Tampere University

MOHAMED BOUFARSS

Engaging with Open Access Locally and Internationally

A holistic and longitudinal study of the United Arab Emirates academic publishing landscape

Tampere University Dissertations 876

Tampere University Dissertations 876

MOHAMED BOUFARSS

Engaging with Open Access Locally and Internationally

A holistic and longitudinal study of the United Arab Emirates academic publishing landscape

ACADEMIC DISSERTATION
To be presented, with the permission of
the Faculty of Information Technology and Communication Sciences
of Tampere University,
for public discussion in the auditorium D11
of the Main building, Kalevantie 4, Tampere,
on 15 December 2023, at 12 o'clock.

ACADEMIC DISSERTATION
Tampere University, Faculty of Information Technology and Communication Sciences
Finland

Responsible supervisor and Custos	Professor J. Tuomas Harviainen Tampere University Finland	
Supervisor	Associate Professor Mikael Laakso Hanken School of Economics Finland	
Pre-examiners	Dr. Nicolás Robinson-García University of Granada Spain	Dr. Thed van Leeuwen Leiden University Netherlands
Opponent	Professor Gunnar Sivertsen Nordic Institute for Studies of Innovation, Research and Education Norway	

Cover design: Roihu Inc.

ISBN 978-952-03-3085-9 (print)
ISBN 978-952-03-3086-6 (pdf)
ISSN 2489-9860 (print)
ISSN 2490-0028 (pdf)
http://urn.fi/URN:ISBN:978-952-03-3086-6

Carbon dioxide emissions from printing Tampere University dissertations have been compensated.

PunaMusta Oy – Yliopistopaino
Joensuu 2023

Dedication

I dedicate this dissertation to my wife and children. They have provided tremendous support and inspiration throughout this process.

ACKNOWLEDGEMENTS

Ever since I finished my master's in library and information science back in 2010, I had been dismissing the idea of pursuing a doctoral degree mostly driven by the belief that a masters is the terminal degree for those in my career line. At the end of 2018, it took only a little push from an ex-colleague to revive the curious researcher in me. This task would have never been completed without the support of colleagues, friends, and family.

First, my greatest thanks and gratitude go out to my supervisors, J. Tuomas Harviainen and Mikael Laakso who have made this journey a rewarding and most importantly an enjoyable one. In addition to the best supervisory support, Tuomas has incessantly mentored me on building better research networks, exploring collaboration opportunities and branching into other areas of scholarship. Mikael has spared no effort in acknowledging the value in my work and providing uplifting encouragement and much needed guidance. To both, I say thank you for taking the pain out of the doctoral research process.

I would like to thank the pre-examiners, Professor Thed van Leeuwen and Professor Nicolas Robinson-Garcia for taking the time to review this dissertation. Their well-informed comments and invaluable inputs have contributed to the improvement of this dissertation. Their expertise is highly valued, and their feedback will be cherished beyond this degree.

I have received all kinds of moral, psychological and advice throughout this journey from different colleagues at work. I owe special thanks to Dr. Imran Islam who was going through a similar process but was always ready with advice. I offer my gratitude to Marwa Al Aqroubi, who has been very encouraging and accommodating during my supervisory visits to Finland.

Lastly, my sincere thanks go to my family members. First, my wife, who has put up with my busy schedule and frequent travels, sacrificing valuable family time and taking care of the kids. Second, my primary motivators – my children Douaa, Rayane and Aya, without whom I would have probably settled for less.

ABSTRACT

Scholarly communication has witnessed many transformative changes throughout history. These changes ere accelerated by the advent of the Internet that enabled complex communication networks between its different stakeholders. These networks are kindled by the noble principle of exchanging research findings. Within this context, no change has been as disruptive as open access (OA). Whether through self-archiving (green) or directly from the publishers (gold), OA's aim is to free the exchange of research findings from paywalls. Many initiatives in support of OA flourished and scientometric studies started measuring its uptake and impact. However, OA research still faces many challenges.

The aim of this thesis was to analyze the UAE research landscape for empirical data on the national state of OA. The UAE makes for a good study case because of its economic, demographic and research characteristics. The UAE is a very young country that is, nonetheless, being classified among high income countries. Its researcher population is characterised by high transiency, an attribute that may negatively affect research output and OA prioritization. The findings show that UAE lacks incentives to adopt OA, OA related mandates and policies, OA infrastructure, and OA funding. However, the UAE is on par with the rest of the world in terms of number of OA journals; practitioners' awareness and support of OA practices; and OA articles output. This study also supports the evident correlation between international coauthorship levels and OA uptake. This is in stark contrast to policy lacunae and no evident prioritization of OA.

This thesis also highlights how existing bibliographic sources of data can draw a distorted picture of the state of OA especially in countries such as the UAE since these sources are largely biased. This is in addition to gaps in OA-related metadata. Even with integrative methods, OA-related research is largely restrained.

The UAE could benefit greatly from a nationwide science policy that would not only promote research output but also make it more visible and accessible through OA supportive measures. OA uptake numbers would improve and consolidate the position of the UAE as a forward looking country and a crossroad of global talents.

TIIVISTELMÄ

Tieteellinen viestintä on kohdannut monia merkittäviä muutoksia historian kuluessa. Internetin synty mahdollisti täysin uudenlaisten kommunikaatioverkostojen synnyn eri osapuolten välillä. Laajentuneiden teknisten mahdollisuuksien lisäksi muutosta on ruokkinut ylevä periaate tutkimustulosten avoimesta jakamisesta. Tässä kontekstissa aivan erityisen merkittävä seikka on ollut open access -julkaiseminen (OA). Tällainen tiedejulkaisujen avoimuus tapahtuu joko rinnakkaistallentamisen kautta (vihreä OA) tai niin että materiaali julkaistaan suoraan avoimesti verkkoon alkuperäisen julkaisijan kautta (kulta OA). OA:n yleisenä tavoitteena on ollut vapauttaa tutkimusjulkaisut maksumuureista. OA on edistynyt merkittäväsi monenlaisten hankkeiden kautta, ja myös tutkimuksen puolella on ahkerasti seurattu avoimuuden kasvua ja sen erilaisia vaikutuksia. Vaikka tutkimusedellytykset avoimen julkaisemisen suhteen ovat kehittyneet, ilmiön kokonaisvaltaisen tutkimisen tiellä on vielä monia keskeisiä haasteita.

Tämän väitöskirjan tavoitteena on ollut analysoida Yhdistyneiden arabiemiirikuntien tutkimusmaaperää ja hankkia empiiristä dataa niiden kansallisesta OA-tilanteesta. Arabiemiirikunnat ovat hyvä tapaustutkimuksen kohde, johtuen niiden taloudellisista, tilastollisista ja tutkimuksellisista piirteistä. Emiraatit ovat hyvin nuori valtio joka iästään huolimatta lukeutuu korkean tulotason maihin. Sen tutkimushenkilöstöä leimaa korkea vaihtuvuus, mikä voi negatiivisesi vaikuttaa julkaisemistehokkuuteen sekä haluun panostaa avoimen julkaisemisen suosimiseen. Tutkimuksen tulokset osoittavat, että Emiraateista puuttuu avoimen julkaisemisen käyttöönottoa edistäviä linjauksia, käytäntöjä, sekä OA:n vaatimaa infrastruktuuria ja rahoitusta. Tästä huolimatta Emiraatit ovat väitöskirjan tulosten mukaan muun maailman tasolla OA-lehtien määrässä, yliopistojen tutkimustuen henkilöstön tietoisuudessa ja tuessa OA-julkaisemiselle, sekä OA-tiedeartikkelien määrässä. Tutkimus osoittaa myös kansainvälisen yhteiskirjoittamisen ja OA saatavuuden välistä yhteyttä, mikä näyttäytyy vastakohtana kansallisten linjausten ja OA:n priorisoinnin puutteelle.

Väitöskirja myös korostaa sitä, miten olemassa olevat bibliografiset lähteet voivat antaa vääristyneen kuvan OA:n tilasta. Tämä pätee erityisesti sellaisten maiden kuten Emiraattien kohdalla, koska lähteet itsessään sisältävät vinoumia kattavuuden suhteen, sen lisäksi että OA:han liittyvässä metadatassa on puutteita.

Tästä johtuen jopa integroivilla menetelmillä toteutettu OA:han liittyvä tutkimus kärsii rajoitteista.

Emiraatit voisivat hyötyä suuresti kansallisista tiedepoliittisista linjauksista, jotka eivät ainoastaan korostaisi julkaisujen tuottamista vaan myös tekisivät niistä näkyvämpiä ja saavutettavampia OA:n kautta. Tätä kautta olisi mahdollista edistää avoimesti saatavilla olevien julkaisujen määrien kasvua, auttaen vakiinnuttamaan Emiraattien aseman eteenpäin katsovana valtiona, joka sijaitsee kansainvälisten lahjakkuuksien risteymäkohdassa.

CONTENTS

1 INTRODUCTION 1

1.1 Statement of the Problem 1

1.2 Thesis Structure 5

2 SCIENTIFIC RESEARCH ENVIRONMENT IN THE UAE 7

2.1 Research Landscape 7

2.2 Science Policy 9

2.3 Summary 11

3 SCHOLARLY COMMUNICATION 13

3.1 Scholarly journals and articles 14

3.2 Languages of publication 17

3.3 Evolution and aspects of scientometrics 17

3.4 Summary 20

4 OPEN ACCESS 22

4.1 The Long Road to Full OA 22

4.1.1 Major Open Access Initiatives 22

4.1.2 Shades of Open Access 23

4.1.3 Open Access Funding Models 25

4.1.4 Libraries and Open Access 27

4.2 OA Controversial Issues 28

4.2.1 Predatory Publishing and Journals 28

4.2.2 Academic Social Networks (ASNs) 29

4.2.3 Equity in OA 30
4.3 OA Research Challenges 31
4.3.1 Shortcomings of bibliographic indexes 31
4.3.2 Volatile OA landscape 32
4.4 Summary 33
5 STUDY METHODOLOGY 34
5.1 Research Philosophy 34
5.2 The Study Design 36
5.3 Ethics 37
5.4 Data Collection 38
5.4.1 Processes 38
5.4.2 Sources of Data 39
5.4.3 Data enrichment tools and services 41
5.5 Summary 43
6 INTEGRATED DISCUSSION 45
6.1 Introduction 45
6.2 Summary of Dissertation Findings 45
6.2.1 Publication I 50
6.2.2 Publication II 51
6.2.3 Publication III 53
6.2.4 Publication IV 55
6.3 Contextualised Discussion of Findings 56
6.4 Implications for Practice, Education and Future Research 58
6.4.1 Practice 58
6.4.2 Research 59
6.4.3 Policy 60

6.5 Limitations of the study **60**

6.6 Conclusions **61**

REFERENCES ***63***

APPENDICES ***73***

PUBLICATION I ***98***

PUBLICATION II ***118***

PUBLICATION III ***144***

PUBLICATION IV ***154***

List of Figures

Figure 1. UAE R&D expenditure as a percentage of the GDP

Figure 2. Thesis underlying research paradigm

List of Tables

Table 1. Research questions, methods and data mapping

Table 2. Taubert, et al. (2019) Open access shades

Table 3. Mapping of individual publications against the thesis RQs and objectives with a summary of implications

ORIGINAL PUBLICATIONS

Article I	Boufarss, M. (2020). Charting the Open Access scholarly journals landscape in the UAE. *Scientometrics,* 122, 1707–1725. https://doi.org/10.1007/s11192-020-03349-0
Article II	Boufarss, M., Laakso, M. (2020). Open Sesame? Open access priorities, incentives, and policies among higher education institutions in the United Arab Emirates. *Scientometrics,* 124**,** 1553–1577. https://doi.org/10.1007/s11192-020-03529-y
Article III	Boufarss, M., & Harviainen, J. T. (2021). Librarians as gate-openers in open access publishing: A case study in the United Arab Emirates. *The Journal of Academic Librarianship, 47*(5), 102425. doi:https://doi.org/10.1016/j.acalib.2021.102425
Article IV	Boufarss, M., Laakso, M. (2023). Open access and international co-authorship: a longitudinal study of the United Arab Emirates research output. *Quantitative Science Studies, 4*(2), 372–393. https://doi.org/10.1162/qss_a_00256

RESEARCH CONTRIBUTIONS

Article I	I was solely responsible for planning and executing the study, writing the article, and acting as the corresponding author.
Article II	I was responsible for planning and executing the study. Both authors equally participated in designing the instrument. I collected the data, analysed it and wrote the results and the discussion. The second author supervised the process by reviewing the conceptualization and editing the manuscript. I acted as the corresponding author.
Article III	I was responsible for planning and executing the study. This involved working on conceptualization, methodology, data collection, visualization, writing- data analysis, writing-original draft, writing-reviewing, and editing. The role of the second author involved supervision, writing - data analysis, writing-reviewing and editing and research contextualization. I acted as the corresponding author.
Article IV	I was responsible for planning and executing the study. This involved working on conceptualization, methodology, data collection, visualization, writing- data analysis, writing-original draft, writing-reviewing, and editing. The role of the second author involved supervision, reviewing the conceptualization, correlation analysis, and editing of the manuscript. I acted as the corresponding author.

