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Determinants of Open Science Adoption in Malaysian Public Universities

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ABSTRACT

This study investigates the factors affecting the adoption of Open Science (OS) practices among researchers at Malaysian public institutions. Notwithstanding worldwide progress towards open science—improving research openness, accessibility, and collaboration—implementation in Malaysia is still disjointed. National efforts such as the Malaysia Open Science Platform (MOSP) exist; however, their implementation is impeded by institutional and human obstacles. This study used a mixed-methods approach to identify key challenges: unclear regulations, inadequate infrastructure, absence of incentives, poor researcher preparedness, and little stakeholder participation. The results indicate that while academics often support open science ideals, apprehensions over data abuse, uncertainty in intellectual property, and insufficient acknowledgment hinder measures such as open data sharing and pre-registration. In addition, progress is further impeded by institutionally misaligned academic reward systems, ineffective policy enforcement, and inconsistent technical support. Research visibility, competitiveness, and ranking performance in Malaysia are all significantly impacted as a result of these restrictions.

1. Introduction

Open Science (OS) is a radical model that tries to make the accessibility, transparency, and reproducibility of scientific research more effective. It has become a leading framework in many parts of the world that facilitates the enhancement of research integrity, facilitates collaboration, and enhances innovation [1] [2]. Open access publication, open data sharing, open peer review, pre-registration, and open-source tools are major practices of Open Science. The reasons behind this movement have been the urge to make knowledge more democratic, to reduce the duplication of research efforts, to create better research, and to ensure that scientific knowledge plays a meaningful role in society. In this way, Open Science is good not only for academics but also for

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society, the economy, and politics. It allows everyone to be involved, policies to be made based on facts, and new ideas to be shared with everyone [1].

International organizations such as UNESCO, the European Commission, and the OpenAIRE project have been advocating the promotion of Open Science as a global research priority. The Netherlands, the United Kingdom, and Canada are some of the countries that have taken national strategies to encourage a culture of openness in research. Such countries have demonstrated that the use of Open Science can enhance the visibility of research outputs anywhere globally, creating global partnerships in research, and an even stronger social belief in scientific endeavors [1].

The concept of Open Science is growing on the radar of researchers, policymakers, and funding organizations in Malaysia. The Malaysia Open Science Platform (MOSP) was introduced by the Ministry of Science, Technology and Innovation (MOSTI) and aims at promoting the sharing of research resources and research data [2]. Even though this is a good beginning, the practice and institutionalization of Open Science is not as distributed evenly across Malaysian public universities. There are still problems with the mainstreaming of Open Science, such as a lack of knowledge, bad infrastructure, data privacy, unclear rules, and not enough incentives[3].

In addition, Malaysian universities are under increasing pressure to improve their international rankings, which are determined by such indicators as research output, international collaboration, and citation impact. Open Science can serve as the key to such an improvement through increasing the accessibility and discoverability of research in Malaysia. In such a way, it is not only a topical issue, but also the necessity to understand the situation with Open Science in Malaysian universities and identify strategies that may be effectively used to enhance its use. This proposal shall examine how Open Science practices can be implemented in Malaysian public universities, examine institutional and individual level obstacles to researchers and give recommendations that are strategic to increase their implementation based on the best practices worldwide.

1.1 Research Objectives

i. To assess the determinants of Open Science adoption among researchers in Malaysian public universities.
ii. To develop strategic recommendations for enhancing Open Science adoption in Malaysian higher education institutions.

1.2 Research Questions

i. What are the determinants of Open Science adoption among researchers in Malaysian public universities?
ii. How can Malaysian universities enhance the adoption of Open Science in line with global best practices?

2. Problem Statement

Despite the growing global emphasis on open science as a mechanism to enhance transparency, accessibility, and reproducibility in research, its implementation within Malaysian universities remains fragmented and limited. Despite the presence of institutional repositories in most local universities, research has revealed that out of 10-30% of research outputs are openly available, which is evidence of the low influence of open access policies [4]. Although most researchers in Malaysia agree with the concept of open science, most of them are unwilling to share their data because of

the fear of data misuse, inadequate credit, and uncertainty of intellectual property [5][3]. The potential of open science has been given a policy-level commitment with the launch of the Malaysia Open Science Platform (MOSP) in 2023; however, implementation remains in the early stages, with technical infrastructure and support varying between institutions and public universities[2].

