

Leadership in Open Science: Perspectives from Academic Libraries

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ABSTRACT

This paper explores the characteristics of open leadership to support academic library leaders in propagating open science. It also aims to identify the current practices of leadership towards open science implementation from the perspectives of Malaysian academic library leaders. The study uses three qualitative approaches; (i) the literature review matrix to explore an overview of leadership framework, characteristics, and principles towards open science implementation; (ii) the internal desk research by reviewing the various internal records, statistics, presentation slides, and speech texts to know the landscape and best practices of open science among Malaysian academic libraries; and (iii) the online survey between 50 Malaysian academic library leaders to monitor the current practices of leadership in open science. The study is based on the Open Leadership Framework, which reveals the current practices of leadership among Malaysian academic library leaders in terms of design (content-focus, governance-focus, information sharing-focus); build (communication, networking, mentoring, data stewardship); and empowerment (maintains clarity of vision, inspires contribution, makes connection). The significant open leadership practices in the design phase show 97.4% respondents agree that the library needs to be involved in the Data Management Plan (DMP) which is under the principles of information sharing focus. While for the build phase, 100% respondents without exception believe that libraries need training and competence development programs which under the mentoring principles. The empowerment phase shows the significant principles with a total response of 61.5% under makes connection principles was that the library needs to collaborate with the university's Information Technology Center and Research Management Center in providing researcher profiles.

Keywords: Open Leadership; Library Leadership; Open Science; Leadership Skills; Academic Librarians

INTRODUCTION

The participation of Malaysian academic librarians in the Data Stewardship for Open Science Training organized by the Malaysia Open Science Platform (MOSP) demonstrates the awareness among the librarians of the need to professionalize their roles in propagating open science. The Ministry of Science, Technology, and Innovation (MOSTI) has demonstrated the aspect of strategic leadership by initiating MOSP as a strategic transformation effort to boost open science in Malaysia.

The three-year (2020-2022) project was funded by MOSTI, spearheaded by the Malaysia Open Science Alliance, and implemented by the Academy of Sciences Malaysia (ASM). Three focus areas in this project are (i) guidelines, (ii) infrastructure, and (iii) capacity building. The aim of this initiative is to make Malaysia's research data a valuable national asset by developing a trusted platform that enables accessibility and sharing of research data aligned to national priorities and international best practices (Malaysia Open Science Platform, 2020).

Despite all of the focus areas highlighted and invested in by MOSP, without management's commitment and involvement from its institutions, the ambitious goals will not be reached. In 2015, Scientific Knowledge Services (SKS) together with the Library of the University College London (UCL) started an initiative to organize a series of events that aimed to discuss the principles of open science at the local level, although there was a significant level of conversation at international conferences. But all these tasks and ambitions are hard to manage without bold leadership, endurance, and sometimes suffering (Ignat, 2021).

Leadership

Leadership is often referred to as the key enabler for achieving the goals and objectives of an organization. Malaysia requires "a high level of national leadership" to achieve consensus across government agencies on the scope of legislative, regulatory, and/or policy changes that need to be made to turn open data into a practical reality and to make its open release a matter of routine (Zijlstra, Vaira and Boothe, 2017). Similarly, the Malaysia Digital Economy Report Year 2018 claims Malaysia still lacks high-level national leadership to reach mutual agreement on the scope of open scientific legislation and policy changes.

Defining Leadership in the context of Academic Libraries

Policy development and governance are important parts of a university's activities in open science. The League of European Research Universities (LERU) Roadmap for Cultural Change in Open Science stated that the major issues in bringing about change at universities require leadership, vision, strategy, and adequate resources for implementation. Leaders should explain to the community why change is necessary and how to support it while upholding the principles of excellence and community building advocated by the university (League of European Research Universities, 2018).

Library Leadership and Open Science

Leadership in open science is shared by all who wish to address open science principles and practices. The speed and nature of that shift will depend on each institution separately. To lead, manage, and engage are the three things that all leaders must do. Leadership includes identifying strategies that will deliver objectives and a willingness to embrace change—to see change as an opportunity, and not a threat (Deketelaere and Ayris, 2019). The literature discussed several factors of library leadership development, and among them, technology is one of the most important factors due to globalization (Hernez and Hughes, 2004).

Therefore, library leadership in open science involves taking an active role in promoting and advancing open science principles within the library community and the broader research ecosystem. As open science comprises a set of institutional policies, infrastructure, and relationships related to open access publication, open data, and scientific resources (Ali-Khan, Jean and Gold, 2018), the libraries play a crucial role in supporting open science initiatives by providing resources, services, and expertise to researchers and the public. However, by themselves, they will not deliver the change in culture that open science requires. To embrace open science, universities and researchers need to embrace cultural change in the way they work, plan, and operate (League of European Research Universities, 2018).

Alongside leadership comes management, because change needs to be managed, not just happen. There are new resources to be identified, new roles to embed in the organization, and new goals to be delivered. This does not just happen automatically, there needs to be an open science strategy that identifies all the challenges, describes the opportunities and benefits, and moves the institution from where it is now to where it wants to be. Sansing (2018) connected the ideas of openness with open leadership towards their openness projects such as Mozilla, Common Voice, openSNP, and The Method Podcast. The leadership part comes from their big ideas associated with open leadership as a set of principles, practices, and skills people can use to mobilize their communities to solve shared problems and achieve shared goals.

Accordingly, this present study adhere the mapping as follows:

Research Objectives	Research Questions
1. To explore the characteristics of leadership to support academic library leaders in propagating open science.	i. What are the leadership framework and characteristics to support academic libraries in propagating open science? ii. Why are leadership practices important for implementing open science?
2. To identify the current practices of leadership towards open science implementation from the perspectives of Malaysian academic library leaders.	iii. What are the significant practices in leadership that have been applied in Malaysian academic libraries? iv. What are the recommendations for future implementation in propagating open science among library leaders?

Figure 1: Mapping Research Objectives and Research Questions

LITERATURE REVIEW

Library Leadership Skills and Competencies

Although leadership is the most explored area in the social sciences (Gill, 2006), there is no coherent understanding of the concept of leadership due to its subjective nature (Narang and Kumar, 2016). Very little literature from the standpoint of library and information science is available (Hernon and Pors, 2013; Ashiq, Rehman and Batool, 2019) which leads almost all scholars and practitioners' to emphasize the centrality of leadership in libraries to librarianship process (Mullins and Linehan, 2006). Leadership in libraries is still dominated by traditional approaches (Wong, 2017). This was supported by Maciel, Kaspar and vanDuinkerken (2018), who examined the library dean and director position descriptions and advertisements from 2011 to 2015, indicating that most leadership postings for academic libraries attend to traditional library experience and management skills, rather than service leadership attributes.