1 INTRODUCTION

1.1 Statement of the Problem

Human knowledge is cumulative, and it is only through sharing findings that researchers could build on previous research to solve emerging issues and create new knowledge. However, the predominant models of publishing and sharing information have been shackling this idealistic scenario. The publisher-imposed paywalls to knowledge alienate those who cannot afford to pay for access. This phenomenon became especially evident with the advent of the Internet and the increase in born-digital or digitized resources starting at the 90s of the last century. Consequently, a new movement calling for providing unrestricted access to research emerged. This was dubbed “Open Access” (OA).

Sharing information is a tradition rooted in scientific research exchange with for example researchers in some disciplines using mailing lists to disseminate their research among peers in the 1980s (Laakso et al. 2011; Ginsparg 2009). However, OA as we know it today was largely facilitated by the advent of and wide-spread use of the Internet coupled with researchers’ dissatisfaction with the unreasonable cost of access and the emergence of the author pays model. For example, the Internet has made the creation of preprint platforms such as arXiv.org possible as early as 1991. Similarly, the open letter to scientific publishers signed by 30,000 scholars in 2001 resulted in the creation of the Public Library of Science (PLoS) (Mukherjee 2010). Likewise, over 8,800 researchers revolted against Reed Elsevier in what was dubbed “Academic Spring”, when they decided to boycott reviewing or publishing in its journals (Epstein 2012).

Academic Spring goes hand in hand with what is referred to as the “Serials Crisis”. This new crisis is the result of a skewed balance between subscription prices and library budgets with for-profit publishers straining library budgets through large

profits (West et al. 2014). For example, Bosch and Henderson (2013) reported a 6% annual increase in subscription prices. Nearly a decade later, with an estimated annual increase of 4%, Bosch, Albee and Romaine (2022, para. 1) state that "Two years into the pandemic, only flat budgets and price increases seem predictable." The exorbitant charges were a catalyst for stakeholders such as researchers and libraries to revolt against subscription-based access models. This in turn spurred support for the open access movement and some associated practices like read and publish or author-pays models. However, a major issue associated with costs namely the extortionate profit margins of some major publishers estimated at 39% in 2013 and which surpassed those of big companies such as Amazon whose profit margin was a mere 4.33% in 2018 (Hungaski 2019) remain unresolved as they still apply in the new transformative agreements or author pays models.

Adding to the intricacy of the OA concept are the various shades and somehow ambiguous definitions of OA models (Taubert et al. (2019). Starting with a dichotomy of Green and Gold, OA now counts a wide spectrum of colours. Each shade introduces new nuances in the definition of OA. The result is an ambiguous ecosystem that is becoming increasingly harder to decipher for most scholarly communication stakeholders. It similarly poses new challenges for bibliometric analysis of research output.

In direct relation with the OA models are the different schools that emerged in support of one or the other. One can notice that some OA pioneers like Steven Harnad prioritize self-archiving (Green) as the best route to achieve higher levels of OA (Harnad, 2010). On the other hand, Europe seems to be endorsing the gold OA model attested by the different transformative agreements and growing support of APCs. As per the latest ESAC's (2023) Transformative Agreement Registry data, the number of North American signed transformative agreements is a mere 10% of those signed by European institutions. Approaches in other parts of the world may strike a balance or swing towards one of the two models. Noteworthy in this context is the South American model which seems to focus more on local OA journals and repositories (Babini, 2020). Countries like the UAE, often falling off the OA studies radar, are still to chart their own path.

A myriad of approaches, methods and data collection instruments have been adopted in studying the OA phenomenon. This is obviously dominated by bibliometric analysis, a primarily quantitative research method that scrutinises publication and citation patterns. Bibliometrics are often used to measure OA uptake and impact. Other very popular methods include surveys, case studies and altmetrics. Content analysis is used to a lesser extent. However, these methods are

seldom used alone. Given the complexity of this phenomenon, triangulation and integrative research methods are often opted for.

The debate around OA has matured over the last few decades from a basic request to remove paywalls to a genuine and in-depth discussion of feasible solutions that are fair to all stakeholders. However, the phenomenon is shyly debated, addressed, or studied in the larger Middle East region and more specifically in the UAE. Initial observation reveals that the UAE presents a few distinctive characteristics in the context of OA landscape making it an interesting case for further investigation. Especially worthy of mention is the absence of a pro-OA science policy and the transiency of the researcher population.

In this dissertation, I explore how the UAE is jumping on the bandwagon of OA. In an endeavor to draw a 360-degree view of the phenomenon, I approach the topic from four perspectives: local journal publishing landscape, research institutions approach, librarians' role, and research collaboration effect on OA uptake. The following research questions guide the research:

RQ1: How integrated is OA within the publishing sector in the UAE?
RQ2: How integrated is OA within libraries, HEIs and research centres in the UAE?
RQ3: Why the share of OA in the UAE is high despite low institutional support?
RQ4: What are the dynamics at play in the UAE research and OA landscape?

Answering these questions will shed light on the state of OA in the UAE and provide a diagnosis of the pain areas in the long journey to achieving the highest rate of OA to research in the country.

The four research articles included in this dissertation will each contribute answers to these overarching research questions. Table 1 outlines the research questions of individual articles and links the contribution of each article to the dissertation research questions.

Table 1. Research questions, methods and data mapping

Publication	P1	P2	P3	P4
Title	Charting the Open Access scholarly journals landscape in the UAE	Open Sesame? Open access priorities, incentives, and policies among higher education institutions in the United Arab Emirates	Librarians as gate-openers in open access publishing: A case study in the United Arab Emirates	Boufarss, M., Laakso, M. (2022). Open access and international co-authorship: a longitudinal study of the United Arab Emirates research output
Thesis RQs	How integrated is OA within the publishing sector in the UAE?	How integrated is OA within libraries, HEIs and research centres in the UAE? Why the share of OA in the UAE is high despite low institutional support?	How integrated is OA within libraries, HEIs and research centres in the UAE? What are the dynamics at play in the UAE research and OA landscape?	How integrated is OA within the publishing sector in the UAE? Why the share of OA in the UAE is high despite low institutional support? What are the dynamics at play in the UAE research and OA landscape
RQs	How many academic journals are published in the UAE? In what languages are these journals published? What is the share of OA journals in the UAE? What are the subject areas of these journals?	What is the level of current awareness, support, policies, and practices related to scholarly journal publishing among UAE HEIs, particularly in relation to OA publishing? What are HEIs in the UAE doing in relation to OA, including what are existing OA policies and funding options available to authors to publish OA? How do HEIs in the UAE assess publications and publication activity of researchers in the context of promotion and performance appraisals of faculty?	What is the level of OA awareness among librarians in the UAE? What is the role of UAE librarians in the training of researchers and patrons on OA policies and mechanisms and on accessing OA resources? How has OA helped reinvent the role of librarians as gate-openers and a driving force behind the eventual success or downfall of the OA movement? What are UAE librarians doing to facilitate users and researchers' uptake of OA? How has UAE Librarians high awareness and perception of OA contributed to the shift in their role?	How has the share of journal articles available OA developed over time? a. What are the disciplinary differences in OA shares? b. Does the journal host country have a connection to OA availability? c. What are the shares of different OA mechanisms? d. What are the most popular repositories for self-archiving? 2. How has international co-authorship developed over time? a. How is co-authorship distributed globally? b. Does the number of co-authors have a connection to OA availability? c. Does the geographic region of co-authors have a connection to OA availability?

1.2 Thesis Structure

The remainder of this article-based thesis is structured as follows:

Chapter 2: Scientific Research Environment in the UAE

This chapter places the thesis in its research environment context. It highlights the distinctive characteristics of the research landscape in the UAE and made an attempt to elucidate the science policy of the country. Outlining these elements is deemed necessary to place the research in its proper milieu and prime the uninformed reader.

Chapter 3: Scholarly communication

Chapter three provides a coverage of key literature on scholarly communication including its underlying principles and historical origins. It especially focused on journals and articles as key tools of scholarly communication. A review of languages of publication within the scholarly publishing context is provided. As this study is anchored in scientometrics, the last section of this chapter touched on the evolution and few characteristics of scientometrics.

Chapter 4: Open Access

Chapter four is devoted to covering aspects of OA as the core concept of the thesis. First, an overarching discussion of a few key OA initiatives, shades of OA, OA funding models, and libraries and OA is presented. Second, controversial issues often associated with OA namely predatory publishing and academic social networks (ASNs) are tackled. Finally, a few challenges researchers face in studying OA such as limitations in bibliographic indexes and the volatility of the OA as a publishing model are addressed.

Chapter 5: Study Methodology

In chapter five, an overview of research philosophy is presented. This thesis's research paradigm is then linked to the research philosophy. The second part laid out the study design where a synopsis of the research designs used in each study is given. A brief note on ethics is then provided before we review the data collection processes, sources and tools.

Chapter 6: Integrated Discussion

All previous chapters and articles listed at the end of this thesis culminate into this chapter which acts as the backbone of this thesis. It provides a summary of the findings of each of the four articles and an overarching contextualised discussion of these findings. This is followed by a section that discusses the implications of the findings for practice and future research. Limitations of this study are then presented and acknowledged. The final part wraps up the thesis with concluding remarks.

2 SCIENTIFIC RESEARCH ENVIRONMENT IN THE UAE

The UAE research environment presents a few distinctive characteristics that make it worthy of consideration in the study of OA. First, the UAE's high GDP places it among developed countries, while it is a very young country that was established only in 1971. Yet, in this short time span, it managed to create an ecosystem of universities and research facilities that have a commendable research output that is comparable to other international institutions with long research traditions. Second, the UAE exhibits major shortcomings in open access policies, mandates, repository infrastructure, overarching science policy, and incentives to publish OA. Nonetheless, its OA output rate is akin to most western countries with such provisions. Third, the UAE has a volatile workforce as the majority of the population and scientists are on temporary residence visas. This defies one of the principles of scientific research namely stability as stated by Ryan (2017) and may as a result affect research output with a domino effect on OA. Finally, as a new nation, the UAE has been channeling the efforts and resources of its HEIs to train talented employees rather than focus on research. For these reasons, the UAE presents a distinctive research environment worth investigating.

2.1 Research Landscape

In the 50 years of its existence, the UAE boasts a variety of nearly 50 higher education institutions (HEIs) that offer masters and doctoral programs (Boufarss and Laakso 2020). This is in addition to stand-alone specialized research centres and think tanks such as the Emirates Centre for Strategic Studies and Research, Mohammed Bin Rashid Medical Research Institute, Trends, and Future for Advanced Research and Studies.

Most of these HEIs were created to cater for and remain mostly focused on teaching. These institutions have doubled their gross enrolment ratio between 2007 and 2016 (Kamal 2018) making the UAE HEIs among the top fastest growing in the region (Alpen Capital 2018). Even though this would mean the teaching load of

academic staff would be higher and prioritised, UAE HEIs have demonstrated desire to promote high-quality research production (Wilkins 2010). The result is a 16-fold increase in research productivity and a small increase in quality of publications over a period of 20 years (Al Marzouqi et al. 2019).

Another often neglected characteristic of the UAE research landscape is the highly transient nature of manpower as Lori (2012, p. 4) put it: "non-citizens residing in the Gulf are not migrants but temporary laborers with little to no recourse for permanent settlement or citizenship." In such a precarious situation, researchers would undoubtedly shift jobs for better pay or use the UAE as a transition point to countries with permanent residences or citizenship prospects such as Canada. Coupled with the fact that citizens represent a mere 7.66% of the workforce in the country (UAE PMO 2021), it becomes clear that stability required by research (Ryan 2017) cannot be guaranteed. The situation is even more pronounced among private universities where up to 98% are expatriate faculty (GFH 2016). Recent reforms of the residency permit system with the introduction of a 10-year golden visa aiming to attract and retain talented residents may bring in positive change.