These systemic constraints are not only inhibiting the process by which Malaysia is attempting to create a more transparent research culture but also have greater external implications concerning international visibility and competitiveness of Malaysian universities. As the world becomes a more competitive academic environment, the QS world university ranks like the QS World University Rankings and Times Higher Education (THE) now evaluate openness, research impact, and collaboration as one of the evaluation criteria. Universities ranked among the best in the world are pursuing greater open-science policies and data sharing, and openly publishing their work, increasing citation and cross-national collaboration [6] [7]. On the contrary, Malaysian universities will lag behind because they have been slow to embrace open science, there is little policy enforcement, and there are no incentives related to open research[5]. Such difference limits the potential of Malaysia to place its institutions in the competitive environment on the international arena, which impacts on the issues of research financing, international cooperation, and, in general, the image of the institution. As such, Malaysian institutions of higher learning are in dire need to incorporate the concept of open science into their research culture and strategic planning to improve global visibility, academic impact and sustainability in their research excellence.

3. Research Gap

Although Open Science has gained popularity and has already been implemented in most developed economies, its implementation in the Malaysian context has yet to reach a mature and consistent phase. The current literature has concentrated on the overall awareness of Open Science and the open access movement, but there is little empirical evidence on the wider Open Science adoption like data sharing, open peer review, pre-registration, and use of open-source research tools in Malaysian public universities [3]. In addition, a majority of existing research is descriptive in nature and does not deepen the discussion on institutional, cultural and policy related factors that affect adoption. The limited literature that focuses on the structural (e.g., poor infrastructure, ambiguous policies) and the individual (e.g., the absence of incentives, low digital literacy) factors that impede the practice of Open Science in Malaysia neglects the discussion of the current situation[8][6].

Moreover, the available evidence of evaluating the preparedness of Malaysian public universities to institutionalise the adoption of Open Science to meet international standards, including those of UNESCO is rather insufficient [7]. With the growing emphasis within international university rankings in research transparency, visibility, and collaboration, the empirical data regarding the positioning of Malaysia within the changes forms a knowledge gap that is strategically important. Unless there is a clear image of the situation and problems in the sphere of Open Science realization, the attempts to create specific policies or institutional plans may be not enough or not correlated with the world tendencies. Thus, the current research will help bridge an important research gap by examining a comprehensive and data-driven overview of the existing trends, challenges, and opportunities regarding the current adoption of Open Science in the Malaysian public universities.

4. Literature review

Implementation of open science practices is closely intertwined with many other issues policy and governance, infrastructure and tools, capacity building, incentives and recognition, monitoring

and evaluation and stakeholder engagement, researcher readiness. All these variables are important in facilitating or hindering the shift towards open scientific practices.

4.1 Policy & Governance

Policy frameworks and governance structures play a major role in shaping the landscape of open science. Proper governance may lead to transparency, openness, and collaborative efforts in research, and bring the open science practices to the frontline of scientific work [9]. The current national and international policies (including EU) have promoted open innovation agendas in which scientific research is aligned with the needs of the society, improving the utility of scientific products [10]. However, in order to introduce the culture of open practices to the research, policymakers need to address matters such as the distribution of resources, alignment of stakeholders, and the integration of the principles of open science into the institutional policies [11]. This requires a well-structured regime of principles of data sharing, robust evaluation practices, and comprehensive strategies that are capable of handling the complex interests of the stakeholders in scientific research [12].

4.2 Infrastructure & Tools

These principles need to be facilitated by a powerful infrastructure, including data sharing and collaboration tools, which are necessary to facilitate open science. The modern data-sharing systems and repositories provide the potential to organize the interaction of a group of researchers and the exchange of their results effectively [13]. These infrastructures may assist researchers to start open science practices without significant financial investments since tools are offered on low-cost or even free terms [14]. The new technological advancements have made it possible to connect researchers and institutions in a better way, which has increased the data sharing potential [15]. The development of such infrastructures, however, should be accompanied by training and support to the users such that the end-users of such tools, i.e., the researchers, would be in a position to use such tools [16].

4.3 Capacity Building

The significance of capacity building to acquire the skills and knowledge researchers require to engage in open science could not be overvalued. Such training and resources that would enhance the knowledge of the researchers regarding the principles of open science can go a long way to ensure that they are better prepared to adopt the same[17]. It is necessary to target education programs in the institutions that foster strict and transparent practices, and open research practices [10]. The requirement of the next generation of researchers can be fulfilled with the help of workshops and seminars in which the principles of open science will be integrated into the existing curricula [18]. Such capacity-building interventions only succeed when it is possible to connect them with the missions of institutions and the demands of the larger scientific community [19].

4.4 Incentives & Recognition

To encourage the utilization of open science practices, there is a need to establish efficient incentives and recognition. The current academic promotion and tenure do not tend to have enough incentives regarding transparency and cooperation [20]. The institutions may use openness to

encourage researchers to work in this spirit by adjusting the criteria of assessment that would recognize contributions to open science [21]. The orientation of the incentive systems toward the norms of open science can contribute to the paradigm shift in the culture of academic research, which would generate an environment where transparency would become a rule rather than an exception [22].