Considering the management of varied information needs of researchers and emerging technologies in libraries, there is a great demand for skilled library professionals (Narang and Kumar, 2016) to upgrade their competencies in terms of leadership. The Library Leadership and Management Association (LLAMA) has identified and defined fourteen foundational competencies regardless of the type of organization, role, or experience as a leader. Among them are communications skills, change management, team building, collaboration and partnerships, emotional intelligence, problem-solving, budget creation and presentation, marketing, and advocacy (ALA, 2016), which in many ways are identical to open leadership like other forms of effective leadership.

Today's world demands excellence in leadership skills and competencies, as stated by Sullivan (2015). As we continue to make the transition to a digital future, we need library leaders with the knowledge, abilities, and drive to transform the organization. Open leaders are usually accountable to a wider audience of contributors and users than traditional leaders (Sansing, 2018). Data collected by Mullins and Linehan (2006b) through interviews with 30 public library leaders from Ireland, Britain, and the USA states that 80 percent of the participants were unable to differentiate between library management and library leadership. Hence, a successful leader in the twenty-first century shares power, builds strong relationships, involves staff in the decision-making process, and stays focused on the goals and objectives of respective organizations (Giesecke, 2007).

With various programs for the development of library leadership and leadership skills, such as the ALA Emerging Leaders Programs, the LIBER Leadership Programs Working Group, and the Leadership Excellence Program for Chief Librarians and Deputy Chief Librarians of Higher Education Institutions (ExceLib), library leaders are now supposedly learning greatly and being well-prepared through these programs. Therefore, Ashiq, et al. (2019) indicate there were professional library associations that did not play their role in the improvement of library leadership, and the situation gets worse with the outdated curriculum offered by most of the library and information science schools. This is also supported by Alajmi and Alshammari (2020) by examining nineteen ALA-accredited Master of Library and Information Science (MLIS) programs that show diversity-related topics are not prioritized in library and information science programs at present, but the relevant curricula are increasing at a slow pace.

Embracing Open Leadership

The recently articulated concept of open leadership focuses on the change in leadership characteristics as a function of developments in technology and the use of multimedia communication tools (Uslu, Bulbul and Cubuk, 2015). Open leadership is composed of ten attitudinal and behavioral elements that Li (2010) identifies as falling into two general categories; information sharing (explaining, updating, conversing, open mic, crowdsourcing, and involving platforms) and decision-making (centralized, democratic, self-managing and distributed).

An open leadership approach is a set of principles, practices, and skills people can use to mobilize their communities to solve shared problems and achieve shared goals. Openness includes deals and practices that any kind of community, project, or organization can practice. Open access is a growing movement that promises to transform universities, libraries, and other academic institutions by making scholarly research freely available to the public, without restrictions. In the spirit of open access, it makes sense to focus on open leadership (Dewey, 2019). This is also relevant, as the leadership part always comes from mobilizing communities to solve shared problems and achieve goals (Sansing, 2018).

A survey on scientific information and documentation conducted by the French National Research Center (CNRS) shared that in the European Research and Innovation Framework Programme running from 2014 to 2020, open access to publications has become mandatory (Schöpfel, *et al.*, 2016). Also, the European Commission is commencing a policy process on open science, considering the transformation, opening, and democratization of science, research, and innovation, with the objective of making science more efficient, transparent, and interdisciplinary (Ramjoue, 2015).

Transparent, inclusive, and accessible leaders exemplify the open leadership approach (Dewey, 2019). Areas of open science policy and practice are already relatively well-advanced in several countries and sectors through the initiatives of some governments, researchers, and the community (Ali-Khan *et al.*, 2018). Additionally, openness to science, or open science, is at the top of the research agenda of the European Union (Schöpfel, *et al.*, 2016).

As the leadership aspects also focus on collaboration and partnership, either with researchers, institutions, or other stakeholders, to foster a culture of openness, this open leadership framework shows the principles of networking, community management, and communication that can be applied. They can work together to develop open science policies, create networks for sharing resources and best practices, or engage in joint projects to advance open science goals.

RESEARCH DESIGN

To meet the stated objectives of the study, three qualitative approaches were used: the literature reviews matrix, internal desk research, and an online survey.

Matrix Method for Literature Reviews

The study will use a literature review as one of the research methods to provide an overview of leadership characteristics and principles. Additionally, an effective and well-conducted review as a research method creates a firm foundation for advancing knowledge and facilitating theory development (Webster and Watson, 2002, as cited in Synder, 2019). Numerous research publications, including journal articles from reputable databases such as Google Scholar, Scopus, Emerald, and ScienceDirect, were searched using keywords such as “open leadership”, “leadership in open science”, “library leadership”, and “open science management”. The matrix method was applied to compare articles to determine the scope of research across time. A review matrix helps to easily spot differences and similarities between journal articles about a research topic (Nolfi, 2020). Besides that, data from Malaysian government portals as well as published national and international reports that address open science or open data in Malaysia are explored as secondary sources of information.

Internal Desk Research

According to Bhasin (2023), desk research can be defined as a type of market research where information about the topic in research is available in printed form or published on the internet, in newspapers, or in government reports and is collected and analyzed. Moreover, desk research can be categorized into two categories: internal desk research and external desk research. In this approach, various internal records and statistics related to open science were collected from MOSTI and its agencies. This includes slide presentations and speech texts during the Official Launch of University Malaya Open Science (UMOS) on June 6th, 2023, workshops, and case study reports during the ExcelLib program, which was held from February 27th to July 5th, 2023. The reviewed and collected data will help to establish an understanding of the landscape of open science in Malaysia, which can be connected to the current practices of leadership in open science.

Online Survey

A survey instrument presents a set of questions that can be used to monitor the leadership aspect among academic library leaders in implementing open science. The questions are based on the Open Leadership Framework, and the Likert Scale from 1 (strongly agree) to 4 (strongly disagree) is used to allow an individual to express how much they agree or disagree with a particular statement. The study took fifty Malaysian public and private academic libraries, consisting of chief librarians, deputy chief librarians, and senior librarians, as the survey population. At the end of the approach, all the information gathered will be used to

explore the current practices of leadership styles and aspects among Malaysian academic library leaders in propagating open science.