A quick scan of services and infrastructure that support research output and dissemination show some lacunae in the UAE research landscape. Recent Registry of Open Access Repository Mandates and Policies (ROARMAP) data shows a steady increase in policies adopted over the world in the last two decades (ROARMAP 2022). However, only one such policy was listed under the UAE. A similar scan of Sherpa Juliet (Jisc 2022a) reveals absence of any funder OA policies in the country. Similarly, the Directory of Open Access Repositories (OpenDOAR) lists only five repositories in the UAE (Jisc 2022b) with a very timid improvement from the four repositories reported by Carlson (2015).

A research ecosystem would not be complete without libraries that provide resources and services that support the research community. Given their significant role in supporting learning and research at the universities, "The decline of the library as the center of the academic community is of greater moment to universities than it may at first appear." (Dowler 1997, p. 225). Libraries support research by collecting and providing access to resources needed by researchers, offering bibliographic services, creating digital repositories, and supporting research data management (Case 2008).

Despite the UAE being a very young nation, it realized early on the importance of libraries in the teaching mandate of HEIs and later in research advancement. The Emirates Publishers Association's website lists over 200 libraries of various sizes and

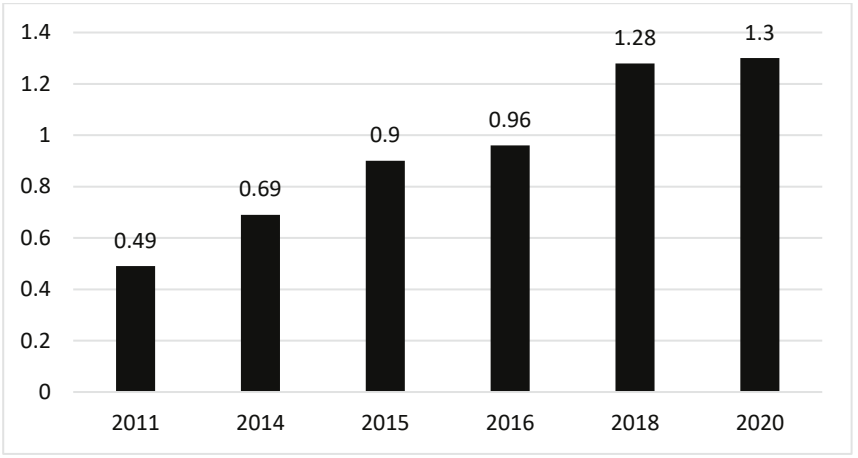
community targets. However, of importance to us here are those affiliated with universities and research centers. Johnson and Potluri (2020) found that academic libraries in the UAE are supporting researchers with information literacy and resources while data services are still at a fledgling stage. This finding is corroborated by Mavodza (2022) who indicates that RDM (Research Data Management) activities are emerging among academic libraries in the UAE.

2.2 Science Policy

According to Fletcher-Etherington (2022), science policy is often referred to as a two-way process. The science for policy part represents the "policymakers need to have access to, and understand, the scientific evidence related to their policy areas" (para. 3). The policy for science part concerns engaging "stakeholders to communicate the benefits of research and to ensure their policies promote the conduct of high-quality and impactful research." (para. 7). A quick look at the situation in the UAE reveals that other fields of policy such as workforce and education had more attention. Nevertheless, a major shift towards research centric HEIs and programs was initiated by recent changes in the UAE science and research stimulation. This direction is shaped by initiatives like UAE Vision 2021, UAE National Innovation Strategy and the National Strategy for Higher Education 2030 which pledged increased funding for research.

The UAE Vision 2021 National Agenda was launched by H.H. Sheikh Mohammed bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE and Ruler of Dubai at the closing of a Cabinet meeting in 2010. Promoting innovation, research and development and building a competitive knowledge economy was among its objectives. As a result of this, Figure 1 shows a gradual increase of expenditure on Research and Development since the date the agenda was launched. Nonetheless, there is still room for improvement since the most recent number remains lower than the OECD members average of 2.57%.

Figure 1. UAE R&D expenditure as a percentage of the GDP



Modified from World Bank (World Bank Group 2022) and pmo.gov.ae data

Four years later in 2014, the UAE launched its National Innovation Strategy (NIS). This strategy is an elaboration on the vision 2021 as it spelt out the four tracks it will focus on to stimulate innovation namely: legal infrastructure and laws, institutionalizing innovation practices, establish and encourage private sector to establish innovation centres, and concentrate on STEM to prepare individuals with highly innovative skills (UAE PMO 2015). To achieve this, the strategy will endeavour to focus on and promote research and development at universities by providing funding and establishing specialized research centers. The output has been promising so far with the establishment of institutions such as the Dubai Biotechnology & Research Park (DuBiotech), the Institute Center for Microsystems (iMicro), the Institute Center for Smart and Sustainable Systems (iSmart), Khalifa Semiconductor Research Center (KSRC) at Khalifa University, Masdar Institute Center for Water and Environment (iWater), UAE Space Agency, the Emirates Institution for Advanced Science and Technology (EIAST), and many more within public universities. This NIS has been supplemented by the National Strategy for Higher Education 2030 in 2017. This new strategy aims among other things to boost the number of PhD students and to provide a Competitive Research Funding initiative (UAE Government Portal, 2022). These efforts and initiatives culminated into the first relevant research policy namely the Research and Development Governance Policy that was released in 2021 with the main objective of strengthening the performance and effectiveness of the UAE research in science and technology by

launching a national R&D governance model and establishing the Emirates Research and Development Council.

These strategies and policies in addition to resulting initiatives such as Emirates Scientists Council, UAE Astronaut Programme, National Space Programme, UAE Open Labs, different research funds, and the golden residence visa for scientists indicate that the UAE has focused on adapting its science policy to boost its scientific research output during the last couple of decades. Indeed, Clarivate Analytics (2019) estimates that UAE papers indexed in Web of Science Core Collection increased by 450% in one decade between 2008 and 2018. It further states that the UAE is part of the global OA increase trend with continuous growth in the share of OA articles released in recent years. However, efforts around established research assessment and evaluation systems, OA and open science promotion, and integrated research funding remain noticeably humble. A case in point is the absence of any mention or insinuation to OA or open science in any of the initiatives cited here. This, of course, leads to a counter-intuitive situation where direct policy and institutional support of OA is not conspicuous while OA uptake is increasing. International research collaboration, high disposable income and ability to pay APCs, publication in international journals that promote OA, and desire to benefit from OA citation advantage could provide a partial explanation of such situation.

2.3 Summary

For its age and geographical size, the UAE boasts a decent number and variety of HEIs with great potential to generate adequate research output. However, they are faced with a few challenges such as the need to focus on teaching and a transient research workforce. Another major challenge is the apparent perception of OA as a low priority as attested by the scarce OA policies, institutional repositories, and OA funder policies.

In fact, the UAE lacks an explicit overarching science policy that acts as a framework for all government science initiatives, agendas and strategies. The government has demonstrated a keen desire to shift into a knowledge-based economy through various strategies and initiatives that stress innovation, R&D and research funding and collaboration. These, unfortunately, failed to prioritise OA and open science.

These specific characteristics and the difficulty of classifying the UAE as either part of the Global North or Global South, present an opportunity to analyse the state of OA from a different context and perspective.

3 SCHOLARLY COMMUNICATION

In its basic form, scholarly communication was defined by Anderson (2018) as the different methods used by authors to disseminate their work among their peers and the general public. However, it has also been defined in broader terms to cover a full cycle of scholarly work including its creation, evaluation, publication, dissemination, discovery and even preservation (ACRL, 2003). Manifestations of scholarly communications include formal and informal outputs. Formal manifestations include among many journal articles, books, reports, conference papers, and theses. Informal outputs include blog posts, mailing lists, listservs and even tweets.

Determining the origins of scholarly communication would be very hard in light of its diverging definitions. The basic act of sharing information could not be dissociated from the availability of shareable knowledge and the ability to communicate to others. Thus, one could say that the act of knowledge sharing could be traced to cave drawings thousands of years BC. If going by ACRL's much broader definition, the advent of scholarly communication could be linked to the letters exchanged by scholars a little before 1665 when the first journals namely the *Philosophical Transactions* of the Royal Society of London and the *Journal des Sçavans* were published.

As an umbrella term that spans over the scholarly work lifecycle, scholarly communication debates often involve a wide range of issues such as journal and article publishing, peer-review, language of publication, scientometrics, copyright, and access rights and costs. Buranyi (2017) and Larivière et al. (2015) provide a good chronological and analytical account of the system from its roots to the current "bizarre" "triple-pay" system that drains government funds and enslaves scientists.

This section presents a brief summary of key milestones in scholarly publishing, the major issue of language often debated in scholarly communication, and scientometrics as a key and largely utilized tool in scholarly communication research. These aspects of scholarly publishing often intertwine with discussions on and around OA.

3.1 Scholarly journals and articles

First, the main priority for OA in both science policy and academic research has been, and still is, scholarly journal publications. In fact, revenues from journals represent 39% of the publishing market value against 11% for books (STM, 2021). Even though the OA movement spread to other scholarly outputs such as books, theses, and research data, "the primary, and original, target for Open Access was the journal literature" (Swan, 2012, p. 19), and peer-reviewed journal articles remain the key focus of most major OA initiatives. This could be attributed to the scholarly peer-reviewed article being dominant in both scholarly output and in research evaluation in most research disciplines (Williams, 2019).

Learned Societies

Book publishing dominated scholarly communication years before the first journals appeared. However, there have been many indicators that the monograph as a traditional conveyor of scholarship was losing ground at the detriment of scientific journals. Perrault (1995) reported a 27.76 percent decline in the rate of acquisitions of new monographs from 1985 to 1989 among ARL libraries. On the contrary, Johnson et al. (2018) reported an annual increase of 5 to 6 percent in research articles. In fact, the Royal Society in London had to give up book publishing to focus on regular publication of its *Philosophical Transactions* as early as 1687 (Fredriksson, 2001).

The earliest scientific journals such as the *Philosophical Transactions* of the Royal Society of London and the *Journal des Sçavans*, both published in 1665, emanated from the extensive letters exchanged by philosophers, scientists, and scholars (Fredriksson, 2001). Even though other forms of periodical publications existed, those were chiefly considered the first scientific journals (Birn, 1965). This belief is dominant but not shared by everyone. Fyfe et al. (2022) question these journals' claim of being the original of the present scholarly journal since they lacked key elements such as peer-review. Debates aside, the Royal Society ushered in an era where societies dominated journal publishing with the Académie Royale in France and later the American Philosophical Society and the Royal Society of Edinburgh. This tradition saw major developments in the 19th century with the emergence of academies and societies that published journals in most European cities and later outside the continent (Fredriksson, 2001). This era was characterized by low cost of publishing, members receiving copies against their subscription, and a barter of issues of publications between societies.

Commercial Publishers

It is very difficult to pinpoint the exact time in history when the major shift happened from learned societies' dominance to the commercial publishers' supremacy. However, Elsevier was established in 1881 in Rotterdam before moving to Amsterdam in 1887. Its first journal, *Biochimica et Biophysica Acta (BBA)*, was published in 1947 (Fredriksson, 2001). The boom in scientific publishing post Second World War coupled with the success of journal publishing as commercial publishers realized they didn't need societies to create them, prompted many to create new journals. This was also kindled by the rising demand for timely information by libraries and scientists. It is, however, the advent of computers and the Internet that accelerated the creation of new journals as well as takeover of a good number of journals previously held by societies.

The mechanics of journal publishing as we see them today such as editorial board, peer-review, correspondence, typesetting, and proof were inherited from the "societies as publishers" era. Today, researchers continue being the backbone of the journal publishing process by acting as producers of content, editors, reviewers and readers. This resulted in some equating their work to slave labor especially with the exorbitant profits made by publishers and many of them relinquishing the copyright ownership of their articles (McGuigan, 2004). According to Fyfe et al. (2022) financial and reputation gain is not new but was associated with the first journal, *Philosophical Transactions*, as they claim it was relatively expensive and probably "had a profit margin built into its price". They further revealed that its first editor, Oldenberg, was being paid a per page fee for each delivered copy by the printers. Fyfe et al. (2017) argue that it was especially around the 1950s that the commercial publishing model became dominant to the extent that "mission driven publishers" such as learned societies and HEIs started eyeing profit by the 1990s.

The reality was gloomy as institutions who pay the salaries of those authors and reviewers end up paying again to access the articles through subscriptions in what was poignantly dubbed as "double dipping". This was even dubbed "triple-pay as funders pay for research, scientists' salaries, and for access (Buranyi, 2017). Additionally, the increasingly disproportionate profit margins of the commercial publishers coupled with the increase in the number of journals set against the dropping budgets of libraries gave birth to the "serials crisis".

