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The perception of cons and pros on Open Science within Kuwait University Faculty members in the State of Kuwait.

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Abstract
Open Science (OS) in academic libraries has become essential to enhance academic activity in research. In other words, results should be shared openly to enhance the production of research results and accessed easily. The aim of this research is to identify the awareness of cons and pros on OS within the Kuwait University Faculty Members (KUFM). Factors that affect the awareness of OS in Kuwait University (KU) were also explored. A descriptive analysis was used to identify the awareness of cons and pros on OS within the Kuwait University Faculty Members (KUFM). Furthermore, an online questionnaire was sent to all faculty members in the Kuwait University Collages. The main findings indicated that sciences fields had an idea about OS practices more than social sciences fields, as well as there is a clear shortcoming from decision-makers at KU regarding the role of OS in an academic environment. Moreover, the results confirmed that there are challenges that hinder the use of OS practices at Kuwait University, such as; financial issues, cultural challenges, lack of OS professionals, lack of technological support, and lack of awareness of OS practices. Therefore, recommendations to KU on establishing an effective OS environment within the University were suggested.
Keywords: Open Science (OS), Kuwait University (KU), Kuwait University Faculty Members (KUFM), Early Career Researchers (ECRs).
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1. Introduction

Forty years and more the future of the library has been questioned by people, as it has been predicted by some the end of the library but a new era for research due to technological changes. Thompson (1983) states that this is due to being incapable to deal with the digital and social transformation, unsustainable by the classic Gutenberg era; having made a dead end, they "may disappear like the dinosaurs". But one thing is for sure, which is the development of the modern world of information technologies and digital developments, connectivity has changed the future advancement of research exhibition, and they must offer advanced solutions if libraries want to exist.

The importance of the resources is determined by contribution and sharing. In other words, according to IFLA (2012) sharing of information is part of the basic principles of libraries, therefore, librarians and other information specialists must provide access to information in any medium or format for library users. They also encourage the concepts of open access (OA), open source, and open licenses. The Open Science (OS) movement in academic institutions and libraries has become necessary and considered a new norm to enhance academic activity in research. To improve the quality of research results should be accessible and shared openly. Therefore, for these activities to succeed, the academic society should recognize the cons and pros of this type of movement before going through the process of implementation and adoption of OS framework.

2. Open Science (OS):

Throughout history, scientists develop the best research by building on the work from others. According to Wang (2019) the essential role of accessible information in the development of science and technology naturally gives growth to the Open Science (OS) movement that aims at disregarding access barriers to scholarly communications (Open Access, OA), research data (Open Data), and the proprieties and other software tools that gather and process the data (Open Source). Recent decades have seen scientists, researchers, and funding institutions embrace the OS idea with tangible measures.

Piwowar (2013) states that research contributions are recognised in the age of OS by the way how technologies have changed. For instance, scientific literature contains acknowledgments and comments that are a form of peer reviews on the cited work. Even, software and datasets are cited work too and not only articles. In other words, according to Pardo Martínez and Poveda (2018) OS is a new approach to research practice based on collaboration and innovative approaches of knowledge sharing using digital technologies and collaborative tools

that encourage combined exertion together with the sharing of results and knowledge as early and as broadly as possible.

Therefore, OS is a movement to make scientific research, data, and spreading accessible at all levels of an investigative society. It is also a transformation of an approach of how research performed, documented, and distributed. The goal of OS is to make research outputs; methods and software are openly accessible. It can be well-defined as a sequence of procedures that, under the proper requirements, it improves the quality of research by making results shared and accessible. Timmermann (2019) confirms that one of the main qualities of OS is sharing research data among researchers. Therefore, the advancement of OS affects various strategic, theoretical, and technical disputes to numerous scientific societies that carry out data-driven research.

2. Open Science Awareness:

Schmidt, et al, (2018) highlights to take OS to the next level it needs researchers' awareness of the importance of openness and sharing, nevertheless, the development of their skills such as embracing innovative research practices. New prospects and challenges are built for researchers when research is enhanced digitally especially for Early Career Researchers (ECRs). To allow the collection and processing of different types of research data and information new tools and platforms are always developing. And to manage and store valuable research data, to assist on-going and future studies, as well as, sharing with research society is a definite challenge.

According to Pardo Martínez and Poveda (2018) the foremost restraints for OS practices among researchers are:

- Absence of appraisal by academic colleagues.
- Studies are in the form of drafts.
- The danger of OS publishing that can damage one's career.
- Absence of institutional support for OA.
- Vague advantages of OS.
- Absence of financial funding or support for OS.
- Absence of national and institutional policies and regulations for OA publishing.