Figure 2 indicates the planning steps for the research design of the study.

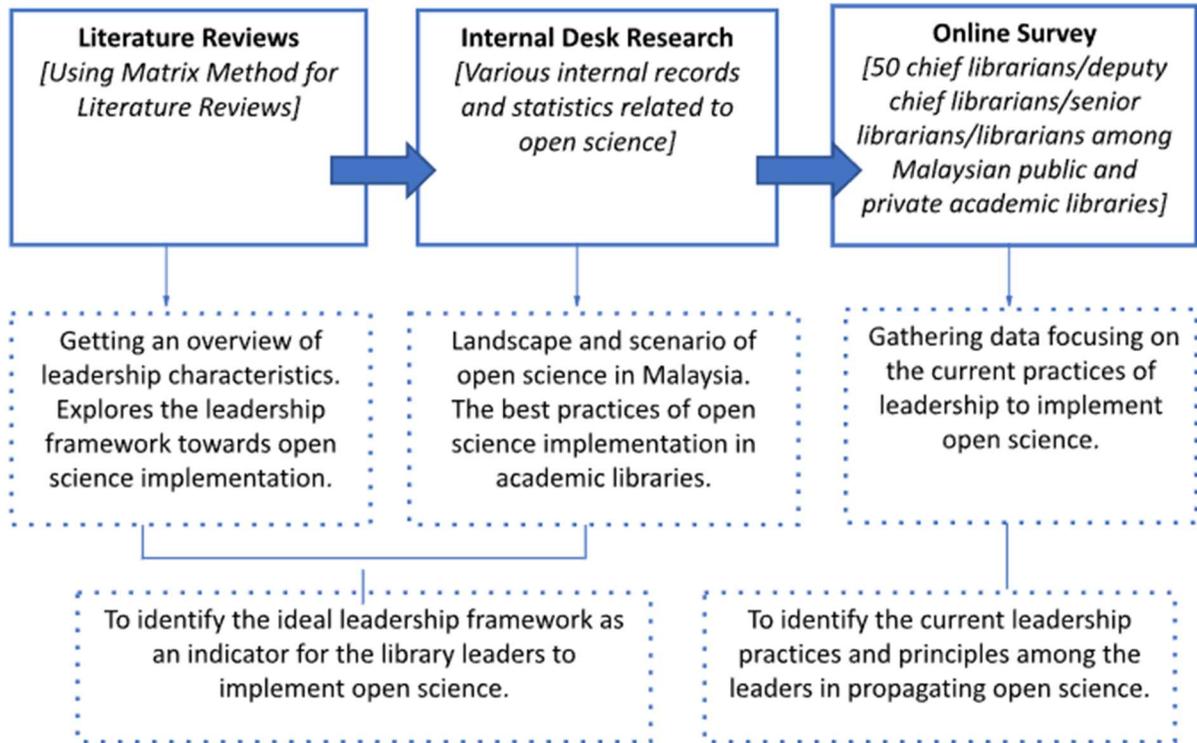


Figure 2: Planning of Research Design for the Study

RESULTS

For the data gathering on the online survey, the responses are viewed and analyzed using Microsoft Excel. The online survey was conducted among twenty Malaysian public universities and ten selected private academic libraries through email invitations and sharing links using messaging applications. 34 (87.2%) responses were received from public universities; five (12.8%) responses are coming from private academic libraries (as per data retrieved on July 13th, 2023). Consequently, 39 questionnaires were completed and used for analysis, resulting in a 78% response rate, which represents their academic libraries. Figure 3 shows the percentage of institutional positions held by seven respondents (18%) among chief librarian/director, 22 respondents (56%) among senior deputy chief librarians/deputy chief librarians, and 10 respondents (26%) among senior librarians/librarians.

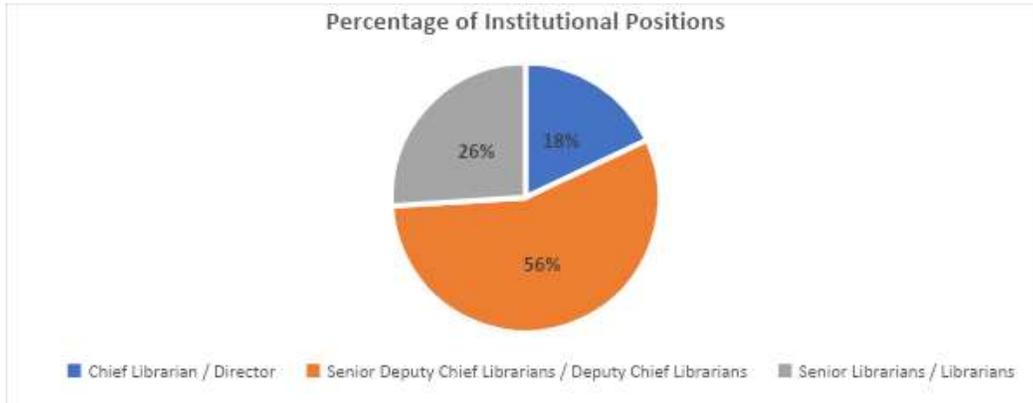


Figure 3: Percentage of Institutional Positions among the Respondents

The Open Leadership Framework

Based on a literature search, a research model known as the Open Leadership Framework (Sansing, 2018) was applied. Open leaders are guided by open principles, which strive for understanding; sharing; participation, and inclusion. From the study, to apply these principles, library open leaders in Malaysian academic libraries take these practices – design; build; empower.

- Design: Open leaders make contextual, deliberate decisions about how and when to be open.
- Build: Open leaders create structures and systems that ensure clarity and process-based management.
- Empower: Open leader's model personal leadership skills that sustain them and their contributors.

In the study, a quantitative approach was adopted, and the framework is presented in Figure 4.

