 2018 to 2022, based on data from the Scopus database.

The performance of publications authored by ROs at UM, analysed within the context of the university's overall scholarly output from 2018 to 2022 (**Figure 8**), demonstrates a consistent and significant contribution to advancing academic research. In 2018, ROs contributed 88 publications, constituting a modest but significant portion of the 4,143 overall publications from UM during that year. While the percentage may seem relatively small, the impact and quality of these publications should be considered, as they contribute to the diversity and depth of the university's research profile. In 2019, a similar trend was observed, with ROs contributing 93 publications out of a total of 4,102 produced by the entire university. This highlights the ROs' stable and active engagement in research activities, underscoring their sustained importance within UM's broader academic and research landscape.

Figure 8. The number of publications authored by ROs in comparison to the overall number of publications in UM from 2018 to 2022 based on data from the Scopus database.



In 2020, the number of publications authored by ROs slightly decreased to 78, while the overall university output rose to 4,484 publications. Despite this reduction, the ROs' contributions continued to represent a significant portion of UM's scholarly output, demonstrating their sustained commitment to research excellence. The following year, 2021, marked a notable increase in both ROs' publications and overall university publications. ROs produced 99 publications out of a total of 4,765, demonstrating an upward trajectory in their research output. This suggests a growing influence and involvement of ROs in shaping the academic landscape of the university. In 2022, ROs at UM further strengthened their research contributions, producing 116 publications out of a total of 5,019 for the university. This not only reflects an increase in quantity but also underscores the expanding role and impact of ROs in driving the university's research agenda.

Figure 8 also presents a significant contribution of RO in which they consistently became the corresponding and first author for the publication every year. The highest number of corresponding and first authors among UM's ROs were 20 in 2019 and 18 in 2018, respectively. Conventionally, in the context of research publication, the extent of involvement decides the order of authorship; for example, the person who has done the majority of the groundwork would be considered eligible to be the first author, and the person who planned and conceived the study would be the last author (supervisor) (Singhal & Kalra, 2021). Usually, the corresponding author is the supervisor or principal investigator of the project, but in some cases, there is more than one corresponding author in a publication, depending on the rules and regulations of the publisher. This is an important highlight that the ROs are not only for writing the publications but are actively involved in other major scholarly and scientific endeavours.

4. Conclusions

The role of ROs at UM has evolved to encompass a wide range of responsibilities that are critical for the success and growth of research programs. Their roles and credibility to navigate the complex and competitive research landscape, facilitate interdisciplinary collaboration, secure funding, and publications, and ensure compliance with regulations are significant to the success of the university.

The publication records of UM's ROs from 2018 to 2022 reflect a diverse and comprehensive engagement with scholarly communication. UM's ROs have established a broad and impactful presence across various fields of study, driving advancements in knowledge, technology, and practical solutions to real-world challenges. This multidisciplinary approach solidifies the university's position as a key contributor to research at the intersection of scientific and engineering disciplines. The top ten authors exemplify areas of prominent expertise within UM, making substantial contributions to the institution's research landscape across multiple fields and research centres.

A consistent upward trajectory in both the quantity and impact of RO's publications, as reflected in the increasing citation counts, suggests a positive and dynamic research environment, with a growing influence on the work within the research community. The diverse network of collaborations demonstrates their commitment to fostering a well-rounded research environment that leverages both local expertise and global perspectives. RO contribution consistently represents a significant proportion of the overall scholarly output at UM, indicating a vital role in the university's research ecosystem, and contributing to its research excellence.

Besides scholarly output, the intellectual properties could be a valuable indicator for assessing the innovation performance of the ROs in the future (Mohd Sarjidan et al., 2023). Other research outputs such as research projects, grants, awards, and recognitions could also be beneficial to capture the holistic impact of the ROs. It is recommended that each faculty at UM establish RO placements to support and enhance the university's research excellence. It is a complementary force with the academics in which this synergy has the potential to significantly elevate the quality and impact of research and innovation, ultimately benefiting the university, the nation, and the global community.