3. Open Science Challenges and Opportunities:

McKierna, et al, (2016) state that there are career-driven essential reasons to apply and promote OS methods. Yet, according to Allen and Mehler (2019) there are main challenges too that are understated and specifically involve those who perform the research whether they are well known researchers or ECRs. Three areas of challenge and opportunities presented by OS practices that face mostly ECRs. Generally, OS methods are expected to address concerns around duplication, are progressively expected, and ECRs can gain from being involved early on.

3.1 Open Science Challenges:

The challenges are mainly in Three areas:

3.1.1 Limitations on flexibility:

OS methods do not prevent the possibility of unexpected discovery, but evidence requires resulting repetition, which involves additional work. Nosek, Spies and Motyl (2012) argue that preregistration is the procedure of documenting the scientist's research plan at the beginning of his/her study and storing that plan in a read-only public repository. Preregistration divides hypothesis generating (exploratory) from hypothesis-testing (confirmatory) research and both methods of research are important for science to grow.

According to McIntosh (2017) experimental evaluations can be put in after registration; however, they can and should have a lower evidential status than preregistered tests. Although this specific lack of flexibility only precisely affects the preregistered qualities of OS, the difference between exploratory and confirmatory study is a more general theory promoted in OS. Traditional science easily allows for the merging of new ideas more flexibly.

According to Lewandowsky and Bishop (2016), Bishop (2017) the more restrictive configurations of OS can result in errors getting greater difficulties than within a more closed approach. Visible papers and data come with greater error visibility, and the flexibility to prevent recognizing errors is lost. However, for science, unrecognized errors are challenging. Hence, errors should be conducted clearly, and in a positive and not in a negative way. Encouraging researchers to be open about their errors and not criticizing others for them though at times these errors can and will happen. Furthermore, under preregistered conditions and higher visibility, mistakes can have greater impacts due to the loss of flexibility in replying to the criticisms and the predetermined timelines.

3.1.2 Time Consumption:

There are theoretic reasons why OS methods could save time. Nevertheless, these reasons hardly come to

completion in the existing system. Allen and Mehler (2019) state that the additional requirements for research that use the OS method often take more time, this all goes back to the traditional procedures like Archiving, documenting, and quality controlling of code and data.

Generally, researchers and ECRs who takes on OS methods will complete less projects within a fixed period in comparison to other researchers who work with traditional methods. Therefore, Allen and Mehler (2019) confirm that there are concerns need to be set to the research plan and approach during an early stage, because resources are limited for ECRs. Time consumption is one of the ultimate challenges in conducting OS and highly affects ECRs, and so may need reconsidering how ECRs research is planned with the supervision of senior researchers. In general, researchers at all levels should take this time consumption issue seriously during planning research.

3.1.3 Low motivational structure:

Institutions that practice OS methods are rare and researchers mostly evaluated according to traditional research criteria. This is due to convincing funders of research, reviewers, and editors at academic journals the importance and need of using open and OS methods. Allen and Mehler (2019) states that a lot of institutions, high-ranking researchers, and journals state their support for OS and open methods, nonetheless, limited numbers have published using these methods. Therefore, ECRs that practice OS expected to have less published papers by the time they are up for their following career stage.

According to Krishna (2020) other challenges that are prominent while adopting OS and that is behind the principles of the OS methods and primarily the science society social contract which benefits society in variable ways. These challenges are coming from:

1. "Market-based privatized science,
2. 4.0 Industrial Revolution technologies,
3. A new firm screen impeding the free flow of scientific data, information, and facts".

3.2 Open Science Opportunities:

Fortunato, et al, (2018), Wang, K. (2019) agree that the OS movement also provides opportunities to access unrestricted high-quality data and for the past years, the world has witnessed outstanding technological developments. According to Poldrack (2019) setting research and data in the public domain is essential to OS and increases ECRs' opportunities for recognition, exchange, cooperation, and progression. Therefore, early implementation of OS practices drives career advantages for researchers in the future.

There are three main recognised opportunities, which are:

3.2.1 Trust in research:

OS methods is known that it could improve the quality and consistency of scientific work. Such methods that are developed become extensively recognized, in addition for researchers and ECRs who adopt OS early, the progress of the research should reflect confidently in the quality.