	Understanding	Sharing	Participation and Inclusion
Design for...	<ul style="list-style-type: none"> ▪ Content focus ▪ Community interactions <ul style="list-style-type: none"> - Learning through use ▪ Storytelling 	<ul style="list-style-type: none"> ▪ Information-sharing focus ▪ Community interactions <ul style="list-style-type: none"> - Gifting - Enhancing value exchange - Networking common interests 	<ul style="list-style-type: none"> ▪ Governance focus ▪ Community interactions <ul style="list-style-type: none"> - Creating together - Soliciting ideas Project identity
Build for...	<ul style="list-style-type: none"> ▪ Communication ▪ Design ▪ Facilitation ▪ Maintenance ▪ Project management 	<ul style="list-style-type: none"> Commons-based production Data stewardship Documentation Licensing Networking 	<ul style="list-style-type: none"> ▪ Decision-making ▪ Delegation ▪ Event planning ▪ Community management ▪ Mentoring
Empower for...	<ul style="list-style-type: none"> ▪ Maintains clarity of vision & purpose ▪ Maintain authenticity & integrity ▪ Stays curious 	<ul style="list-style-type: none"> Makes connections Resilience Self-care 	<ul style="list-style-type: none"> ▪ Embraces failure ▪ Ensures safety ▪ Inspires contribution

Figure 4: Open Leadership Framework (Sansing, 2018)

The Characteristics of Open Leadership Practices

(a) Design Practices

For the design practices, the study initiates the content focus (understanding); information-sharing focus and gifting (sharing); and governance focus (participation and inclusion) as the open principles that can be implemented among library leaders. These aspects focus on the advocacy programs that focus on open science principles and policies at institutional, regional, and national levels (Ogungbeni, *et al.*, 2018). As the landscape of open science in Malaysian academic libraries is based on unclear information and the absence of development plans or policies (Amanullah and Abrizah, 2023), it is suggested the roadmap for cultural change toward open science by establishing advocacy programs to identify the benefits of open science approaches, whilst being realistic about the challenges (League of European Research Universities, 2018). This is associated with policy development aspects where library leaders can provide input on policies related to open access publishing, research

data management (RDM), copyright, incentives, and licensing to ensure these policies align with open science principles and benefit the research community.

(b) Build Practices

As for the build, the study analyzed how leaders can take these practices in terms of communication, facilitation, and maintenance (understanding); commons-based production, data stewardship, and networking (sharing); and mentoring (participation and inclusion) among the open principles towards open science implementation. These include the infrastructure and services to support open science activities, which involve establishing institutional repositories for open access publications and research data, providing guidance on data management plan (DMP) and sharing plans, and offering tools and platforms for collaborative research. This possibly echoed the findings of Higman and Pinfield (2015), who revealed the cause of slow implementation is not rooted in the lack of leadership by the libraries but in the institutional guidance in the areas of research governance. In fact, the National Open Science Platform launched by MOSTI in 2018 aims to facilitate the sharing of research outputs, including publications, data sets, and software.

(c) Empower Practices

While for the empowerment practices, the study found that the library should be leading in terms of maintaining clarity of vision and purpose (understanding); making connections (sharing); and ensuring safety and inspiring contribution (participation and inclusion). These can be implemented by taking the lead in designing and delivering education and training for an open science program in the outreach and community engagement aspect by hosting events, workshops, and participating in conferences and seminars. The Focus on Open Science in Hungary reported that open science practice is best established at the university level, where there are training programs to support it. Significant practice across Europe shows that such activities are successfully led by university libraries, which are well-placed to offer leadership (Ignat, 2021).

The Current Practices of Open Leadership

From the design section, analysis of the study demonstrates the current leadership practices among the Malaysian academic library leaders in terms of governance focus, with 94.8% accepting that the governance of open science programs in universities should be carried out on a top-down approach rather than bottom-up (Q2). Whereas only 5.2% of respondents disagree with the statement. Matthews (2015) quoted Professor Atalar as saying, "The top-down approach is more successful provided that the right person is the leader. [But] poor leaders in a top-down approach may lead to a disaster." Moreover, gaining support from the top management of the institutions will attract human talent and expertise and secure development funds to exceed the project cycles (Ignat, 2021).

Table 1 also shows that most of the respondents (97.4%) agree that the library needs to be involved in DMP, which is under the information sharing focus (Q3). The results show there are no respondents strongly disagreeing while only 2.6% of respondents disagree with the statement. DMP support refers to any elements, standards, tools, policies, or plans for the details of data management throughout open science or research management services. The libraries can take the lead by up-skilling their professionals and introducing research data management (RDM) services, including consultancy in DMP, data processing and its analysis, data description guidance, and preservation of data (Sheikh, Malik and Adnan, 2023).

The results found that 71.8% of respondents strongly agreed that the significance of collaboration between institutions (internal/external) helps make the open science agenda a success (Q5). Universities may be able to save money by collaborating on shared infrastructure and services. Managing costs is a key part of the leadership role that all universities need to adopt. Malaysia has been actively promoting open science initiatives to foster collaboration, transparency, and knowledge sharing within the scientific community. One of the most significant challenges in introducing open science practices is managing the costs of the transition (Deketelaere and Ayris, 2019).

For the question on the aspect of library management that should lead to the development of an open science policy at the university, the study perceived that 66.6% of respondents agreed and 33.4% disagreed with the statement (Q1). Therefore, categorizing the findings into chief librarians and directors shows that 85.7% accepted that library management should lead policy development, whereas only 14.3% disagreed with the statement. It shows that the library’s top management believed this open leadership practice was significant for open science implementation.

Table 1: Findings on the Design Leadership Practices

Open Leadership Practice	Question	Principles	Strongly Agree	Agree	Disagree	Strongly Disagree
Design for...	Q1: Library management should lead the development of an open science policy at your university	Content-focus	35.8%	30.8%	30.8%	2.6%
	Q2: The governance of open science programs is more suitable to be implemented top-down rather than bottom-up.	Governance focus	79.4%	15.4%	2.6%	2.6%
	Q3: The library needs to be involved in your university’s Data Management Plan (DMP).	Information sharing focus	64.1%	33.3%	2.6%	0%
	Q4: Libraries need to propose of incentives to academics and researchers to encourage the production of open access output.	Community interactions - Gifting	35.9%	41.0%	20.5%	2.6%
	Q5: It is important for your library to collaborate with institutions (internal / external) to make the open science agenda a success.	Community interactions – Learning through use	71.8%	0%	0%	28.2%

The study also reveals that the libraries need to propose incentives and recognitions to academics and researchers to encourage the production of open access output, where 76.9% accepted the statement, and the others denied it (Q4). It is in contrast with the survey result by PLOS 2023, which found that less than 20% of respondents will work on the adoption of professional incentives for academics who employ open science-based outputs. Abd Rahman (2023) stated that researchers ‘buy-in’ and sustainability are among six major issues and challenges to implementing open science in Malaysia. It is important to develop incentives for researchers to overcome those barriers. Joseph (2021) reported that the NASEM Board on Research Data and Information agreed on the development of a new national-level initiative that aligns incentives to support open science.