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References

Amran, Faridah Hanum, Ibrahim Kamal Abdul Rahman, Kalsom Salleh, Syed Noh Syed Ahmad, and Noor Hasniza Haron. (2014). funding trends of research universities in Malaysia. *Procedia - Social and Behavioural Sciences, 164*,126–34. https://doi.org/https://doi.org/10.1016/j.sbspro.2014.11.060

Azman, Norzaini, Morshidi Sirat, Pang, V., Yew, M. L., Govindasamy, A. R., & Wardatul Akmam Din. (2019). Promoting University–Industry Collaboration in Malaysia: Stakeholders' perspectives on expectations and impediments." *Journal of Higher Education Policy and Management, 41*(1), 86 –103. https://doi.org/10.1080/1360080X.2018.1538546

Baltaru, R. D. (2019). Do non-academic professionals enhance universities' performance? Reputation vs. organisation. *Studies in Higher Education, 44*(7), 1183-1196. https:// doi.org/10.1080/03075079.2017.1421156

Berman, J. E., & Pitman, T. (2010). Occupying a 'third space': Research trained professional staff in Australian universities. *Higher Education, 60*(2), 157-169https://doi.org/10.1007/s10734-009-9292-z

Brantnell, A., & Baraldi, E. (2022). Understanding the roles and involvement of.technology transfer offices in the commercialization of university research. *Technovation 115,* 102525. https:// doi.org/10.1016/j.technovation.2022.102525

Buenestado-Fernández, M., Álvarez-Castillo, J. L., González-González, H., & and Espino-Díaz, L. (2019). Evaluating the institutionalisation of diversity outreach in top universities worldwide. *PLoS ONE 14(*7), e0219525. https://doi.org/10.1371/journal.pone.0219525

Burnham, J. F. (2006). Scopus database: A review. *Biomedical Digital Libraries, 3*(1). https:// doi.org/10.1186/1742-5581-3-1

Ecarnot, F., M. F. Seronde, R. Chopard, F. *Schiele, & N. Meneveau. (2015). Writing a scientific article: a step-by-step guide for beginners. European Geriatric Medicine,* (6), 73-579. https:// doi.org/10.1016/j.eurger.2015.08.005

Gander, M. (2018). Professional staff in universities: Career needs, values, attitudes and behaviours. *Australian Journal of Career Development, 27*(3), 160-171. https:// doi.org/10.1177/1038416218775746

Gander, M. (2023). The psychological contracts of university professional staff: Expectations, obligations and benefits. *Perspectives: Policy and Practice in Higher Education, 27*(1), 2-7. https:// doi.org/10.1080/13603108.2022.2077854

Ghani, Nazifa Abd, Teo, P. C., Ho, T. C. F., Choo, L. S., Beni Widarman Yus Kelana, Sabrinah Adam, & Mohd Khairuddin Ramliy. (2022). Bibliometric analysis of global research trends on higher education internationalization using Scopus database: Towards sustainability of higher education institutions. *Sustainability (Switzerland), 14*(14), 8810. https://doi.org/10.3390/ su14148810

Hellström, T. (2018). Centres of excellence and capacity building: From strategy to impact. *Science and Public Policy, 45*(4), 543-552. https://doi.org/10.1093/SCIPOL/SCX082.

Johari, J., & Khulida Kirana Yahya. (2019). Organizational structure, work involvement, and job performance of public servants. *International Journal of Public Administration, 42*(8), 654-66. https://doi.org/10.1080/01900692.2018.1498106.

Kucharčíková, A., Tokarčíková, E., & Blašková, M. (2015). Human capital management – Aspect of the human capital efficiency in university education. *Procedia - Social and Behavioral Sciences 177*, 48-60. https://doi.org/10.1016/j.sbspro.2015.02.332.

Liow, G. E., & Wong, H. M. (2021). Exploring the role of Malaysian research university-based incubators in facilitating the entrepreneurial process. *International Journal of Innovation, 9(*2), 239-266. https://doi.org/10.5585/iji.v9i2.18578.

Md Kasim, Azrin, Chang, L. W., Nuratiqah Mohamad Norpi, Noor Hayaty Abu Kasim, & Azirah Hashim. (2021). Enhancing research mechanisms and institutional processes in Malaysia: A case study of Universiti Malaya (UM). *Journal of Research Management & Governance, 4*(1), 10-23. https://doi.org/10.22452/jrmg.vol4no1.2.

Millones-Gómez, P. A., Yangali-Vicente, J. S., Arispe-Alburqueque, C. M., Rivera-Lozada, O., Calla-Vásquez, K. M., Calla-Poma, R. D., Requena-Mendizábal, M. F., & Minchón-Medina, C. A. (2021). Research policies and scientific production: A study of 94 Peruvian universities. *PLoS ONE, 16*(5)., e025241. https://doi.org/10.1371/journal.pone.0252410.

Mohamad Sheriff, Nooraini, & Noordini Abdullah. (2017). Research universities in Malaysia: What beholds? *Asian Journal of University Education, 13*(2), 35–50.

Mohd Sarjidan, Mohd Arif, Azizi Abu Bakar, Noor Hidayati Ismail, Sharifah Nur Syafiqah Syed Omar, & Noreen Nordine. (2023). Practices Malaysian research universities: Patent profile in the lens database. *Journal of Information and Knowledge Management, 13*(1), 75–89.