An important aim of the OS movement is to make science more reliable and trustworthy. According to Allen and Mehler (2019) sharing of procedures and data leads to repetition, reproduction of analyses, and exploration. This increased exploration can also be an influence to guarantee good quality data and analyses. In addition, in an educational prospective, once code and data presented the researcher replicate results presented in papers, which simplifies understanding of the study. Scientists at all levels can benefit when replication of results found, as it is crucial to OS and vital in increasing trustworthiness.

3.2.2 Innovative supportive systems:

In order, for researchers to promote collaboration among them configurations must establish around OS. Biecek and Kosinski (2017), Allen and Mehler (2019) agree that these configurations include a variety of software tools, and publishing mechanisms. OS software such as web-based, version-controlled repositories like GitHub archivist and Bitbucket can help with preserving and sharing code. These configurations can help researchers in verifying their work, improving workflows, and supporting collaborations with other researchers. In addition, ECRs can form well-documented and strong code libraries that may use over again for impending studies and for educational purposes. New open tools can help strong data analysis in a manageable manner. Finally, the OS movement offers opportunities to access unrestricted high quality, and standardised data.

3.2.3 Future Investment:

Poldrack (2019) argues that placing more research and data in an unrestricted domain is fundamental to OS and increases ECRs' opportunities for recognition, exchange, collaboration, and development. Furthermore, Piwowar and Vision (2013) pointed articles that published and share open data obtain more citations than articles that do not share data, therefore, researchers and ECRs can obtain citations for their work when deposited at unrestricted

open repositories such as the OS Framework. Moreover, once their research is open therefore, visibility will be increased and users who can simply download open versions of research will cite these versions. Overall, with open data, it is open to everyone, therefore, to access, to use, and to publish using this data, one does not need a large funding, and so OS can expedite wide contribution for researchers.

4. Methodology:

Since this study is exploratory and descriptive in nature, a questionnaire was adopted to answer the following research questions:

Q1: What are the perceptions of faculty members in respect of the cons and pros on OS in KU?
Q2: What factors affect the awareness of the OS concept in KU?
Q3: Why are these factors present in KU?

A descriptive analysis was used to identify the awareness of cons and pros on OS within the Kuwait University Faculty Members (KUFM). The study was carried out during the winter of 2022. An online questionnaire was sent to all faculty members in the Kuwait University Collages (see Table 1).

Table 1: Participants` profiles

Kuwait University Collages		Numl	
		Professor	Associate Professor
Collage of Education	Count	4	7
	% of Total	17.6%	29.5%
Collage of Science	Count	3	7
	% of Total	8.6%	20%
College of Engineering and Petroleum	Count	4	8
	% of Total	13.8%	27.6%
Colleges of Medical (Public Health, Pharmacy, Medicine, Allied Health Science, Dentistry)	Count	7	19
	% of Total	12.7%	34.7%
College of Business Administration	Count	2	8
	% of Total	9.5%	38.1%
College of Architecture	Count	1	2
	% of Total	14.3%	28.6%
Collage of Social Science	Count	2	3
	% of Total	13.3%	20%
College of Sharia and Islamic Studies	Count	3	8
	% of Total	15%	40%

Table 1: Participants` profiles

In this research a questionnaire was used to obtain a descriptive overview of the respondents' perceptions from a large population since this research included all faculty members in Kuwait University. The statements in the questionnaire were established from the literature concerning OS and Academic libraries. The questionnaire was divided into four main sections. The first section included three questions to elicit demographic information, while the second section which deals with the OS Awareness included 11 items using a 5-scale rating scale to answer the statements. The third section concerned the role of OS, while the last section regards the challenges of using OS in KU. This was divided into 8 points using a 5-scale rating one final open-ended question was added for comments and suggestions about the challenges that faces the respondents in using OS. Out of 300 questionnaires, 239 were returned with a 79.7% return rate.

4.1 Demographic profile:

This part of the questionnaire sought to identify the participants` profiles to give a clear image of the percentages of this profile before presenting the other results. The findings show that out of 239 participants, 122 (51%) were male while 117 (49%) were female (Figure 1).