Serials Crisis

The Serials Crisis is a loose term that refers to the phenomenon of gradually increasing unsustainable costs of serial access against the stagnant or even falling

library budgets (McGuigan, 2004). There were hints to such a crisis as early as the 20s of the previous century by Gross and Gross (1927). Even though this "scholarly communication system failure" emanates from the trilogy of great numbers of publications, increasing cost and issues of ownership, it is the inflation that is the key issue (Cronk, 2020, p. 79). She went on to explain that at the annual inflation rate of 5.5% for serials and 2.5% for library budgets, the cost of serial access doubles every 13 years while library budgets would take around 29 years to double. This led many libraries to cut their serials subscriptions (7%) while paying more (124%) between 1986 and 1996 (Thomes and Clay, 1998). Cancellations of subscriptions lead to lower numbers of subscriptions which in turn force publishers to raise costs resulting in a vicious cycle (Okerson, 1996).

Big deals

A byproduct or an outcome of the serials crisis was the publishers' offering bundles of journals for subscription. This new approach to journal subscriptions which many libraries adopted turns out to be a new crisis with many pitfalls even though it enabled libraries to provide access to more titles than with individual title subscriptions. According to Calson and Pope (2009) some of the major issues of the big deals include the inability of librarians to predict pricing; expensive journals represent a very small fraction of the bundles; bundles are cluttered with a large number of unneeded titles; and cancellations are much complicated due to complex licensing terms that may sometimes even prevent libraries from future access to individual titles.

Profit Margins

As old as 1636, Descartes rejected the financial terms of Elzevier brothers when trying to publish his book *Discours de la Méthode* (Fredriksson, 2001). This could be interpreted as the first sign of the off-balance in profits and income from scholarly publishing. Hundreds of years later, this continues to be a dilemma. Challenged by researchers with a question of "what do the publishers do?" if the research, peer review, journal editing, research consumption and preservation in libraries is done by the research community, Richard Smith, the editor of BMJ lost words (Smith, 2018).

Profit margins of these publishers' amount to 30-40% surpassing any other business (Smith, 2018). This results in an academic publishing market valued at $28 billion in 2019 with forecasts of $29.5 billion in 2024 (STM, 2021). This state of excessive profits is shifting to the new OA publishing business model and thus remains a preoccupation of the scholarly community.

3.2 Languages of publication

Of significant importance to both the United Arab Emirates, a Middle Eastern Arab country, and to the OA movement, a publishing model whose success depends on universal adoption, is the debate on the increasing dominance of English as a language of publication and marginalization of local and regional languages. Elements of this argument include internationalisation versus localization, publication venue prestige versus local journals, and local priorities and social impact versus larger readership base.

The predominance of scholarly publishing by English as the current lingua franca of science comes at the detriment of other languages such as French, German, Latin and Arabic. Some researchers estimate the percentage of English language journals to be around 80% (Van Weijan, 2012) or even 90% (Banks, 2018). However, local languages still have and should continue having a pivotal role in scholarly publishing especially with issues of local nature and for higher societal impact. Multilingualism in scholarly communication also achieves what Balula and Leão (2021) refer to as bibliodiversity. In the UAE the shift of most education programs to English as a language of instruction as well as the increasing push for faculty to publish in Scopus indexed journals means a systematic move to English as the language of publication.

A problematic hurdle to the study of interrelation between language of publication and OA rates is the absence of a universal unbiased source of data that provides metrics on both English and Arabic publications from the UAE.

3.3 Evolution and aspects of scientometrics

The advent of the Internet and the parallel swell in the number of publications, authors and citations coupled with the desire of institutions and decision makers to assess outcomes called for the creation of metrics in an attempt to make sense of this intricate landscape. Enabled by data analysis possibilities facilitated by advances in computers, metrics such as bibliometrics, scientometrics, webometrics and informetrics emerged. Fyfe et al. (2017) state that publication records were first used for employment evaluation purposes by Prussian universities as old as the late 18th century. Bibliometrics are based on the use of statistical analysis within bibliographic databases to measure aspects related to publications, authors and citations. It was thus widely used in library and information science. Scientometrics falls under the same category of measures. In fact, according to Zhao and Zhao (2014, p. 905) it is “a translation of the Russian term “naukometriya” (measurement of science) coined

by Nalimov and Mulchenko (1969)". Zhao and Zhao (2014, p. 911) state further that scientometrics' chronological development can be divided into three stages. The fetal stage starts from inception to the early 20th century. The establishment period from the early 20th century to the 1960s. Finally, the development period which came after the 70s of the last century. On the characteristics of each of these stages, they conclude:

> …through comprehensive and comparative review of the main research areas of each stage, we can draw the following conclusions: (1) citation analysis has been a core research area during every stage; (2) research interest has shifted from theoretical research to applied aspect; (3) visualization methods and scientific mapping have attracted more and more attention and will become a main research area of scientometrics. (p. 911)

Goodhart's law is based on the principle that "When a measure becomes a target, it ceases to be a good measure". It is the same measure that resulted in people breeding mice and cobras in response to an Indian government offer of a reward for each killed or captured animal. Similarly, the focus of promotion and tenure systems on publications and the ensuing "publish or perish" phenomenon among researchers resulted in over dependence on different impact measures. These measures have developed over time to the extent that they became difficult to understand (Suelzer and Jackson, 2022). They include publication venue-based metrics such as the Journal impact factor (JIF), author-focused ones such as the h-index and i-10 index, or article measures such as ICite. The stress on metrics especially for tenure and promotion results in a scramble by authors to publish. Two negative outcomes of this rush to publish under pressure include negligence of local journals in favour of international high exposure titles and falling prey to predatory publishers that try to capitalise on this pressure.

Author impact metrics

Author impact measures are the metrics that measure an author's scholarly output with a focus of a combination of both productivity and impact. They are, however, frequently criticized for being skewed by self-citation, not accounting for individual author contribution and efforts (Suelzer and Jackson, 2022) and disadvantaged young researchers (Gasparyan et al. 2018).

Suelzer and Jackson (2022) list some popular author impact metrics including H-index, G-index, i-10-index, and iCite. However, Gasparyan et al. (2018) added to these other metrics including the e-index, a metric focusing on highly cited articles and helps "distinguish highly productive authors with identical h-index scores".

Journal Impact measures

The Journal Impact Factor (JIF) , initially designed to help the librarians' select journals for subscription, is now a widely used metric to evaluate authors (Koelblinger et al. 2019). This abuse and controversial usage of the JIF as a proxy to a researchers' quality has been extensively criticized (Garfield, 2006; Van Noorden, 2010). Journal impact measures have also expanded and increased in complexity with Suelzer and Jackson (2022) listing eleven different measures.

Article-Level Metrics (ALMs)

In his SPARC primer, Tananbaum (2013) provides a good account of ALMS below. Admitting that no metric is flawless, he believes that they may constitute a better alternative to traditional journal metrics that dictate the impact of an author is by association linked to that of their publishing venue. They encompass a cocktail of data associated with the individual article and level of socialisation. These Sources of data include:

- Usage: number of times an article has been viewed, accessed, or downloaded.
- Captures: Number of times an article has been bookmarked, shared in platforms such as Mendeley or recommended in any scholarly platform.
- Mentions: number of times an article is discussed, blogged, written about, listed in Wikipedia, and received comments beyond the immediate academic audience.
- Social Media: number of times an article is like, shared or tweeted on social media platforms such as Facebook, LinkedIn, or Twitter.
- Citations: number of times an article is cited giving an indication on its impact in scientific literature.

The advantage of this measure is it encompasses altmetrics, a new form of measures that are complementary to conventional citation metrics as they capture the impact and reach of research as measured by online interactions.

OA and impact metrics

Gasparyan et al. (2018, p. 10) state that "Visibility of research may increase attention of readers and attract constructive post-publication criticism along with relevant citations." This statement could be linked to the citation advantage often associated with OA. Wang et al. (2015) confirm not only the OA citation advantage but also the views, social media attention and download advantage of OA versus paywalled articles. This conclusion of the existence of OA advantage corroborates findings of Greyson et al. (2009), Gargouri et al. (2010), and Harnad and Brody (2004). This advantage is often used by librarians to lobby for adoption of OA among researchers and likely a motivator of many funders.

3.4 Summary

A discussion of OA could not be possible without touching on some key aspects of scholarly communication. The most common manifestations of scholarly communication are journals and research articles which are in turn the core units in the OA publishing model and scientometric studies. Allegedly started in 1665 with *Philosophical Transactions* and *Journal des Sçavans,* the journal still dominates knowledge sharing mechanisms and is now at the heart of OA discussion and measurement.

The shift of journal publishing from learned societies to commercial publishers at the end of the 19th century ushered in an era of rapid growth in the number of journals and a plethora of issues. The big number of titles coupled with exorbitant profit margins started a domino effect that brought about the serials crisis and then the big deals.

With English becoming the lingua franca of science and most commercial publishers being based in Western Europe, challenges to local scholarship and publications in other languages started surfacing. Today, a big part of scientific research from outside of the center (Western Europe and North America) and in non-English languages remain marginalised. Because of this, drawing a complete picture of the OA landscape remains partial.

The use of journals and articles as proxy of research quality and researchers merit resulted in the development of a number of metrics that grew in scope and

complexity with time. Of importance to the study of OA is the journal, article and author focused metrics because of the citation advantage associated with OA.

4 OPEN ACCESS

4.1 The Long Road to Full OA

It is impossible to pin down an exact date for the advent of OA. It is rather a snowball progress that gained momentum through direct major OA initiatives but also aided by external factors such as the serials crisis, platforms such as ARXIV, and infrastructure developments such as E-prints. The previous chapter has slightly covered the historical origins of OA within the context of the general scholarly communication developments. In this chapter, we provide a brief account of initiatives that have marked the OA movement, definition of OA shades, OA funding models, challenges associated with OA and libraries' role in OA.

4.1.1 Major Open Access Initiatives

OA is a movement of a global magnitude, albeit one that has been sporadically endorsed or implemented from one country to another. However, there have been a number of initiatives that have had a greater impact by transcending national impact and effect. Listed below are a few that I think had the most impact.

arXiv

E-print archive or what came to be known later as arXiv launched in 1991 at Aspen Center for Physics by Paul Ginsparg is a major turning point for research articles sharing and later for OA. It ushered in an era of digital exchange in an ecosystem until then dominated by print and email exchange making it possible to disseminate higher volumes of articles conveniently beyond the walls of a single institution and boundaries of disciplines.

SciELO

Scielo (Scientific Electronic Library Online) is more than a bibliographic database. It was developed by the Latin American and Caribbean Center for Collaborative Health Sciences Information (Bireme/PAHO/WHO) with the main objective of cater for the scholarly communication needs of researchers in developing countries especially in

Latin America. It later expanded into the Caribbean and even Spain and Portugal. SciELO is significant for the OA movement since it incorporates an OA journals publishing model in addition to being a bibliographic database and digital library.

Budapest Open Access Initiative (BOAI)

BOAI could be considered the first international initiative to call for and promote OA to scientific research. Launched in 2002, this initiative which brought together stakeholders from different disciplines and countries attempted to provide a practical definition of OA and a set of recommendations for the wide-spread adoption of OA practices. Its self-archiving and OA journals recommended approach remain the guiding principles of most initiatives today.

Creative Commons

Creative Commons (CC) is an international nonprofit organization that has made it its mission to enable the sharing of knowledge through six copyright licenses. CC plays a key role in achieving the open access movement objectives of free access within a copyright framework since they provide authors with a machine-readable system to communicate the permissions they want associated with their work.

Plan S

Plan S is one of the most influential OA initiative in recent years. Launched in 2018 and endorsed by the international consortium of research funding and performing organisations (cOAlition S), it mandates that all scholarly publications derived from research funded by public grants must be made available OA starting from 2021.

OA2020

OA2020 is a global initiative with a more radical approach to OA transformation as it aims to foster and support flipping of current paywalled journals to OA with unrestricted access, use and re-use. Its ultimate objective is to “make open access the default in scholarly communications”. The initiative received widespread international institutional support. Unfortunately, no institution from the UAE is listed as a signatory of the OA2020 Expression of Interest.

4.1.2 Shades of Open Access

The complexity of the OA ecosystem is illustrated by Taubert et al. (2019) who listed about thirteen shades of OA (Table 4). The occasional emergence of new shades and

definitions of OA is a tell-tale of the ever progressing and changing OA ecosystem including but not limited to the entrance of new stakeholders, changes in policy, publishers' change of stances, and emergence of new access platforms and techniques.