4.5 Monitoring & Evaluation

The practices of open science need to be monitored and assessed to follow trends of adoption and influence. The systematic evaluation of the levels of open science integration in the various disciplines ought to be done in a very methodical way, which allows studying the evolution and resistance points [8]. These indicators reflecting qualitative and quantitative aspects of the open practices may be used to comprehend the efficiency of the policies implemented and the usefulness of the latter [12]. Systematic evaluation of open science as a continuous evaluation comes in the form of feedback that can be used to change policy and plan for future projects [23].

4.6 Stakeholder Engagement

To make the open science efforts successful, it is necessary to engage various stakeholders in academia, industry, and civil society. Open science should be a collective effort with the input of different sectors to address the various issues that are associated with data sharing and access [10]. Creation of collaborative networks will enable the stakeholders to achieve a symbiotic environment where best practices, resources, and innovations are shared, which will ultimately enhance the resilience of the scientific ecosystem [19]. The trust established among the stakeholders will enable building stronger partnerships and foster a collective attitude towards open practices [14].

4.7 Researcher Readiness

Lastly, the researcher's readiness is also one of the key constituents of the successful adoption of open science practices. The term readiness would not be limited to the personal traits of the researchers but to the support system that the institutions can extend to them [17]. The researchers must be aligned with the goals of open science, which imply being willing to embrace openness and collaboration [18]. The learning of open science, whether via collaborative projects and interdisciplinary workshops, plays a critical role in ensuring that the researchers are well prepared and capable of adopting open science practices long-term [24].

In conclusion, the realization of open science on a full scale relies on a mixture of various and interrelated factors: powerful policy and governance frameworks, well-designed infrastructure, specific capacity-building measures, reward systems, active monitoring, interested parties, and preparedness of researchers. All these factors must be put together and merged to aid in making a radical shift towards a more open scientific community.

This study establishes that the implementation of Open Science (OS) at Malaysian public institutions encounters several obstacles, such as inconsistent policy frameworks, insufficient infrastructure, poor researcher preparedness, and misaligned incentive systems. Even though there are state programs like the Malaysia Open Science Platform (MOSP), they are not always put into action in the same way. This makes research less open, less visible internationally, and less competitive at the university level. The identification of seven essential determinants—encompassing legislation, infrastructure, capacity development, incentives, monitoring, stakeholder

involvement, and researcher preparedness—indicates that existing problems arise from both systemic deficiencies and individual reservations. Without proactive action, Malaysia's conformity with global research best practices would remain limited, undermining its potential for cross-border cooperation, citation impact, and ranking progress.

Malaysia needs to make coordinated changes to turn these problems into opportunities. They should: (1) Set clear, enforceable OS policies with strong governance; (2) Invest in a unified digital infrastructure and technical training; (3) Include OS contributions in academic reward systems; and (4) Build coalitions of stakeholders from academia, the government, and industry. As suggested by UNESCO, OS usage needs to be seen as more than just a technology change. It needs to be seen as a shift in culture that values openness, cooperation, and responsible research. Malaysian universities can improve their global standing, generate innovations that have a positive effect on society, and ensure long-term research success by incorporating these concepts into their institutional strategy and national research environments.