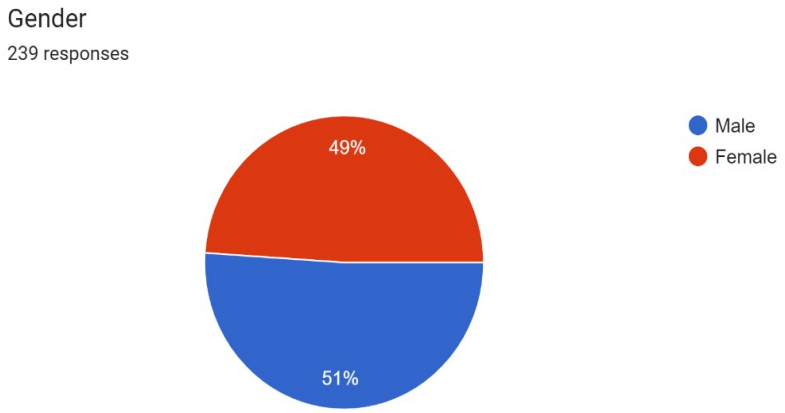

Figure 1: The gender of participants

Regarding the participants' position, out of 239, 31 (13%) were Professor, while 73 (30.5%) were Associate Professor, and 135 (56.5%) Assistant Professor (Figure 2).

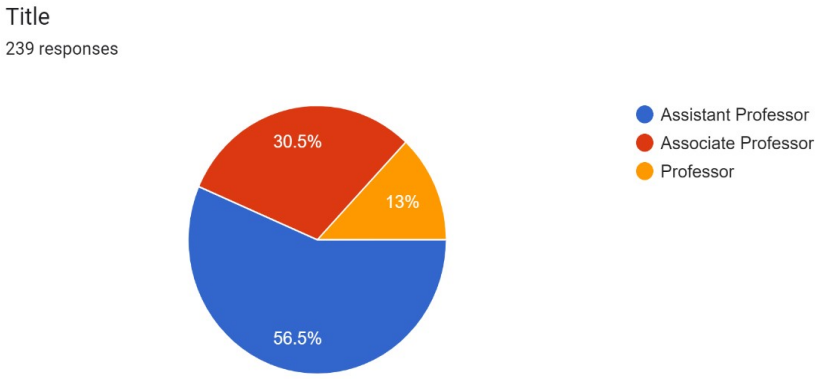

Figure 2: The position title of participants

Figure 3 illustrates the number of respondents distributed over the KU collages. The percentages were close: 35 (14.6%) were from College of Science, 29 (12.1%) were from College of Engineering and Petroleum and, 27 (11.3%) were from College of Law and, 23 (9.6%) from College of Education, while 20 (8.4%) were from College of Sharia and Islamic Studies, 21 (8.8%) from College of Business Administration, and 15 (6.3%) from College of Social Science. At the same percentage 7 (2.9%) were both College of Life and College of Architecture, while the large percentage 55 (23%) were from the Colleges of Medical specialties (Public Health, Pharmacy, Medicine, Allied Health Science, Dentistry).

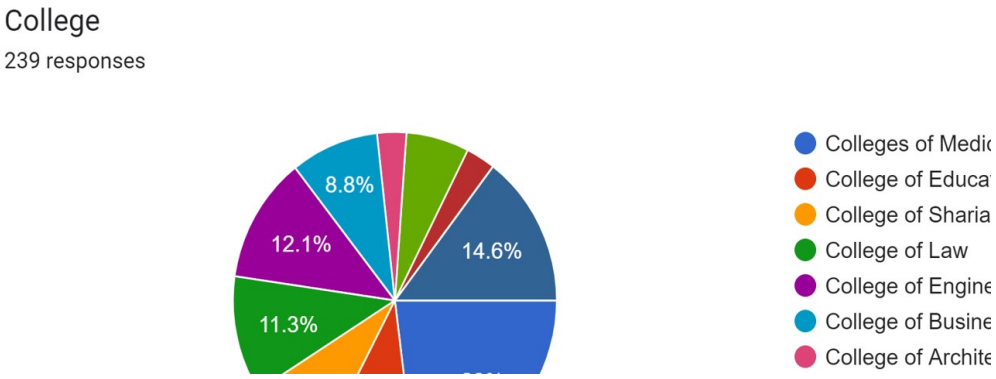

Figure 3: The collage of participants

4.1 The Awareness of Open Science:

This part of the questionnaire sought to obtain results on the awareness 0f OS. The researchers started this section by asking the participants if they had "ever heard about OS practices". The results showed that out of 239 participants, 181 (67.4%) had not heard of OS, while 80 (33.5) had heard (see figure 4). For instance, out of 7 participants from College of Architecture five of them had not heard of OS practices. In the same vein, 6 participants from College of Life Science had not heard the same. Furthermore, all participants in three collages; College of Business Administration, College of Sharia and Islamic Studies and College of Law had not heard about OS practices at all. While out of 23 participates from College of Education 17 of them had not heard of OS and out of 15 participants from College of Social Science had not heard the same. In contrast, respondents from College of Science, College of Engineering and Petroleum and Colleges of Medical specialties had heard more about OS practices (see Figure 5).