Figure 5 demonstrates the current practices of open leadership that have been carried out among Malaysian academic library leaders.

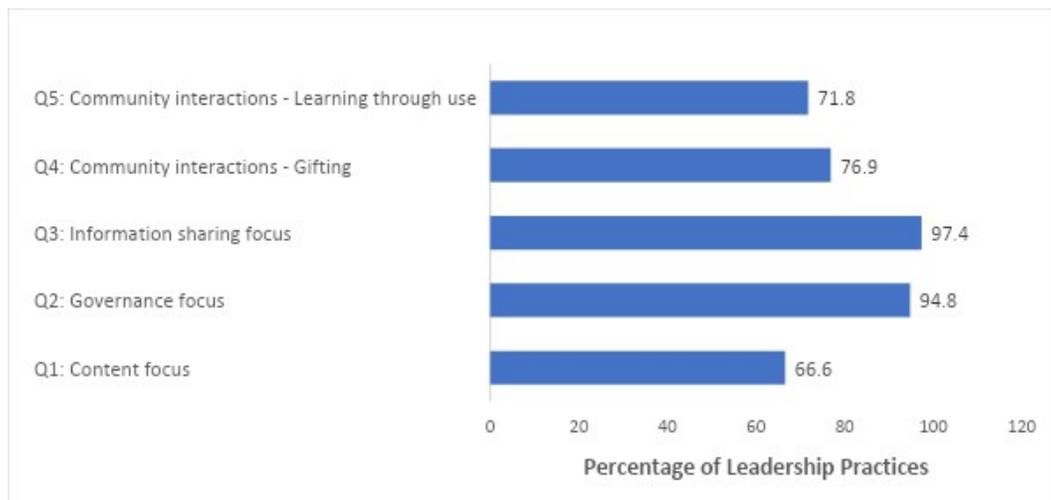


Figure 5: Open Leadership Practices for the Design Principles

While for the build practices, Table 2 exposes 100% of respondents without exception believing the libraries need training and competence development programs that are specific to open science (Q10). The mentorship agenda matches specific advice to the librarians’ needs for growth and helps with professional growth. A leader needs to master the necessary practical skills, such as managing projects and organizing digital collections (Tzanova, 2020).

Therefore, only 35.8% of the respondents agree with the statement that the library has provisions for successful training programs related to open science (Q12), which shows the limited allocation received for almost all academic libraries. Although this facilitation principle is significant for learning needs, it is still a challenging issue to be addressed. Leaders should learn the needed approaches to understand constraints on their ability to engage in open science practices (Castille, *et al.*, 2022).

The statement on the Data Stewardship Program (Q11) shows 64.1% of respondents acknowledge their librarians have already followed the program offered by the Malaysian Academy of Science and MOSTI. During the UMOS program, it was presented that the MOSP focus areas include national guidelines, awareness and capacity; and infrastructure. Among the targets was to train 200 data stewards, which was achieved by July 2022, when almost 240 data stewards had been trained in the Malaysian research landscape (MOSP, 2023).

Most of the respondents, 94.9%, recognize that library management should encourage publication in open access journals (Q8) as well as the library’s role in determining the university’s open data platform (Q9). For both statements, only 5.1% disagree, which indicates that common-based production and project management principles are significant for open science implementation. This focuses on the project content, framework, milestones, and documentation, besides leading the evaluation, accessibility, and adaptability of the project (Sansing, 2018).

Table 2: Findings on the Build Leadership Practices

Open Leadership Practice	Question	Principles	Strongly Agree	Agree	Disagree	Strongly Disagree
Build for...	Q6: The open science agenda has been clearly communicated at your university.	Communication	5.1%	30.8%	61.5%	2.6%
	Q7: Libraries need to lead collaborative activities in universities to increase awareness of open science.	Networking	33.3%	53.8%	10.3%	2.6%
	Q8: Library management should encourage publication in open access journals as one of the strategies for selecting journals in universities.	Common-based production	28.2%	66.7%	5.1%	0%
	Q9: Libraries have an important role in determining your university's open data	Project management	59%	35.9%	5.1%	0%

	platform (repository).					
	Q10: Libraries need to have training and competence development programs that are specific to open science.	Mentoring	59%	41%	0%	0%
	Q11: Librarians from your university have followed the Data Stewardship Program offered by the Malaysian Academy of Sciences and MOSTI.	Data stewardship	51.3%	12.8%	23.1%	12.8%
	Q12: Your library has provisions for successful training programs related to open science.	Facilitation	17.9%	17.9%	46.3%	17.9%
	Q13: Your library has specific provisions for developing and maintaining an open data platform (repository).	Maintenance	17.9%	23.1%	41.1%	17.9%

Hence, in terms of the library having specific provisions for developing and maintaining an open data platform, 41% of respondents agree with the statement (Q13). Still, the budgeting issues occurred in terms of facilitation and maintenance, which always need to be planned for the long-term for the sustainability of the project or programs. The presentation slides on Open Science to Jumpstart Open Innovation at the UMOS clearly stated that in open science management, minimizing the costs of unnecessary duplication of research is important, along with better planning in research management and funding (Akademi Sains Malaysia, 2023). Moreover, among the barriers to implementing open science are a lack of knowledge, time, and costs associated with the implementation (El Amin, *et al.*, 2023).

It also states that 87.1% of respondents accepted that libraries need to lead collaborative activities in universities to increase awareness of open science (Q7). Creating partnerships with allied organizations makes it easy for libraries to rally around shared issues and values.

Collaboration and partnership can also be implemented by encouraging collaboration with external partners, other research organizations, and funding agencies to promote open science (Abrizah, 2023). As open science promotes transparent and accessible knowledge that is shared and developed through collaboration for the benefit of all (Peeters, 2021), leaders do not need to worry about starting with small partnerships because working together on small projects can lead to big opportunities for bigger collaborations (Carpino, Mentkowski and Nejd, 2020).

The analysis also shows that only 35.9% of respondents agree that the open science agenda has been communicated at their universities. It shows that the communication within the community regarding open science is still not completely comprehensive. Since open science practices shift from closed to more transparent positions (Bowman and Keene, 2018), leaders should produce clearer communication of what is required for organizational success (Johnson and Sobczak, 2021).

Figure 6 illustrates the percentage of current practices of open leadership under the build element.