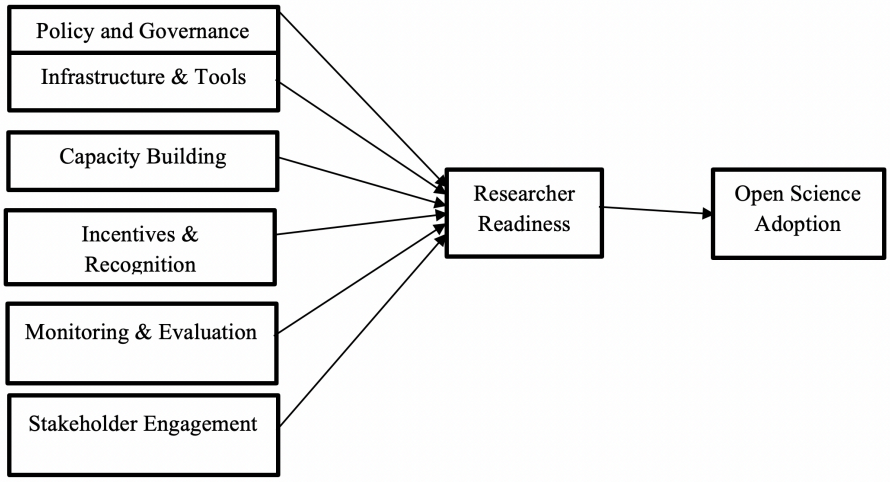

Fig. 1. Framework for Enhancing Open Science Adoption

Table 1
Variables for Open Science Adoption

Independent Variables	Focus Area	Supporting Theory
1. Policy & Governance	Institutional policy development	Institutional Theory [25]
2. Infrastructure & Tools	Digital infrastructure and technical platforms	TOE Framework [26]
3. Capacity Building	Skills, training, and support	Knowledge-to-Action (KTA) Framework [27]
4. Incentives & Recognition	Academic motivation and rewards	Expectancy Theory [28]
5. Monitoring & Evaluation	Assessment and reporting	Program Evaluation Theory [29]
6. Stakeholder Engagement	Collaboration and community building	Stakeholder Theory [30]
7. Researcher Readiness	Individual readiness	Technology Readiness Index [31]

5.

5. Methodology

The mixed method will be used, including quantitative surveys and qualitative interviews. The survey will involve academic personnel of the identified Malaysian public universities to determine awareness, attitudes, and adoption regarding the Open Science. Policymakers, research officers and institutional repository managers will be interviews semi-structured in order to understand more about policy implementation and institutional support. Thematic analysis and descriptive statistics will be used to analyse data.

6. Expected Outcomes

The expected outcomes of this research include a comprehensive overview of the current state of Open Science adoption within Malaysian public universities, highlighting both the strengths and the critical areas in need of improvement. It will also identify institutional and individual-level barriers that hinder widespread implementation, such as insufficient incentives, lack of infrastructure, and limited awareness. In addition, the study will produce a detailed policy and infrastructure assessment report, evaluate how institutional frameworks support or obstruct Open Science adoption. Finally, this research aims to develop a strategic framework and set of practical recommendations to guide universities, policymakers, and funding agencies in fostering a culture of openness, ultimately aligning Malaysia's research landscape with international best practices.

7. Significance of the Study

This study will provide important information concerning Open Science in Malaysia, which is gaining relevance in the environment of the global competition in research. As the world opens up to open and collaborative research practices, Malaysian universities must be current to make themselves relevant and competitive. This paper will provide a decent review of the structural and cultural context of the adoption of Open Science in Malaysia by identifying the existing discrepancies in infrastructure, policy, and researcher engagement[3].

Policymakers, university leaders, and funders will utilize the results as a source of evidence in the development of evidence-based responses that could shape a more open, transparent, collaborative research environment. These interventions may be performed by reforming the promotion and tenure guidelines to reward data sharing, providing training in skills and infrastructure in data sharing, and modifying institutional policies to the Open Science practices [4].

Moreover, with the growing importance of aspects such as research visibility, citation impact and international collaboration in the global university ranking systems, including QS and THE, Malaysian universities have a chance to use the adoption of Open Science to their advantage in order to boost their international ranking. By embracing Open Science, not only is discoverability and impact is increased, but also an intent to conduct ethical and socially responsible research is demonstrated [7] [6]. Thus, the work can help to achieve the national targets of research excellence without sacrificing an equitable and inclusive scientific community.

8. Conclusion

This study provides a timely and critical examination of the adoption of Open Science (OS) practices within Malaysian public universities. In an era where global research landscapes are rapidly evolving toward transparency, accessibility, and collaboration, Malaysia must strategically align with

international standards to ensure its research system remains competitive, credible, and impactful. Despite commendable national efforts such as the Malaysia Open Science Platform (MOSP), the implementation of OS across higher education institutions remains inconsistent and fragmented, largely due to policy ambiguity, infrastructural gaps, limited researcher readiness, and a lack of incentives and support mechanisms.

By examining key variables such as policy and governance, infrastructure and tools, capacity building, incentives and recognition, monitoring and evaluation, stakeholder engagement, and researcher readiness, this study offers a holistic understanding of the barriers and enablers influencing OS adoption. The proposed strategic framework and evidence-based recommendations are intended to guide institutions, policymakers, and funding agencies in fostering a culture of openness grounded in best practices and supported by established theoretical models.

Ultimately, enhancing the adoption and sustainability of OS in Malaysia is not merely a technical endeavour but a cultural and systemic transformation. It requires coordinated leadership, inclusive policies, robust infrastructure, and a shift in academic norms to reward openness, collaboration, and social impact. The findings of this study not only contribute to academic discourse but also serve as a practical guide for shaping Malaysia's research ecosystem in ways that are globally competitive, ethically grounded, and socially responsive.

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