This result indicated that, participants from sciences fields had an idea about OS practices more than social sciences fields.

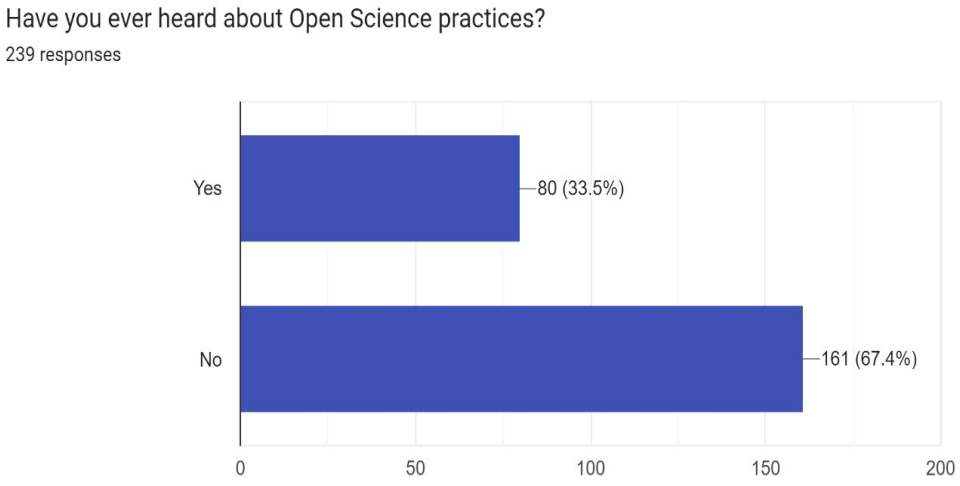

Figure 4: Have you ever heard about OS? practices

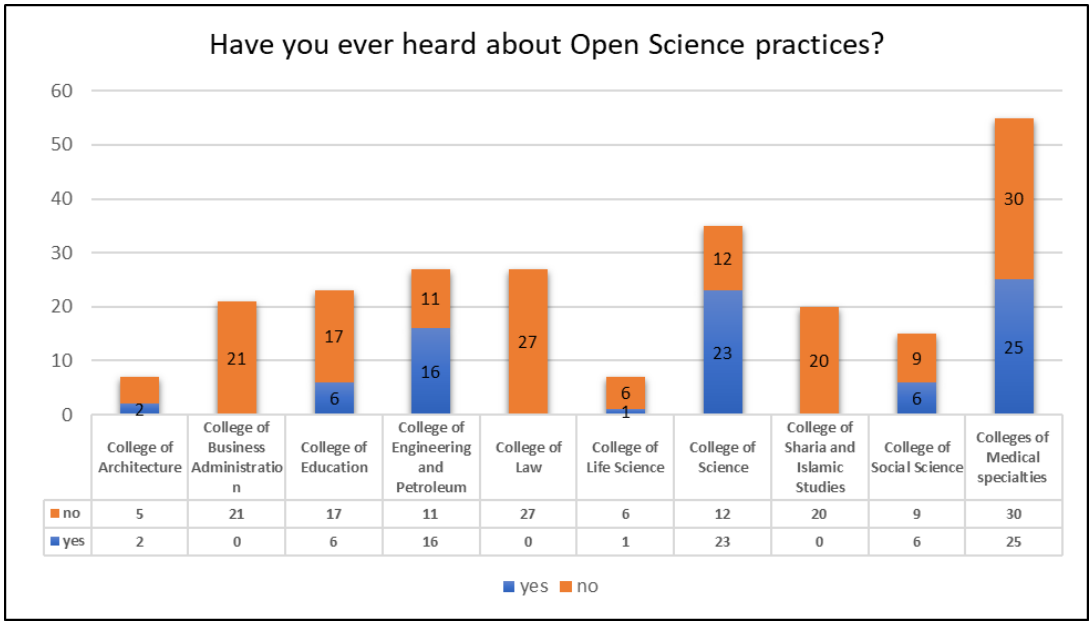

Figure 5: The correlation between collages and Q1 "have you ever heard about OS practices?"