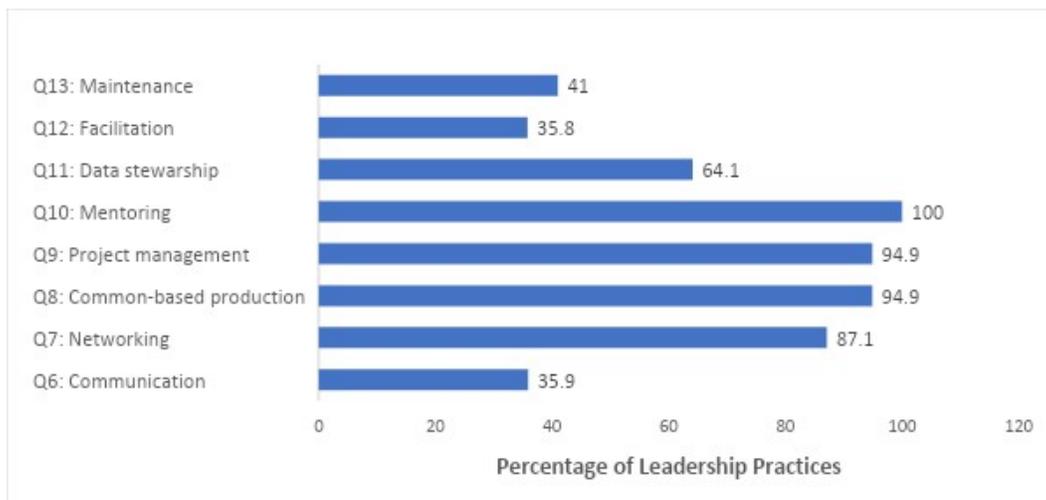


Figure 6: Open Leadership Practices for the Build Principles

For the results on empowered leadership practices, Table 3 displays the significant principles in terms of maintaining clarity of vision and purpose, inspiring contribution, and making connections. This illustrates a set of leadership principles that are currently practiced among Malaysian academic library leaders, who strongly agree on the statement under these practices.

The most strongly agreed statement, with a total response of 61.5%, was that the library needs to collaborate with the university’s Information Technology Center and Research Management Center in providing researcher profiles based on open access platforms (Q16).

The respondents also highly accepted that the library management needs to include the open science agenda as the main core of the library’s strategic plan, which indicates 46.2% strongly agree and 53.8% agree (Q14). The experience from the National Institutes of Health Malaysia in implementing open science shares that the management or organization can support the movement of open science through appropriate data or strategy plan establishment (Muhd Zulfadli, 2023).

Table 3: Findings on the Empower Leadership Practices

Open Leadership Practice	Question	Principles	Strongly Agree	Agree	Disagree	Strongly Disagree
Empower for...	Q14: Library management needs to include the open science agenda as the main core in the library's strategic plan.	Maintains clarity of vision & purpose	46.2%	53.8%	0%	0%
	Q15: Libraries need to encourage faculties / institutes / centers in universities to develop, implement open science and open evaluation in the academic publishing process.	Inspires contribution	38.5%	61.5%	0%	0%
	Q16: The library needs to collaborate with the university's Information Technology Center and Research Management Center at the university to provide researcher profiles based on open access platforms.	Makes connections	61.5%	38.5%	0%	0%

While for the statement that libraries need to encourage faculties/institutes/centers in universities to develop, implement open science and open evaluation in the academic publishing process (Q15), 61.5% of respondents agree, and the others strongly agree. This inspiring contribution encourages and promotes research integrity, transparency, and reproducibility through clear guidelines and expectations.

The Significant Practices and Recommendations in Open Leadership

This section summarized the significant practices in open leadership that have been applied in Malaysian academic libraries based on the online survey analysis. Figure 7 illustrates the

most exceptional practices in terms of design, build and empowerment principles in open leadership besides the recommendations for the future towards open science implementation.

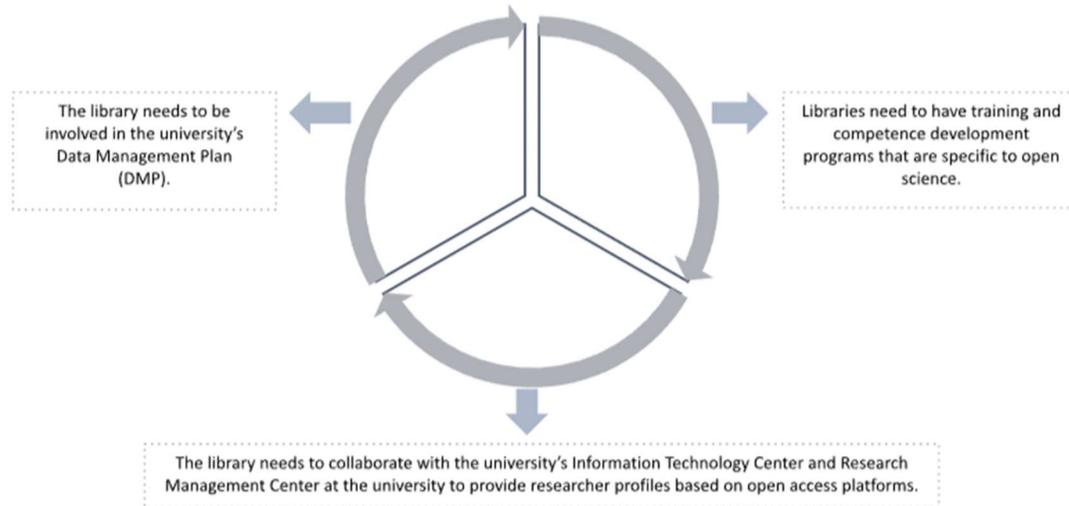


Figure 7: The Significant Practices Open Leadership among Malaysian Academic Libraries

CONCLUSION

It is apparent that open leadership is an approach that supports the implementation of open science, yet it is not so frequently observed in Malaysia, compared to other leadership styles. The results show that several leadership practices are put forward to support academic library leaders in propagating open science, therefore requiring a comprehensive understanding of the principles and values that encourage the academic library leaders to act and promote these practices within the scientific community and beyond. In summary, open leadership in open science among Malaysian academic libraries focus on policy advocacy in terms of DMP or policy changes at the institutional, national, and international levels besides working with government and funding agencies to shape supportive policies and legislation.