OA Type	*Description*	*Reference*
Hybrid OA	Subscription-based journals allow authors to make their individual article immediately available online if article processing charges have been paid.	Prosser 2003
Delayed OA/ Moving Wall OA	Publications are freely available online after an embargo period, which is usually between six and 24 months long.	Willinsky 2003
Platinum OA	Gold OA publications are freely available immediately in fully OA journals without any publications fees to be paid.	Wilson 2007
Diamond OA	Different label for Gold OA publications in fully OA journals without any publication fees to be paid.	Fuchs & Sandoval 2013
Gray OA	Gold OA publications in journals not covered by the Directory of Open Access Journals (DOAJ).	Crawford 2016
Bronze OA	Immediate or delayed OA publications on publishers' websites without any license for reuse.	Piwowar 2018
Transient OA	Publications are openly available only for a certain period of time and are then taken offline or placed behind a paywall.	Archambault et al. 2014
Guerilla OA	Publications that can be freely accessed online but infringe copyrights.	Swartz 2008
Black OA	Publications that can be freely accessed online but infringe copyrights.	Björk 2017
Robin Hood OA	Publications that can be freely accessed online but infringe copyrights.	Archambault et al. 2014
Blue OA	Self-archiving policy of publisher allows deposit of postprint version (final draft).	Hubbard 2007
Yellow OA	Self-archiving policy of publisher allows deposit of preprint version.	Hubbard 2007
White OA	Self-archiving is not formally supported by publishers' policy.	Hubbard 2007

Table 4. Taubert, et al. (2019) Open access shades

For the sake of brevity and clarity we will list only the most common colours. These are:

Gold

Gold OA is one of the two primary types of OA. It is a broad term for an OA publishing model where publications are available immediately and freely without subscriptions or paywalls and directly from the publisher. A few sub-categories of

gold OA defined in Table 4 above include diamond OA, platinum OA, gray OA, bronze OA, hybrid OA and delayed OA.

Green

Green OA is the second of the two primary types of OA. This OA publishing model is a type of OA where the author or their affiliated institution or funder self-archives a version of their research article in an institutional repository, subject-based repository or website to make it freely accessible to the public. Self-archived versions of articles vary between preprint and postprint based on the journal policy. A postprint version often means author version or peer-reviewed accepted manuscript without journal formatting. Subcategories of green OA include yellow and blue OA defined in the table above.

Piracy- based OA

One of the unfortunate dark-side byproducts of OA publishing models is the emergence of publishing trends that infringe copyrights. These often carry names with shades of color reminiscent of piracy and outlaw practices such as black OA, guerilla OA, and Robin Hood OA. Sci-hub and to some extent academia.edu and ResearchGate are the most popular services associated with such OA practices.

4.1.3 Open Access Funding Models

Publishing, like any other business process, entails costs even though authors or reviewers aren't paid for their services. These costs can be associated with essential operations such as editorial process coordination, technology, preservation, typesetting, etc. While traditional societies covered the cost through volunteering and membership fees and traditional publishers recouped the cost through subscriptions, the OA model dictated finding new sources of funding. Currently, these sources vary widely including Article Processing Charges (APCs), revenue from advertisement sales, revenue from services, endowment, grant, community, institutional, library funding, collaboration/coalition, and freemium.

APCs are reminiscent of the page fees imposed by journals in the 80s. Today, however, they are one of the most common sources of OA funding (Solomon and Björk, 2012). Indeed, around a third (5689) of the 18,004 journals currently listed in the Directory of Open Access Journals (DOAJ) charge APCs with an increase of around 6% from the 26% reported in 2012 by Solomon and Björk (2012). APCs

themselves rely on other sources of funding including some of those listed above (Cantrell & Swanson, 2020) instead of being paid from researchers' own funds.

The OA movement seems to have created an ebb and flow movement in the relationship between publishers and libraries. One such manifestation is the transformative agreements (TAs) also referred to as "publish and read" or "read and publish" depending on the focus of the license fees. Hinchliffe (2019, para. 3) defines transformative agreement as follows:

> "At its most fundamental, a contract is a transformative agreement if it seeks to shift the contracted payment from a library or group of libraries to a publisher away from subscription-based reading and towards open access publishing."

TAs, however, are a complex new trend that includes at least three different types of contracts according to Borrego, Anglada and Abadal (2021). These are: 1) pre-transformative agreements based on granting subscribing institutions APC discounts or vouchers for a limited number of articles accepted for publication from that institution; 2) Partially transformative agreements that have dispositions for both a read fee and a publish fee to cover the APCs of a certain number of articles; 3) Fully transformative agreements that covers all accepted articles for publication from researchers affiliated with the subscribing institution.

These agreements based on transition from the library as a subscriber model to the library as an OA funder model have been until recently a European phenomenon (Else, 2018) mostly because of the Plan S push to publish all funded research OA. A late adopter, US institutions are increasingly jumping on the bandwagon. A few entities from the Middle East signed TAs in recent years notably the King Abdalla University of Science and Technology in Saudi Arabia, Qatar National Library, and the United Arab Emirates University.

Nonetheless, these deals are increasingly being criticized. A major drawback of such agreements is that they often involve hybrid journals that fail to offset the subscription prices against the payments covered from these agreements resulting in double-dipping (ESAC Initiative, n.d.). Another problematic area of these deals is that the Global South with limited resources will be pushed to the margins of the new emerging scholarly publishing ecosystem if these agreements succeed in transforming the existing publishing model (Stewart, 2020). Finally, there seems to be a common concern among a wide array of initial transformative agreements assessments reported in Borrego, Anglada and Abadal (2021) about their

"transitoriness" and that they may uphold the existing publishing and access system and its associated exorbitant costs.

The APC-based gold OA model is, thus, fraught with drawbacks. Other OA funding models either of a more co-operative nature or freemium based provide viable alternatives. Journals may waive publication fees as they get cover costs through revenue from advertisement sales of services, memberships, endowments and grants, institutional funding, or coalition approaches.

A good example for the success that can be achieved by coalition and membership cooperative funding by different institutions is arXiv that positively impacted the uptake of OA as a leader of pre-prints. arXiv receives funding from several HEIs enabling it to provide free services to both users and authors (Eve, 2015).

Another model where institutions bear the cost for both readers and authors is Diamond OA popular in Latin America. HEIs in Latin America publish journals with their researchers producing, editing and peer-reviewing content thus bypassing the intermediary of commercial publishers. This often-acclaimed model is coming under pressure from the APC-based model rampant in the Global North (Alperin, 2022). Some Latin American authors are forced to pay APCs to publish in international journals seen as prestigious and of high impact. Without this system being adopted in other parts of the world, there is a risk of the Latin American publishing ecosystem becoming isolated from the global publishing landscape.

Other publishers such as PLOS devised what it refers to as "Community Action Publishing" model which ensures APCs are covered if the author's institution is a member of PLOS journal communities. In-built into this model is the equitable distribution of publishing costs among affiliate institutions. PeerJ has a similar annual institutional membership with unlimited publishing. It offers also a "PeeJ Contributor Rewards" scheme enabling reviewers to earn tokens convertible to APC discounts as well as a PeerJ Hubs that support societies' OA publishing efforts.

4.1.4 Libraries and Open Access

Libraries have always been part of all debates related to scholarly communication and naturally part of the OA discussions. Afterall, libraries were at the heart of the serial's crisis. Thus, they have been involved in embracing OA through funding of APCs, managing repositories and self-archiving, researcher training on policies,

mandates, and archiving, negotiating transformative agreements, providing guidance on predatory publishing, managing research data, and ensuring OA is a priority among researchers.

Bailey (2007) acknowledges libraries' role in OA as facilitators of access to OA resources, publishers of OA content, creators and managers of digital archives, digitizers of out-of-copyright publications, preservers of OA material, and funders of OA publishing. This has been corroborated by Bell, et al. (2005) and Chan, et al. (2005) who believe that reference librarians can champion the success of IRs. Furthermore, Scott (2017) states that information literacy instruction constitutes a chance for libraries to lead in the OA landscape. Libraries can also support the OA movement by partnering with and financially supporting publishers to flip their journals to OA. Some successful examples include the National Library of Finland and the Federation of Finnish Learned Societies (Ilva, 2018) and the Canadian Research Knowledge Network (CRKN) and the Érudit Consortium (Érudit) collaboration (Ward & Lavoie, 2016) agreements.

4.2 OA Controversial Issues

4.2.1 Predatory Publishing and Journals

Scholarly communication and OA have been plagued with a new unethical practice dubbed "predatory publishing" fuelled by potential lucrative gain from APCs (Butler, 2013), financial incentives (Demir, 2018), mounting pressure on researchers to publish in journals (Nielsen & Davison, 2020) among other factors. The term was first used by Jeffrey Beall, a US librarian, to describe a new trend of OA journals and publishers that exploit the authors' scramble to publish and often adopt unscholarly practices (Teixeira da Silva and Kimotho, 2022). With the goal of collecting APCs, these journals resort to unethical publication tactics starting with academic spam, rudimentary or non-existent review process, fake JIF and editorial board, and going as far as hijacking reputable journals.

There are indicators that predatory publishers are to some extent succeeding. Shen and Björk (2015) reported that the number of articles published by journals suspected to be predatory went from 53,000 articles in 2010 to about 420,000 articles in 2014. However, it is not all gloomy since OA gave rise to some pioneering publishers like PLOS (Public Library of Science) ONE (Butler, 2013).

In the context of the UAE, Ibrahim et al. (2022) found that medical students have little awareness of reputable publication practices and can easily fall prey to predatory journals. This coupled with Shehata and Elgllab (2018) finding that Arab scholars tend to publish in predatory journals because of convenience to publish in them calls for exerting extra efforts to raise awareness, reform policies, and increase research methodology training at universities.

Most research on predatory publishing comes under fire for using either of the two controversial methods: 1) the black and white lists approach which uses pre-established lists of suspicious journals and publishers such as Jeffrey Beall's and Cabell's lists; or 2) the Bohannon (2013) style sting operation which based on sending questionable articles to journals with the aim of debunking their unethical review practices. Therefore, Beall's list and inclusion criteria and evaluation methodologies have continuously come under fire including from influential OA researchers such as Crawford (2016).

In recent years, OA gets also bad rap for contributing to the spread of misinformation. While this can be argued against and refuted given that legitimate OA undergoes the same review process as paywalled content, unwary researchers may be citing OA articles from predatory journals with erroneous content. In an endeavour to measure the impact of journals in predatory journals on scientific research, Björk et al. (2020) found that such articles had an average of 2.6 citations per article compared to Scopus indexed articles with an average of 18.1 citations. Even though they conclude that such articles have little scientific impact, the dangerous impact of fake science cannot be neglected especially when used to support political and ideological agendas.

4.2.2 Academic Social Networks (ASNs)

Another new phenomenon that is often discussed in tandem with OA research is the academic social networks (ASNs). The move of research output to an online environment paved the way to the emergence of these networks such as Academia.edu and ResearchGate. These collaborative peer-to-peer platforms are based on the noble principle of free exchange of research as a public good, albeit often in violation of copyright (Laakso et al. 2017). These illegal OA copies fall under what Björk (2017) refers to as "Black OA". This sparks the arguments of those critical of OA. And there is a reason to worry. According to Laakso et al. (2017) articles deposited in these networks surpassed those self-archived in repositories or

personal websites. Indeed, being out of the control of funders and academic institutions and in the absence of internal mechanisms to filter Black OA practices, these platforms are harming the reputation of OA and create noise around legitimate self-archived articles by providing a breeding ground for what Bodo (2016) dubbed as the low-level individual piracy.

Noteworthy is the lack of research on tangible solutions to the preference of ASNs over IRs by researchers. Such research could cover mechanisms for penalization of black OA just like predatory journal publishing, how to improve IR platforms to provide similar user experiences as ASNs, and how to increase IR resources visibility, dissemination, and discoverability. There is also a need for more in-depth qualitative research on ASNs rather than the currently prevalent self-reported data and surveys research.

4.2.3 Equity in OA

Equity was and remains one of the core principles that guided the advent and prosperity of the OA movement. However, OA is far from being an equitable field because of a plethora of reasons either innate in the system itself or came to be as the movement gained momentum. OA equity is essential not only because OA has to align with the UN Sustainable Development Goals (SDGs) but also because pandemics such as COVID-19 heightened the importance of equitable access to essential research. The European Federation of Academics of Sciences and Humanities (ALLEA) 2021 statement on equity in open access lists “barrier to participation” and biases based on “disciplines, career stages and geography” as major hurdles to equity.