Regarding the awareness of respondents of OS practices, the majority (221 = 92.5%) strongly agreed and agreed that "OS is important to me as a researcher". In the same vein, 222 (93%) admitted that "OS practice will have an impact on my role in KU". Moreover, 204 (85.4%) confirmed that "OS practices can increase motivation for research in faculty members", 197 (82.4%) said "OS increases visibility of research impact", 209 (87.4%) admitted that "OS can help increase motivation among academic research members to publish", 226 (94.6%) confirmed "OS does have an impact in the increase of citations", while 191(79.9%) confessed that "OS can increase improvement of a researcher's career", and 219 (91.6%) agreed "OS does help avoid duplication in research efforts". However, large percentage of participants (227=95%) disagreed that "OS does not influence the increase of citations". In addition, (201=84.4%) opposed that "KU is aware about Open Science practices", while 173 (72.4%) disagreed with that "OS will not help keep track of academic research members' output in KU (Figure 6).

The findings revealed that participants believed that OS practice is important to them as researchers, however, decision makers at KU are not aware about OS practices. This indicates that not only KU faculty members should be aware of the importance of OS practices but also that managers need to update themselves about it.

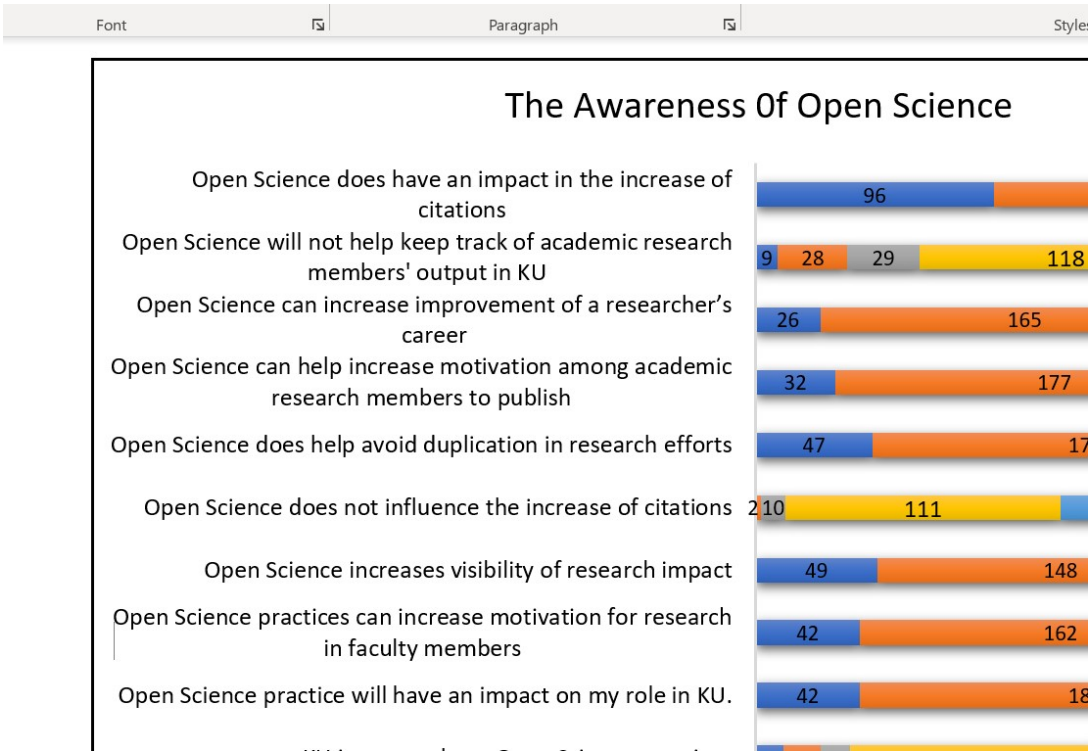

Figure 6: The awareness of OS practices

4.2 The Role of Open Science:

According to De Rosa and Aragona (2021) [23] OS is already playing an important role in changing the academic profession starting from micro-practices to professional relations with epistemic communities and stakeholders. Hence, most respondents (231=96.7%) agreed that "KU needs to mandate an OS practice to establish an OS community for academic research members outcomes". However, more than half participants (142=59.5) did not use at least one of OS practices such as: open access; open data, materials, and code; reproducible analyses; preregistration and registered reports; replication research. Although most participants 204 (85.4%) confirmed that "Open Science gains KU a better picture of research outputs", many of them 199 (83.3%) admitted that "Research that is shared and published through Open Science practices is not accepted in applying for promotion in KU", as well as 173 (72.4%) of respondents said that "The government has no influence on Open Science practices through their instructions".

This result confirms that there is a clear shortcoming from decision-makers at KU regarding the role of OS in an academic environment.