While there may be challenges and concerns to address complex global challenges, mentoring principles in terms of education and training programs for researchers, students, and institutions are essential to raise awareness about open science practices besides to encourage the integration of open science topics and to foster collaboration, transparency, and inclusivity. By embracing open leadership principles such as making connections through collaboration and networking, being able to establish online communities and networks to share the best practices and discuss the challenges in implementing open science. In the spirit of open leadership, fostering a culture of openness, collaboration, and inclusivity in scientific research can unlock the full potential of open science to address the challenges and build a brighter and more equitable future for all.

REFERENCES

- Abd Rahman, N. 2023. Malaysia Open Science Platform: Open science today for new science tomorrow. Official Launch of University of Malaya Open Science (UMOS), Universiti Malaya, Tuesday, 6th June 2023, Auditorium Hal Ehwal Pelajar, Kompleks Perdana Siswa (KPS), Universiti Malaya, Kuala Lumpur. Keynote Speech. Unpublished material.
- Abrizah, A. 2023. Open science policies and governance. Official Launch of University of Malaya Open Science (UMOS), Universiti Malaya, Tuesday, 6th June 2023, Auditorium Hal Ehwal Pelajar, Kompleks Perdana Siswa (KPS), Universiti Malaya, Kuala Lumpur. Unpublished material.
- Akademi Sains Malaysia. 2023. Open science to jumpstart open innovation. Official Launch of University of Malaya Open Science (UMOS), Universiti Malaya, Tuesday, 6th June 2023, Auditorium Hal Ehwal Pelajar, Kompleks Perdana Siswa (KPS), Universiti Malaya, Kuala Lumpur. Keynote Speech. Unpublished material.
- Alajmi, B.M. and Alshammari, I. 2020. Strands of diversity in Library and Information Science graduate curricula. *Malaysian Journal of Library and Information Science*, Vol. 25, No.1: 103-20. Available at <https://doi.org/10.22452/mjlis.vol25no1.6>
- Ali-Khan, S.E., Jean, A. and Gold, E.R. 2018. Identifying the challenges in implementing open science. *MNI Open Research*, Vol. 2, No. 5: 1-17. Available at [10.12688/mniopenres.12805.1](https://doi.org/10.12688/mniopenres.12805.1).
- Amanullah, S.W. and Abrizah, A. 2023. The landscape of research data management services in Malaysian academic libraries: librarians' practices and roles. *The Electronic Library*, Vol. 41, No. 1: 63-86. Available at [https://doi-org.eresourcesptsl.ukm.remotexs.co/10.1108/EL-06-2022-0135](https://doi.org.eresourcesptsl.ukm.remotexs.co/10.1108/EL-06-2022-0135)
- American Library Association, 2016. LLAMA foundational competencies. Available at <https://www.ala.org/llama/sites/ala.org.llama/files/content/LLAMA%20Foundation%20Competencies%20-%20White%20Paper.pdf>
- Ashiq, M., Rehman, S.U. and Batool, S.H. 2019. Academic library leaders' conceptions of library leadership in Pakistan. *Malaysian Journal of Library & Information Science*, Vol. 24, No.2: 55-71. Available at: <https://doi.org/10.22452/mjlis.vol24no2.4>
- Bhasin, H. 2023. Desk research: Definition, importance and advantages. Available at <https://www.marketing91.com/desk-research/#:~:text=Internal%20desk%20research%20is%20referred,collected%20from%20the%20external%20sources.>
- Bowman N. D. and Keene J. R. 2018. A layered framework for considering open science practices. *Communication Research Reports*, Vol. 35, No. 4: 363–372. Available at <https://doi.org/10.1080/08824096.2018.1513273>
- Carpino, L., Mentkowski, A. and Nejdil, C.S. 2020. Building strategic partnerships through collaboration between Law Libraries. *AALL Spectrum*, Vol. 24, No. 4:1: 6-19. Available at <https://search-ebSCOhost-com.eresourcesptsl.ukm.remotexs.co/login.aspx?direct=true&db=edshol&AN=edshol.hein.aallar.spectrum0024.74&site=eds-live>

- Castille, C.M., Cobb, H.R., Siegel, J.A. and Thomas, C.L. 2022. Opening up: Tips for fostering belongingness in our scholarly communities while encouraging open science. *The Industrial-Organizational Psychologist*, Vol. 60, No. 1: 12-17. Available at [https://search-ebscohost-com.eresourcesptsl.ukm.remotexs.co/login.aspx?direct=true&db=a9h&AN=159946075&site=eds-live](https://search.ebscohost.com.eresourcesptsl.ukm.remotexs.co/login.aspx?direct=true&db=a9h&AN=159946075&site=eds-live)
- Chmers, M. 1997. An integrative theory of leadership. Available at <https://doi.org/10.4324/9781315805726>
- Deketelaere, K. and Ayris P. 2019. Leadership - the key to open science success. Available at <https://www.leru.org/news/leadership-the-key-to-open-science-success>
- Dewey, B.I. 2019. Open leadership for a vibrant future. *John Hopkins University Press*, Vol. 19, No. 3: 359-364. Available at 10.1353/pla.2019.0021
- El Amin M., Borders J.C., Long H.L., Keller M.A. and Kearney E. 2023. Open science practices in communication sciences and disorders: A Survey. *Journal of Speech, Language & Hearing Research*, Vol. 66, No. 6: 1928-1947. Available at doi:10.1044/2022_JSLHR-22-00062
- Giesecke, J.R. 2007. *Modeling leadership theories*. Westport, CT: Libraries Unlimited.
- Gill, R. 2006. *Theory and practice of leadership*. London: Sage Publications.
- Hernez-Broome, G. and Hughes, R.L. 2004. Leadership development: Past, present and future. *Human Resource Planning*, Vol. 27, No.1: 24-32. Available at <https://www.proquest.com/docview/224578876>
- Hodonu-Wusu, J. O., Noorhidawati, A. and Abrizah, A. 2020. Malaysian researchers on open data: The first national survey on awareness, practices and attitudes. *Malaysian Journal of Library and Information Science*, Vol. 25, No. 2: 1–20. Available at <https://doi.org/10.22452/mjlis.vol25no2.1>
- Ignat, T., 2021. What motivates us to develop the focus on open Science series? 127-144. Available at DOI 10.36820/MTAKIK.KOZL.2021.OpenS.6
- Johnson, J.I. and Sobczak, P.D. 2021. Leadership and leader development: Perspectives from museum and academic library professionals. *Curator*, Vol. 64, No.2: 269-295. Available at doi:10.1111/cura.12409
- Joseph, H. 2021. Building momentum to realign incentives to support open science. *Data Intelligence*, Vol. 3, No. 1: 71–78. Available at https://doi.org/10.1162/dint_a_00079
- Li, C. 2010. *Open leadership – how social technology can transform the way you lead*. Jossey-Bass – A Wiley Imprint.
- Maciel, M.L., Kaspar, W.A. and vanDuinkerken, W. 2018. Seeking service leadership in academic libraries: An analysis of dean and director position advertisements. *Journal of Library Administration*, Vol. 58, No. 1: 18-53. Available at <https://doi.org/10.1080/01930826.2017.1399711>
- Malaysia Open Science Alliance Working Group. 2021. *The landscape of open science in Malaysia*. Available at <https://www.akademisains.gov.my/mosp/landscape-report-on-open-science-in-malaysia/>
- Malaysia Open Science Platform. 2020. *What is Malaysia Open Science Platform?* Available at <https://www.akademisains.gov.my/mosp/about/what-is-malaysia-open-science-platform/>