Mohd Sarjidan, Mohd Arif, & Azrin Md Kasim. (2023). Trends of academic publications: A case study of Malaysian research universities. *Journal of Research Management and Governance, 5*(1), 18-29. https://doi.org/10.22452/jrmg.vol5no1.2.

Mullen, C. A, Murthy, U., & Teague, G. (2008). Listening to those we serve: Assessing the research needs of university faculty. *Journal of Research Administration, 39*(1), 10-31.

Noorhidawati, A., Yanti Idaya Aspura, M. K., Zahila, M. N., & Abrizah, A. (2017). Characteristics of Malaysian highly cited papers. *Malaysian Journal of Library and Information Science, 22*(2), 85-99. https://doi.org/10.22452/mjlis.vol22no2.6

Pranckutė, R. (2021). Web of Science (WoS) and Scopus: The titans of bibliographic information in today's academic world*. Publications, 9*(1), 12. https://doi.org/10.3390/publications9010012

Department of Higher Education, Ministry of Higher Education. (2023). *Department of Higher Education Strategic Plan 2018 - 2022*. Department of Higher Education, Ministry of Higher Education. Retrieved from https://jpt.mohe.gov.my/portal/index.php/en/corporate/development-plan/15-jpt-strategic-plan-2018-2021

Quaglione, D., Muscio, A., & Vallanti, G. (2015). The two sides of academic research: Do basic and applied activities complement each other? *Economics of Innovation and New Technology, 24*(7), 660-681. https://doi.org/10.1080/10438599.2014.974944

Rådberg, K. K., & Löfsten, H. (2023). The entrepreneurial university and development of large-scale research infrastructure: Exploring the emerging university function of collaboration and leadership. *Journal of Technology Transfer, 9*(1), 334-366. https://doi.org/10.1007/s10961-023-10033-x

Ramli, Nasiibah, Zinatul A. Zainol, Junaidi Abdul Aziz, Hasani Mohd. Ali, Jady Hassim, Wan Mohd Hirwani Wan Hussein, Ruzian Markom, Wan Siti Adibah Wan Dahalan, & Noor Inayah Yaakob. (2013). The concept of research university: The implementation in the context of Malaysian university system. *Asian Social Science, 9*(5), 307. https://doi.org/10.5539/ass.v9n5p307

Roets, L. (2017). Protection of the human research participant: A structured review. *South African Medical Journal, 107*(10). https://doi.org/10.7196/SAMJ.2017.v107i10.12533

Saadatian, O., Elias Ilias Salleh, Osman Mohd Tahir, & Kamariah Dola. (2009). Observations of sustainability practices in Malaysian research universities: Highlighting particular strengths. *Pertanika Journal of Social Science and Humanities, 17*(2), 225-244.

Salau, O. P., Falola, H. O., Ibidunni, A. S., & Igbinoba, E. E. (2016). Exploring the role of human capital management on organizational success: Evidence from public universities. *Management Dynamics in the Knowledge Economy, 4*(4), 493-513.

Sato, S., Gygax, P. M., Randall, J., & Mast, M. S. (2021). The leaky pipeline in research grant peer review and funding decisions: Challenges and future directions. *Higher Education, 82*(1), 145-162. https://doi.org/10.1007/s10734-020-00626-y

Singhal, S., & Kalra, B. S. (2021). Publication ethics: Role and responsibility of authors. Indian *Journal of Gastroenterology, 40,* 65-71. https://doi.org/10.1007/s12664-020-01129-5

Suruhanjaya Perkhidmatan Awam Malaysia. (2020). Retrieved from https://www.spa.gov.my/spa/

Tan, C. N. L., & Shuhaida Md. Noor. (2013). Knowledge management enablers, knowledge sharing and research collaboration: A study of knowledge management at research universities in Malaysia. *Asian Journal of Technology Innovation, 21(*2), 251-276.. https://doi.org/10.1080/19761597.2013.866314

Unwin, A. (2020). Why is data visualization important? What is important in data visualization? *Harvard Data Science Review, 2(*1), 1. https://doi.org/10.1162/99608f92.8ae4d525

Veles, N., Graham, C., & Ovaska, C. (2023). University professional staff roles, identities, and spaces of interaction: Systematic review of literature published in 2000–2020. *Policy Reviews in Higher Education, 7*(2), (127-168. https://doi.org/10.1080/23322969.2023.2193826

Yan, E., & Li, K. (2018). Which domains do open-access journals do best in? A 5-year longitudinal study. *Journal of the Association for Information Science and Technology, 69*(6), 844-856. https://doi.org/10.1002/asi.24002