With often exorbitant APCs being charged by journals that embrace gold OA, we have witnessed a shift from “a barrier to access to barrier to participation” (ALLEA, 2021). In fact, the commercial publishers push to replace subscriptions with APCs through “read and publish” deals have marginalized a large portion of authors especially from the Global South and from small institutions who can’t afford those costs. Addressing this barrier ensures equity for authors and not only for readers.

The second major set of inequitable practices were inherited from the scholarly publishing system namely biases related to languages, disciplines, career levels, and geographical regions. English has become almost a de facto language of science pushing scientific outputs in other languages to the backburner. Similarly, there is a

focus on research from large institutions that can afford to address research issues privileged by the high impact journals at the detriment of local issues and from early career researchers and those from the Global South.

Conscious of the importance of creating a sustainable OA publishing system, an increasing number of key OA players including ALLEA, the International Science Council, SPARC, Open Research Funders Group (ORFG) among many others have taken a stance or implemented actions in support of equity and social justice in OA. SPARC had made equity a guiding principle for the themes of its International Open Access Week from 2018 to 2021.

4.3 OA Research Challenges

The path to solid and reliable OA research is fraught with challenges emanating from sources of data, the changing nature of the OA landscape, and shifts from paywalled to open and between versions within OA.

4.3.1 Shortcomings of bibliographic indexes

One of the major challenges facing OA research is the often cited limitations associated with bibliographic indexes used in scientometric studies. Laakso (2019, para. 1) states that "readily-available data on the state of open access is still limited." He went on to argue that this shackles science policy. This is especially true in light of the absence of standardized metrics, better data, and risk of commercial interests informing science policy. A significant shortcoming of most of the bibliographic databases used for OA analysis such as Scopus, WoS and even DOAJ is skewness towards Western and English-language scholarship, certain disciplines and marginalization of the Global South research output and other non-English languages (Mongeon and Adèle Paul-Hus 2016; Khanna, Ball, Alperin et al 2023; Björk 2019; Laakso 2019).

The second significant limitation of existing bibliographic indexes is divergence in coverage. There is no central one inclusive resource of journals and articles. Integrative data methods have to be used to aggregate necessary data for analysis. Our study on scholarly journals in the UAE had to use over ten sources with surprisingly limited overlap. Martín-Martín et al. (2021) list limited coverage as one of the two key shortcomings of the leading databases Scopus and WoS. Types of coverage span "subject coverage, retrospective coverage, geographical coverage,

language coverage, journal coverage, etc." (Gusenbauer, 2022, p. 2684). According to Laakso (2019) coverage is influenced by the databases inclusion criteria which are in turn dictated by their biases in terms of disciplines, countries, and languages. To this coverage issue is to be added the difficulty of extracting data due to the database owners exaggerated protection of their bibliographic data (Gusenbauer 2022). This was seconded by Laakso (2019, para. 3) who highlighted the absence of "open and public infrastructure to track and summarize journal activities". Furthermore, sufficient coverage may be jeopardised by the limited search functionalities of these services as reported by Martín-Martín et al. (2021).

The last noteworthy shortcoming is the limited metadata. Most bibliographic databases are designed and optimized for discovery and other usages such as citation metrics. Bibliometric analysis of metadata could be seen as a marginal usage of these services (Hood and Wilson 2003). Because of such limitations and lack of viable alternatives, researchers have to settle for Unpaywall as the go to source of OA metadata by default, adopt "fitness for use" resource choices or perform ample manual data collection and enrichment to remedy these metadata gaps. One example of such lacking metadata is related to longitudinal status changes of journals (Laakso, 2019).

4.3.2 Volatile OA landscape

Journal flipping, articles move from paywalled to open after an embargo, new emerging OA models and color shades, changing policies and national priorities create an OA environment that is highly volatile and challenging for OA research.

Laakso (2019) used the "amnesia" metaphor to refer to the difficulty of capturing the retrospective changes in journal status. This failure of existing bibliographic indexes to capture historical changes in journal and article status is due to the constant change from closed to open either through journal flipping or end of embargos. This may also be linked to journal mergers or journals ceasing to exist (Laakso, 2019).

Another challenge for the study of OA is occasional emergence of new OA models and or different interpretations resulting in varying definitions of the same OA color shade. This in the researchers opinion affects comparability of data as various search results and datasets use different interpretations and denominations. Taubert et al. (2019) identified at least 13 different OA shades. Within this context, it would be for example impossible to verify the legitimacy of the green status of each and every

article posted in ASNs such as Researchgate. This could, to some extent, apply to self-archived articles.

Establishing strong and solid metadata sources that would assist in disentangling the complexity of the OA environment and to be able to draw a real picture of the landscape and wisely inform science policy requires coordinated efforts involving all scholarly communication stakeholders. Until this is achieved, research of OA will remain shackled and easily manipulated by the commercial publishers dictated metadata elements.

4.4 Summary

OA as a 20th century phenomenon that was mostly ushered in by the advent of the Internet and kindled by the researchers desire to democratize access to research as a public good spans across many disciplines and involves many stakeholders. Thus, it has been extensively studied from different angles. However, given its complexity and the intricacies of the ecosystem within which it operates, plenty of lacunae in research, methods, and data sources have been identified requiring further investigation and scrutiny. Especially noteworthy are the shortcomings in existing bibliographic sources which dictate use of manual data collection and adoption of integrative methods. Similarly, most of these sources are biased towards English-language content and North American and European scholarship. Furthermore, research on OA in the Arab region in general and the UAE in particular remains very limited.

This thesis provides an opportunity to make a contribution to filling some of the identified lacunae especially in relation to the state of OA in a country such as the UAE and to address the insights of some of the different stakeholders.

5 STUDY METHODOLOGY

The purpose of this thesis is to dissect the scholarly publishing landscape in the United Arab Emirates and to subsequently draw a 360-degree real picture in terms of number and rate of OA journals, the situation of OA among research universities and researchers including policies, priorities and incentives, the role of librarians in the OA publishing, and relationship between OA rates and international co-authorship. To achieve this, the thesis aggregates research from four separate articles with different research design, methods, data collection and analytical approaches.

5.1 Research Philosophy

Duignan (2016, entry 527) defines research philosophy as:

> *"The conceptual underpinnings of the researcher's world-view of the relationship between the observer and that which is to be observed, the nature of knowledge and learning processes, and how it is gained, along with the transformational processes that arise in the act of conducting research."*

While most researchers do not make their viewpoint explicit assuming it is implied, an understanding of the underlying research philosophy and concepts is essential. This is because worldview informs the choice of research methods which in turn underpin the conducted research. The complexity of the research paradigms or philosophies is a source of predicament and "tautological confusion" especially for the student researcher (Mkansi and Acheampong, 2012). Because methodology is directly related to research philosophy and its main concepts of ontology and epistemology. Both represent one's intrpretation of reality and philosophy of knowlege respectively (Byrne, 2017).

Mkansi and Acheampong (2012) states that even though there is a quasi-agreement on the meaning of epistemology and ontology, there is widespread disagreement among advocates of research philosophies about the "classification and categorisation of these paradigms" with plenty of differences on ontological and epistemological stances. These stances often referred to as research paradigms represent the philosophical framework of research. Coupled with research methodology, they spell out the ontological and epistemological stance from which

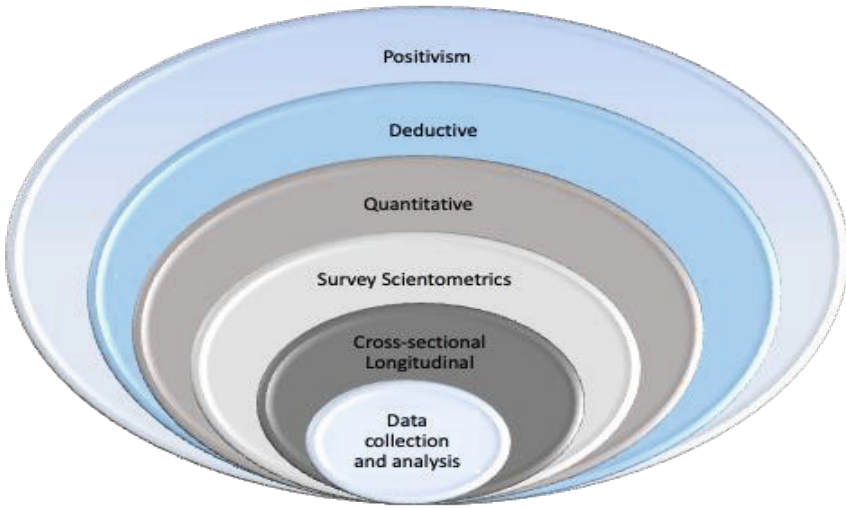
a researcher conducts their research. The selection of a research paradigm in turn affects the choice of qualitative, quantitative or mixed research methods.

There is a wide variety of research paradigms informed by both ontology and epistemology. Patel (2015) provides a mapping of some of the most popular paradigms and how they relate to philosophical stance and choice of methods. For the sake of simplicity, we will focus on positivism as the most relevant to scientometrics and quantitative research.

Positivism is often listed as an ontological paradigm and was first coined by Auguste Comtè (1798–1857). Comtè believed that 'positive science of society' could be built on the same principles applied in natural sciences (Howell, 2013). Based on the principle that there is a single reality, it becomes possible to measure and know it. This is often using mostly scientific deductive reasoning. Thus, the most common associated research methods are quantitative (Williamson, 2002).

Even though scientometric studies can be conducted using diverse research paradigms and methodologies, this thesis relied heavily on quantitative methods and data analysis techniques combining bibliometric analysis and surveys. Mukherji and Albon (2023, p. 64) state that "Positivism tends to underpin quantitative methodological approaches to research". Both bibliometric analysis and surveys are generally associated with positivism because they are used to collect data that can be statistically analysed for patterns and trends independent of the researchers perceptions and values. Figure 2 below provides the research logic underlying this thesis.

Figure 2. Thesis underlying research paradigm



5.2 The Study Design

The perfect research design is one that has a synergy between the research objectives, research questions, and used methods. Denzin & Lincoln (2008, p.33) define a good research design as a framework that "describes a flexible set of guidelines that connect theoretical paradigms first to strategies of inquiry and second to methods for collecting empirical materials." Given the nature of this study and its objective of studying different aspects of OA in the UAE, it called for a mixture of study approaches that draw from areas of bibliometrics, surveys, and scientometrics.

Publication one consists of a journal-level analyses and thus bibliometric data on all journals that are scholarly peer-reviewed, active and published in the UAE were collected from a combination of international and local sources such as Ulrichsweb, Scimago journal and country Ranking, Directory of Open Access Journals (DOAJ), Directory of Open Access Scholarly Resources (ROAD), SherpaRomeo, websites of UAE higher education institutions, The Arabic Citations and Impact Factor (ARCIF), Directory of Free Arab Journals (DFAJ), Arab Impact Factor (AIF), and a general search on the web for any scholarly journals published in the UAE. The compiled list was then cleaned to remove duplicates, ceased publication, and non-electronic editions. Manual data clean-up and enrichment was used to get to the final working list of 534 titles with all necessary metadata fields. The data was analysed to study the aspects covered by the article in detail. To our knowledge, this is the most exhaustive study of online journals in the UAE and the first to have covered these many sources of data.

Publication two, on the other hand, focused on institutional approaches and practices to scholarly communication and OA in the UAE. We initially identified that the bulk of research output in the country comes from higher education institutions (HEIs). We, then, analysed data from the Commission for Academic Accreditation list of higher education institutions, Scimago Institutions Rankings, QS World University Rankings, and Web of Science researcher affiliations to determine the institutions to include in the study. The research administration offices of a final list of 40 research-intensive HEIs were sent a quantitative online survey consisting of 42 mostly close-ended questions revolving around the following areas:

- scholarly publishing,
- OA policies,
- Article Processing Charges (APCs) and OA funding,

- incentivizing research,
- researcher promotion and publishing output,
- Institutional Repositories (IRs) and self-archiving,
- awareness of predatory journals.

Publication three looks at the role of librarians as a major player in scholarly communication and OA. As it sets out to argue that the librarians' role has changed from gatekeepers to gate openers within the scholarly communication cycle, it adopted a 21-question quantitative questionnaire. The survey aimed to collect librarians' views and insights on OA awareness and perception, OA discovery tools, piracy based and academic social networks, OA-related instruction, OA resources integration, and predatory journals. The targeted librarians represent all types and sizes of libraries and were recruited from a local librarians' information literacy network. 56 unique responses were received.