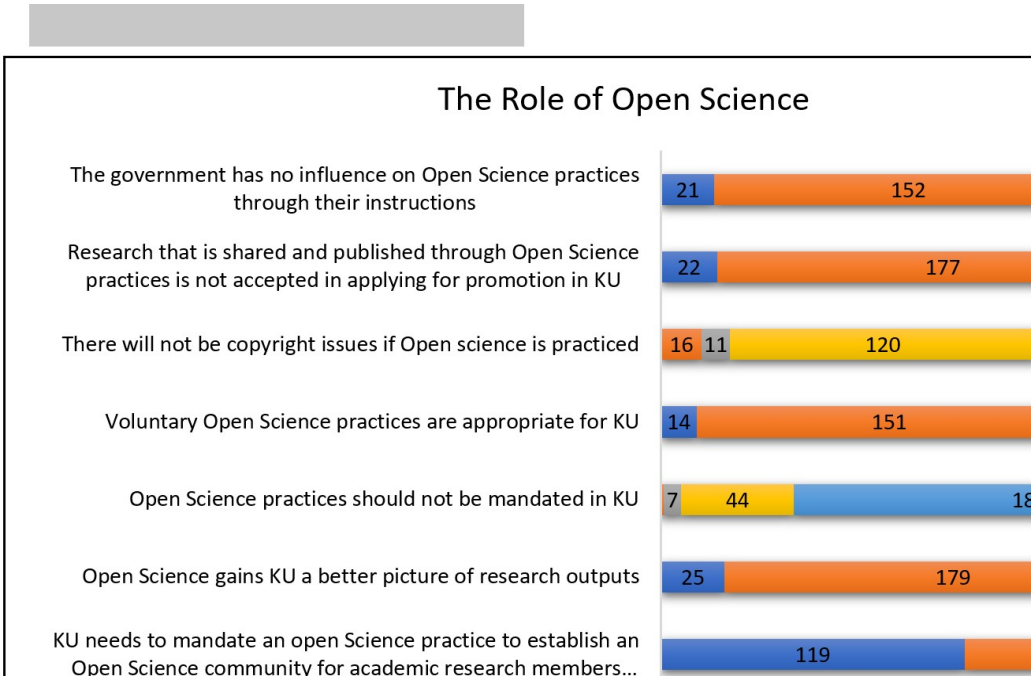

Figure 7: The role of OS practices

4.2 The Challenges of Open Science:

This part of the questionnaire sought to obtain results on the challenges of OS. Almost all participants (231 = 96.7%) strongly disagreed and disagreed that "Financial issue is not an Open Science barrier". In the same vein, 211 (88.3%) disagreed that "Cultural challenges will not be an issue when practicing Open Science". However, 229 (95.8%) confirmed that "Lack of Open Science professionals will prevent the practice of Open Science", 212 (88.7%) said "Technology resources do not prevent the practice of Open Science", 203 (84.9%) admitted that "KU researchers will not be hesitant by Sharing data of their ongoing research". In addition, 197 (82.4%) of respondents confirmed that "KU research will not be funded if it is going to be through Open Science practice", while 216 (90.4%) agreed that "Open Science practices could help KU reduce costs". Most participants (233=97.5%) agreed that "More efforts must be made by KU to spread awareness of Open Science practices" (Figure 6).

The findings confirmed that, there are several challenges which hinder the use of OS practices at Kuwait University, such as:

- Financial issues
- Cultural challenges
- Lack of OS professionals
- Lack of technological support
- Lack of awareness of OS practices