- Matthews, D. 2015. 'Top-down' leadership approach 'key to most successful universities'. Available at <https://www.timeshighereducation.com/top-down-leadership-approach-key-most-successful-universities>
- Muhd Zalfadli, H.I. 2023. Knowledge translation in healthcare: Role of open science. Official Launch of University of Malaya Open Science (UMOS), Universiti Malaya, Tuesday, 6th June 2023, Auditorium Hal Ehwal Pelajar, Kompleks Perdana Siswa (KPS), Universiti Malaya, Kuala Lumpur. Experience from NIH Malaysia. Unpublished material.
- Mullins, J. and Linehan, M. 2006. Desired qualities of public library leaders. *Leadership & Organization Development Journal*, Vol. 27 No. 2: 133-143. Available at: <https://doi.org/10.1108/01437730610646633>
- Narang, A. and Kumar, J. 2016. Leadership competencies for librarians. *International Journal of Library Science*, Vol. 14, No. 3: 31-40. Available at https://www.researchgate.net/publication/309407503_Leadership_Competencies_for_Librarians
- Nolfi, D. 2020. Matrix method for literature review: the review matrix. Available at <https://guides.library.duq.edu/matrix>
- Ogunbeni, J.I., Obiamalu, A.R., Ssemambo, S. and Bazibu, C.M. 2018. The roles of academic libraries in propagating open science: A qualitative literature review. *Information Development*, Vol. 34, No. 2: 113-121. Available at <https://doi.org/10.1177/0266666916678444>
- Peeters, F.V. 2021. Opening doors to discovery: Partnerships are key to advancing open science. *Information Services & Use*, Vol. 41, No. 1/2: 171-176. Available at doi:10.3233/ISU-210105
- PLOS. 2023. Open Science Advocacy and Capacity Building for Leadership in African Higher Education Institutions. PLOS: Advocacy Collaboration Open Science. Available at <https://theplosblog.plos.org/2023/03/open-science-advocacy-and-capacity-building-for-leadership-in-african-higher-education-institutions/>
- Ramjouw, C. 2015. Towards open science: the vision of the European commission. *Information Services & Use*, Vol. 35, No. 3: 167-170. Available at: <http://dx.doi.org/10.3233/isu-150777>
- Rausch, E. 2005. A practical focus on leadership in management – for research, education and management development. *Management Decision*, Vol. 43, No. 7/8: 988-1000. Available at: 10.1108/00251740510609983
- Sansing, C. 2018. Open leadership framework. Available at <https://mozilla.github.io/open-leadership-framework/framework/#what-is-open-leadership>
- Schöpfel, J., Ferrant, C., André, F. and Fabre, R. 2016. Ready for the future? A survey on open access with scientists from the French National Research Center (CNRS). *Interlending & Document Supply*, Vol. 44, No. 4: 141-149. Available at <https://doi.org.eresourcesptsl.ukm.remotexs.co/10.1108/ILDS-06-2016-0023>
- Sheikh, A., Malik, A. and Adnan, R. 2023. Evolution of research data management in academic libraries: A review of the literature. *Information Development*. Available at <https://doi.org/10.1177/02666669231157405>
- Stephens, S.A., Cole, H.J., Gibbs, K.J., Riehle, C.F. and Weare, W.H. 2009. Developing core leadership competencies for the library profession. *Library Leadership & Management*, Vol.23, No.2: 63-74. Available at

- <https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1377&context=librarysciencedill>
- Sullivan, M. 2015. *Creating leaders: An examination of Academic and Research Library Leadership Institutes*. Chicago, IL: Association of College and Research Libraries.
- Synder, H. 2019. Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, Vol. 104: 333-339. Available at <https://doi.org/10.1016/j.jbusres.2019.07.039>
- Tzanova, S. 2020. Changes in academic libraries in the era of Open Science. *Education for Information*, Vol. 36, No. 3: 281-299. Available at doi:10.3233/EFI-190259
- Uslu, T., Bulbul, I.A. and Cubuk, D. 2015. An investigation of the effects of open leadership to organizational innovativeness and corporate entrepreneurship. *Procedia – Social and Behavioral Sciences*, Vol. 195: 1166-1175. Available at [https://doi-org.eresourcesptsl.ukm.remotexs.co/10.1016/j.sbspro.2015.06.169](https://doi.org.eresourcesptsl.ukm.remotexs.co/10.1016/j.sbspro.2015.06.169)
- Uwarani, K., Abd. Rahim, N., Mohamed, Z. and Salim, F. 2022. Strategic framework towards open science adoption in Malaysia. *IEEE Technology & Engineering Management Conference - Asia Pacific (TEMSCON-ASPAC)*. Available at 10.1109/TEMSCON-ASPAC52831.2022.9916546
- Wong, G.K.W. 2017. Leadership and leadership development in academic libraries: A review. *Library Management*, Vol. 38, No. 2/3: 153-166. Available at <https://doi.org/10.1108/LM-09-2016-0075>
- Wong, G.K.W. 2019. A tool for academic libraries to prioritize leadership competencies. *College & Research Libraries*, Vol. 80, No. 5: 597. Available at <https://doi.org/10.5860/crl.80.5.597>.
- Zijlstra, A.R., Vaira, C.L. and Boothe, R. 2017. *Open data readiness assessment: Malaysia (English)*. Malaysia development experience series. Washington, D.C.: World Bank Group. Available at <http://documents.worldbank.org/curated/en/529011495523087262/Open-data-readiness-assessment-Malaysia>