Publication four adopts a purely scientometric approach since it investigated the interplay between OA, co-authorship, and international research collaboration in the UAE context. It uses a dataset of research output from UAE affiliated authors indexed in Scopus from 2009 to 2019. Data was extracted using Scival, then enriched using several tools such as Unpaywall for OA status and OA version related metadata, Crossref Link References for DOIs, and manual data collection in the case of residue articles from the previous process. Finally, we enriched the dataset with the journal country using the ISSN Portal. The author affiliation country field was then dissected and regrouped by continents. Next, we mapped the subject clusters into the five main disciplines of Scopus.

5.3 Ethics

We believe that this research is of a nature that does not require complicated ethical approvals and arrangements. Nevertheless, this research is fully compliant with the guidelines of Finnish National Board on Research Integrity "*The ethical principles of research with human participants and ethical review in the human sciences in Finland"* (TENK, 2019). In line with those guidelines, articles two and three which are using a survey instrument included an informed consent form with option to withdraw from the study at any stage without any obligations or consequences. This form was included at the beginning of every survey.

5.4 Data Collection

This section details the data collection processes. It first presents the description of both manual and automatic processes deployed in the different publications contributing to this thesis. Secondly, it presents a brief description of the different sources of data used.

5.4.1 Processes

Data used for this thesis consist mainly of bibliographic, scientometric, and quantitative data. Therefore, different tools and approaches were used to collect these data. This involved usage of both manual and direct retrieval processes. Most of the quantitative data from publication II and three was collected using surveys as an instrument. Publication I relied mostly on bibliographic data collected from different sources. Publication IV used mainly automatic data collection methods supplemented by manual data enrichment to build the final data set.

As the UAE is at the margins of the dominant dichotomy of North and South dominant in bibliometrics and scientometrics studies, other sources of data had to be used instead of the two leading and often used bibliographic indexes namely WoS and Scopus.

Surveys

Two of the studies making up the core publications of this thesis have used surveys to collect data. This was justified by the need to collect data about the inner states of the respondents. Publication II used a survey as it was deemed appropriate to collect insider data on policies, practices, and procedures of UAE HEIs. Given that these data are often not made public, this method was the most appropriate. Similarly, publication III used a survey to collect data on the UAE librarians' beliefs, perceptions, views, and behaviours vis-à-vis OA.

Bibliographic Data

Scientometric aspects of this research relied mainly on an integrative methods approach. Multiple bibliographic indexes as well as other tools were used in both publications I and IV.

Publication I used eight different local, regional, and international bibliographic sources namely: Scimago Journal and Country Ranking, Ulrichsweb Serials Directory, Directory of Open Access Journals (DOAJ), Directory of Open Access Scholarly

Resources (ROAD), SherpaRomeo, The Arabic Citations and Impact Factor (ARCIF), Directory of Free Arab Journals (DFAJ), and Arab Impact Factor (AIF). This was in addition to manual searches in the UAE HEIs websites and the general web. This was necessary to overcome the shortcomings associated with bias in international indexes towards Western and English-language content. After aggregating data from all the sources, we proceeded to clean up data by removing non-journal records and duplicate titles. Some manual data enrichment was performed to fill gaps in metadata on aspects such as OA status, language, type of publisher, and discipline.

Scopus furnished the core data set for publication IV. The process involved two stages: searching and downloading, and manual data enrichment from other sources. Using Scival, a search for all articles with at least one UAE-affiliated author were searched. Filters included a longitudinal range of 2009 to 2019, and article types limited to articles, articles in the press, business articles, and data papers. Manual enrichment of data consisted of journal country using ISSN Portal, DOIs using Crossref Link References, Unpaywall Simple Query Tool for OA metadata, and Scopus for co-author affiliation continent, and All Science Journal Classification Codes (ASJC) for disciplines. Extra manual data collection involved web searches and publisher websites visits to append data missing from the previous process.

5.4.2 Sources of Data

Ulrichsweb

Ulrichsweb is a well-established commercial widely used global directory of serials including bibliographic and publishers' information. Even though it is the largest serials directory and lists over 300,000 titles in over 200 languages, it remains biased towards English language publications. Therefore, publication I used it as the main source of UAE journal data in combination with other sources.

Scimago journal and country Ranking (SJR)

SJR was the second major source of data for publication I. SJR includes key scientometric data on a large list of Scopus indexed scholarly journals. The SJR metrics are characterised by factoring the citing journal prestige in the citations and filtration of journal self-citations. This source contributed 54 unique titles to that study.

Directory of Open Access Journals (DOAJ)

No study of OA journals would be complete without including some sort of data from or comparison with the DOAJ. With over 18,860 OA journals listed at the start of 2023, it is supposed to be the main source of data on OA journals. Yet, this directory has proven to have shortcomings in terms of coverage and bias towards English language journals with nearly 80% of the journals being in English language. A mere 271 Arabic titles are listed in DOAJ. This source contributed only 9 unique titles to the dataset of publication I. Noteworthy is that this low number may be due to UAE journal editors not being aware of the importance of indexing their journals in directories such as DOAJ or simply the journals are not meeting the demanding inclusion criteria of the directory.

Directory of Open Access Scholarly Resources (ROAD)

ROAD is a database launched and maintained since 2013 by the ISSN International Centre. ROAD aims to provide free access to the OA content created by national ISSN centres and the International ISSN Centre as part of the ISSN network. This data is enriched by information from other sources such as DOAJ and Scopus. ROAD listed OA scholarly resources include journals, monographic series, conference proceedings, repositories, and research data sets.

The Arabic Citations and Impact Factor (ARCIF)

Officially launched in 2018 by E-marefa database after nearly 10 years of underlying work, ARCIF is a citation database of scholarly journals in the Arab world. It covers various disciplines including social sciences, humanities, economics, engineering, medical sciences, etc.

Its 2022 annual report included the impact factor of 1000 Arabic peer-reviewed journals representing double the 499 analyzed in its 2019 annual report. The advantage of such an index is that it attempts to fill a gap in international indexes often skewed towards English-language journals and those published in the West.

This product provided data on journals published in the UAE for publication I.

Directory of Free Arab Journals (DFAJ)

Inspired by DOAJ, DFAJ is a project that was launched in 2013 and aimed to create a directory of all OA scientific journals published in Arab countries. DFAJ currently lists 319 OA journals from 150 publishers in 18 Arab countries. DFAJ was a good source of data on OA journals in the UAE for publication I.

Arab Impact Factor (AIF)

Established in 2007 by Mahmoud Abdel-Aty, an Egyptian scholar, AIF aimed to underscore the contribution of Arab scientific production to global scholarship. It released its first report in 2015. AIF is heavily reliant on the traditional metric of citations as a measure of JIF. Its distinctive feature is that it is solely focused on journals in the Arabic language.

This product provided data on journals published in the UAE for publication I.

Scopus (Scival)

Scopus is one of the leading citation databases with comprehensive metadata at the journals, researchers, and articles levels across a very wide range of disciplines. This makes it one of the go-to resources on metrics by scientometrics and bibliometrics researchers as well as research institutions and funders. In addition to its freely accessible CiteScore feature, it offers a much deeper layer of metadata and analysis through its subscription service, Scival.

Scival was used as a main tool to extract data on publications by UAE-affiliated authors for publication IV. Like its immediate rival, WoS, this database is often criticized for bias towards certain journals, countries, and languages.

ISSN Portal

The ISSN Portal is an online platform that provides access to the ISSN Register. The register is the main reference database of serials, be it journals, magazines, newspapers, and monographic series in both print and digital formats. It indexes serials and resources from more than 100 countries and international organizations. This database was partly used in publication I journal data collection and mostly in publication IV to enrich data with journal country of publication.

5.4.3 Data enrichment tools and services

Unpaywall

Unpaywall is both a browser extension and an online platform that provides access to millions of OA articles and research papers from thousands of publishers and repositories. Unpaywall harvests OA versions of articles from indexes like Crossref and DOAJ, repositories, authors websites, gold, and hybrid journals. If it finds any OA version of an article, it provides users with a direct link to the OA version. The tool

makes it easier for researchers to find and access OA scholarly research. We used the "Simple Query Tool" feature of Unpaywall to run DOIs for data enrichment in publication IV. It provided invaluable data such as OA status, OA version, OA resource links, OA license, and OA host.

Crossref Link References

Crossref Link References is an online DOI (Digital Object Identifier) search service from Crossref. Reference linking makes it possible to link references through the DOI link that becomes a persistent link to those resources. The Simple Text Query feature was used to look up and collect DOIs for articles retrieved from Scopus for publication IV. These manually collected DOIs made it possible to run the list through Unpaywall to extract OA status data. It is this ability to obtain several DOIs quickly that was exploited for our study.

Commission for Academic Accreditation list of HEIs

The CAA is the official UAE federal body in charge of higher education quality. It is also entrusted with licensure of HEIs and accreditation of programs they offer in the country. Thus, it maintains the National Register of all officially licensed HEIs. This register was a main source of data for UAE HEIs to be targeted with the survey for publication II.

Websites of UAE higher education institutions

Conscious that UAE HEIs may not be proactive in getting their journals listed in different indexes, an exploration of their website was performed to collect data on scholarly journals not listed anywhere else. This exercise enabled the discovery of many publications otherwise invisible. This was used for data in publication I.

QS World University Rankings

QS World University Rankings is one of a few leading international university rankings. Primarily designed to assist students find their desired university, it is increasingly used by universities to boast their reputation and world position. In addition to research metrics, it factors in academic and employer reputation, and faculty/student ratio.

This ranking was primarily used in publication II to capture the list of UAE HEIs to survey.

Web of Science ResearcherID

WoS ResearcherID is a unique author identifier that provides author information and links researchers to claimed publications in WoS regardless of name variations or change of affiliations. In addition to linking authors to their work, this service could be used to identify affiliations and potential collaborators. This service was primarily used in publication II to investigate which type of institution most researchers in the UAE are affiliated with. This exercise helped us target HEIs research management offices in our institutional survey.

SherpaRomeo

Sherpa Romeo is an online global platform that aggregates publishers' OA policies. It lists OA pathways permitted by publishers and provisions for each journal title including embargo, licence type, copyright owner, self-archiving locations, and any other conditions. This resource was used for publication I to capture data on journals published in the UAE.

SCimago Institutions Rankings

The SCImago Institutions Rankings (SIR) defines itself as "a classification of academic and research-related institutions" based on three indicators namely research output, innovation and social impact as indicated by their web visibility. Noteworthy is that "any platform is as weak as its sources of data". In this case, Scopus is used as a source of data. Thus, the limitations associated with it such as bias towards English-language and Western countries' research output cascade down to SIR.

The SIR was mainly used in publication II to collect data about the most research-intensive institutions in the UAE to survey

5.5 Summary

The study of OA involves a multitude of stakeholders, resources, mechanisms, and resources. Therefore, it has been studied from different angles and using different qualitative and quantitative methods. This research is no different as it used a combination of methods drawing from quantitative survey methodology and scientometric analysis. Noteworthy is the discovery that common bibliographic indexes often used in this type of studies exhibit major limitations related either to bias and inclusion or metadata limitations. This is especially the case for a country like the UAE where not all publications are in English or scholarly publishing is

mature enough to scramble for inclusion in global indexes. To compensate for this, our study had to adopt an integrative approach to data collection by adding data from local and regional indexes and services to the mix. Manual data collection and enrichment was also used in the two scientometric analysis based studies One and Four.

6 INTEGRATED DISCUSSION

6.1 Introduction

In order to study the subject matter of this thesis from different angles, four studies using various research methodologies and techniques were carried out. This approach made it possible to analyze different UAE OA stakeholders and players as well as acquire a better understanding of the research ecosystem in the country.

The first part of this chapter presents an overarching summary of the studies and how they relate to the objectives, research questions and implications of the thesis. The second part comprises a much-detailed look at each publication and how it helps address the problem under investigation. The third section discusses the findings within the research and policy context of the UAE. The fourth section delves into the studies implications for practice, research, and policy. The following section presents different limitations of the thesis and highlights areas for future investigation and research approach improvement. The last section presents concluding remarks.

6.2 Summary of Dissertation Findings

Table 2 below outlines the individual publications objectives, research questions, objectives, methods, and implications. It also presents the overarching thesis objectives and research questions. It constitutes the framework on which further discussions of individual studies and overall research findings and conclusions.