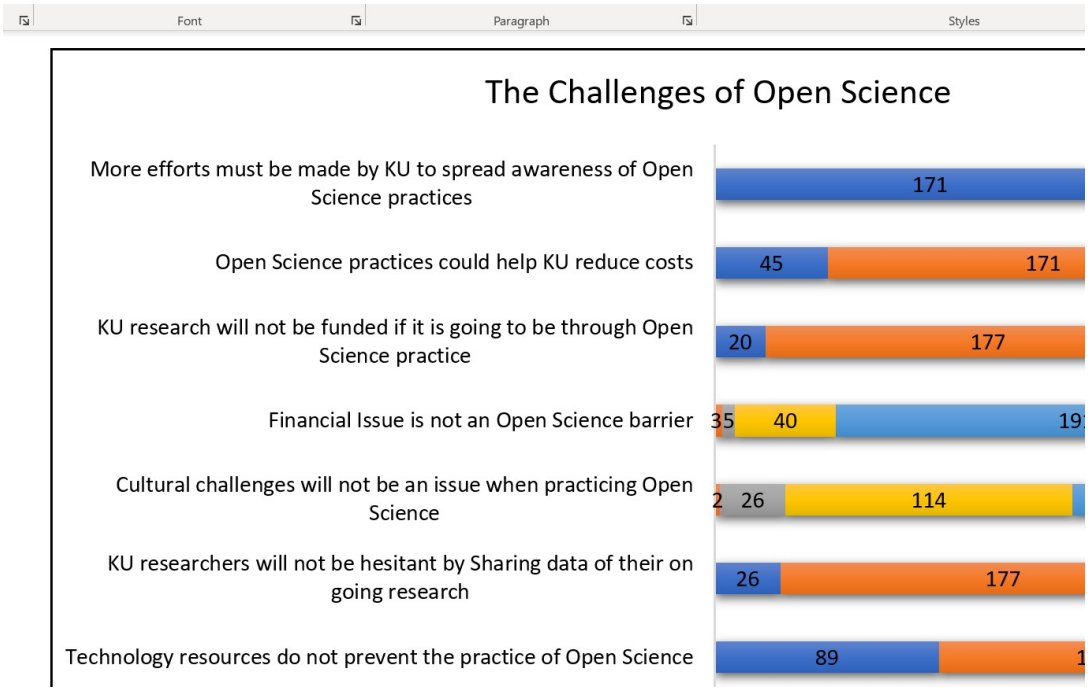

Figure 8: The challenges of OS practices

5. Conclusion

Open Science represents an important change in the way universities and their researchers operate. It carries numerous benefits, but also a lot of challenges. Open Science in higher education is necessary to increase academic activity in research. KUFM and management are not fully aware of OS practices or take full benefit of OS initiatives. This research has explored several factors that affects and explores the awareness of OS in KU, therefore, KU management needs to consider these factors in its strategic plan for OS practices among KUFM. KU strategic plan should consider many factors: lack of awareness of OS practices, cultural challenges, financial issues, lack of OS professionals and lack of technological support.

Nevertheless, there is also the need to consider the main actors and advocates in OS practices and processes, namely KUFM, management and information specialists. KU needs to establish policies, processes and guidelines to promote OS. This institutional transformation may not be easily made. However, taking the first step would begin to change the whole academic environment at KU to get an open society for future OS practices.

6. Recommendation:

Four key recommendations are addressed in this research:

6.1 Promoting Awareness:

It is important to promote awareness about the cons of OS practices to the KU academic community, therefore, KU needs to establish strategies to raise awareness of OS practices among its community. This could be achieved in different ways (e.g., attending and organising seminars, conferences about OS, arrange training sessions, and arranging an "Open Science awareness week or month"). Provide a support team, who can advocate about the benefits of OS methods, while being factual about the challenges. Create a programme of cultural change, which is essential to support the changes in theory and practice which OS brings.

6.2 Management's Encouragement to Openness:

This research revealed that the awareness of cons and pros on OS among faculty members in KU is the position of management support for the involvement of faculty members in promoting OS practices is also due to lack of the management awareness. Management should be involved and communicate with faculty members to progress in research and achieve openness. Set up a communication plan, which supports KU to become accustomed with OS practices.

6.3 *Mandating OS Practices and Government support and providing Funds:*
By mandating OS practices, the institution must provide funds to researchers therefore they will be obligated to deposit their work in the IR or make their research open in other ways. Hence, the researchers recommend that the government should attempt to create a fund for research projects by making it mandatory for all academic institutions to support OS practices and trends. In addition, institution management should endorse mandatory OS practice gradually within the institution this will give more time to spread awareness throughout the institution and for academic staff to recognise the importance of OS. Overall, these actions should reflect the institution's commitment to openness.

6.4 *Developing Technological Systems, Maintenance and Training:*
It is widely recognised that user satisfaction is an important aspect in the acceptance of technology. Continuous maintenance of the technology is also needed to ensure that systems run efficiently such as, OS Framework. Consequently, it is essential to address the lack of library staff training by offering continuing education programs (on-site and online) in the field of ICT and OS to be practiced by faculty members. Finally, KU should also encourage researchers to create accounts on the internet such as "Research Gate", "Academia" and "Google scholar" and making their research publication profiles public to track citations of their publications.

7. Research Limitations

This study was challenging as it is based on questionnaires only. Another case study could not be included because KU is the only government university in Kuwait. This research cannot therefore be generalised to a wider population in Kuwait. Consequently, it is important that further research should be conducted to other academic institutions (private), in addition to further investigation should be conducted with the higher management KU by using interviews as a tool.

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