Table 2. Mapping of individual publications against the thesis RQs and objectives with a summary of implications

Article	Boufarss, M. (2020). Charting the Open Access scholarly journals landscape in the UAE. Scientometrics, 122, 1707–1725. https://doi.org/10.1007/s11192-020-03349-0https://doi.org/10.1007/s11192-020-03349-0	Boufarss, M., Laakso, M. (2020). Open Sesame? Open access priorities, incentives, and policies among higher education institutions in the United Arab Emirates. Scientometrics, 124, 1553–1577. https://doi.org/10.1007/s11192-020-03529-y	Boufarss, M., & Harviainen, J. T. (2021). Librarians as gate-openers in open access publishing: A case study in the United Arab Emirates. The Journal of Academic Librarianship, 47(5), 102425. doi:https://doi.org/10.1016/j.acalib.2021.102425	Boufarss, M., Laakso, M. (2022). Open access and international co-authorship: a longitudinal study of the United Arab Emirates research output
Study objectives	The purpose of this study is to chart the scholarly journal landscape in the UAE in order to provide a scientific perspective on research productivity, distribution, and access in the country and lay the foundations for further research in this area. The study aims also to contribute to research endeavoring to paint a global picture of scholarly publishing.	This study explores the role of HEIs in the United Arab Emirates (UAE) OA uptake and reflects on the ongoing international initiatives pushing for universal OA to research.	This study investigates the level of OA awareness among librarians in the UAE. It also highlights their role in the training of researchers and patrons on OA policies and mechanisms and on accessing OA resources. This study also aims to demonstrate how OA has helped reinvent the role of librarians as gate-openers and a driving force behind the eventual success or downfall of the OA movement. More specifically, we wanted to demonstrate what UAE librarians are doing to facilitate users and researchers' uptake of OA and how their high awareness and perception of OA has contributed to the shift in their role.	The objective is to provide a granular analysis of research article output in the country, level of openness, and connection to international co-authorship. We aim to improve the current level of knowledge regarding both the influence of co-authorship on OA status of articles, as well as the level of compromise that relying on readily available OA data implies when investigating phenomena like this.
Thesis Objectives	The purpose of this thesis is to dissect the scholarly publishing landscape in the United Arab Emirates in order to draw a 360-degree real picture in terms of number and rate of OA journals, the situation of OA among research universities and researchers including policies, priorities and incentives, the role of librarians in the OA publishing, and OA and international co-authorship.			

Linkage to the thesis objectives	This study contributes greatly to the main objectives of the thesis since journals constitute the main pillar of scholarly communication and scientific literature output of a country. To the best knowledge of the author, this is the first study to look at journal publications in the UAE especially from the OA and indexing databases perspective.	This study contributes to meeting the objectives of the thesis as it looks at one of the major stakeholders in scholarly communication. An analysis of the state of OA in a country would not be complete without looking at funders, researchers, policies and incentives as enablers of transition to OA.	This study contributes to the objective of the thesis since it looks at librarians as stakeholders that infiltrate all stages of the scholarly communication and thus de facto players in the OA process be it during the production of research, dissemination, preservation or awareness.	This study contributes greatly to drawing a picture of the state of OA in the UAE as the research article is the main output by which countries' scientific output is measured. It is also the main level of scholarly research collaboration. This study helps also place the UAE in a global context as far as co-authorship and how it correlates to OA uptake.
Research Questions	How many academic journals are published in the UAE? In what languages are these journals published? What is the share of OA journals in the UAE? What are the subject areas of these journals?	What is the level of current awareness, support, policies, and practices related to scholarly journal publishing among UAE HEIs, particularly in relation to OA publishing? What are HEIs in the UAE doing in relation to OA, including what are existing OA policies and funding options available to authors to publish OA? How do HEIs in the UAE assess publications and publication activity of researchers in the context of promotion and performance appraisals of faculty.	What is the level of OA awareness among librarians in the UAE? What is the role of UAE librarians in the training of researchers and patrons on OA policies and mechanisms and on accessing OA resources? How has OA helped reinvent the role of librarians as gate-openers and a driving force behind the eventual success or downfall of the OA movement? What are UAE librarians doing to facilitate users and researchers' uptake of OA? How has UAE Librarians high awareness and perception of OA contributed to the shift in their role?	How has the share of journal articles available OA developed over time? a. What are the disciplinary differences in OA shares? b. Does the journal host country have a connection to OA availability? c. What are the shares of different OA mechanisms? d. What are the most popular repositories for self-archiving? 2. How has international co-authorship developed over time? a. How is co-authorship distributed globally? b. Does the number of co-authors have a connection to OA availability? c. Does the geographic region of co-authors have a connection to OA availability?

Data and research methods	The study used data compiled about scholarly journals published in the UAE compiled from international and local sources including Ulrichsweb, DOAJ, DOAR, and Arabic databases such as AlMandumah. The resulting journal list was studied focusing on the share of OA titles, language of publication, discipline, and type of publisher	The study is based on an online survey targeted at UAE higher education institutions research management units thus soliciting institutional views on OA policies, priorities and incentives. Only one response was solicited from each institution. The data collection instrument used was a multi-institutional quantitative online survey. The survey consists of 42, mostly close-ended, questions.	This study focused on the librarians perspectives on OA. It adopted a short quantitative questionnaire as the instrument for gathering their views and insights. The survey consists of 21 questions focusing on OA awareness and perception, OA discovery tools, piracy based and academic social networks, OA-related instruction, OA resources integration, and predatory journals. The survey targeted the UAE librarians who are involved in information literacy, user instruction, and research support.	This study used bibliometric data on research articles authored by researchers affiliated with UAE institutions over a period of 11 years extracted from Scopus. Data was then enriched through Crossref DOI and Unpaywall queries as well as manually through web searching and ISSN Portal. Data was then cross tabulated and analysed to capture the inter-play between c-authorship and openness with factors such as journal publication country, shades of OA, archived version, and disciplines considered.
Implications for research	The study contributes to a large global body of research on OA with a zoom in on the local landscape. This will provide grounds for a better understanding of local and regional unique characteristics.	Our research raises a number of opportunities for future research of regional dimension similar to the European annual institutional survey on OA.	This study is one of the first to highlight the gate opener role of librarians in OA. Future studies may emulate or build on this study and most importantly adopt our data gathering instrument.	This study is one of the first to attempt looking at the relationship between inter-continental co-authorship and openness. It will thus raise opportunities for further and future research in this area.
Implications for policy		This study is one of very few if not the only study that touched slightly on science policy and will surely influence future decisions related to institutional and national policies.	Librarians are often involved in research related policies development at the institutional level. This study could influence decisions on OA policies, predatory publishing, APCs, and self-archiving mandates.	This study is likely to have implications for policy by influencing the push for more collaboration and reward systems for research collaboration. It may for example motivate the integration of internationalisation and international research networks in future policy directions.

Implications for practice	The analysis of data sources reveals very low presence of local journals in DOAJ. One major possible implication of this for practice is to motivate these journals to seek listing in international indexing services including DOAJ. Results should also be of interest to university research managers and libraries as they provide guidance for researchers on venues to publish research. Researchers especially those looking for Arabic language publication venues could find this study useful.	By integrating the practitioners and stakeholders points of views, this study connects the theoretical to the practical aspects of OA and raises awareness among those involved in research and decision making. A major practical contribution of the present research is that it provides much needed data on the actual views and insights of the HEIs research management units, their everyday preoccupations, and what they are planning. This data is important given that this is the only study to address this. A second important implication is the need to focus efforts at this level given that it links directly to national science policy and that it could help mitigate the risks associated with transient researchers.	By integrating the practitioners and stakeholders points of views, this study connects the theoretical to the practical aspects of OA and raises awareness among those involved in research support services and infrastructure. Librarians will be more aware of their pivotal role in scholarly communication and empower them to support the efforts towards full OA of research. A major implication for practice stems from our reframing of the role of librarians and thus empowering them to support the OA movement. As this study is focused on librarians as practitioners, it may also have implications on librarians training programs that would hopefully integrate OA support and dissemination.	Having shown that there is a correlation between increased co-authorship and openness, this study will influence the researchers and research management offices to boost their international collaborations.

6.2.1 Publication I

Charting the Open Access scholarly journals landscape in the UAE

The aim of this study was to chart the OA scholarly journal landscape in the UAE and help provide a scientific perspective on research productivity, distribution, and access in the country. The study aimed also to contribute to research endeavoring to paint a global picture of journal scholarly publishing especially considering skewed international journal indexes and challenges of non-English language publications. To our knowledge, no other study has looked at the UAE journals in detail nor used the wide array of data resources used in this study. It thus lays foundations for further research in this area.

Bibliometric methods were used in this study. We used collected data on journals published in the UAE to analyze languages of publication, disciplines, publishers, and the openness rate. Journal data were collected from nine different global as well as local sources in addition to general web searches and visits to publishers' websites. This exercise resulted in a final list of 534 journal titles of which 377 were published online. Collected metadata includes elements such as ISSN, title, publisher, start year, language, OA status, APC, and discipline. These enabled analysis of share of OA journals, publication language apportionment, type of publishers, and discipline.

The results indicated that online journals are dominant (nearly 71%) and that about 64% of these online journals are OA. Noteworthy also is that only 7.5% of these OA journals are listed in DOAJ. Data also revealed an increase in the number of OA journals from the year 2004 onwards. Journal OA status showed that most OA journals (89%) started as OA and the rest either converted from print to OA or were mirrors of print versions. APC analysis revealed that APC-based OA is the dominant among UAE journals (70% of journals) and that most of these APC-charging journals (92%) are owned by commercial publishers.

A striking result is that Arabic-language journals represented only 1% of UAE published journals and that journals by non-commercial publishers accounted for a very small fraction of UAE journals. Similarly, there was a dominance of STM disciplines among journals published in the UAE.

Comparing these findings against previous studies is a challenge. Most existing OA percentage statistics are based on a single database count such as DOAJ, Scopus

or Dimensions while this publication used multiple sources and manual data collection. Most of these studies, thus, tend to ignore the journals that Piwowar et al. (2018) described as “hidden Gold” or OA journals that fail to license content but published all their article as free-to-read. The findings of this publication are very positive for a young country with a fledgling research system like the UAE. Nonetheless, the very low percentage of journals listed in DOAJ calls for further investigation as to what may be the underlaying reasons.

The main significance of this study lies in it being a first study to look at the UAE journal landscape in detail and beyond the individual and conventional sources of data such as Scopus or WoS. It also constitutes an important contribution to a large global body of research on OA with a focus on the local landscape and a chance to provide grounds for a better understanding of local and regional unique OA ecosystem characteristics. Furthermore, a major practical contribution of this study is that it provides empirical data on sub-par indexation of UAE journals in international journal indexes including the obvious luck of OA journals in DOAJ. This information is likely to motivate UAE journal editors to seek listing in international indexing services including DOAJ. Results should also be of interest to university research managers and libraries as they provide guidance for researchers on venues to publish research. Researchers especially those looking for local publication venues could find this study useful.

6.2.2 Publication II

Open Sesame? Open access priorities, incentives, and policies among higher education institutions in the United Arab Emirates.

This study was co-authored with Mikael Laakso.

The main objective of this study was to explore the role of higher education institutions (HEIs) in the UAE OA uptake and to provide a chance to reflect on the ongoing international initiatives pushing for universal adoption of OA to research. Furthermore, this study contributed to meeting the objectives of the thesis as it looks at one of the major stakeholders in scholarly communication. An analysis of the state of OA in a country would not be complete without looking at funders, researchers, policies, and incentives as enablers of transition to OA.

To look closely at the level of current awareness, support, policies, research assessment, incentives, and practices related to scholarly journal publishing among UAE HEIs, particularly in relation to OA publishing, The study used an online survey targeted at UAE higher education institutions research management units. It solicited institutional views on aspects related to OA. The data collection instrument used was a multi-institutional quantitative online survey consisting of 42, mostly close-ended, questions.

Results of the study suggest a low explicit commitment to OA among UAE HEIs as shown by the low number of institutional OA policies and mandates, limited OA funding opportunities, low number of institutional repositories, apparent lack of eagerness to migrate from current subscription models, and mediocre factoring of OA publications for promotion purposes. These anomalies related to the institutional support for OA is intriguing especially when viewed against actual OA outputs. Publication I reported a high OA journal percentage in the UAE and Publication IV found the UAE authors OA output on par with developed countries. This leads one to spiculate that increasing internationalization of research collaboration and desire to publish in high impact prestigious journals transcends the limitations imposed by lack of local supportive policies. However, higher institutional support and engagement with OA is required for a sustainable national academic publishing landscape.

The study is one of the first in the region to look at the institutional approaches, insights, and plans on OA. It, thus, had research implications for this growing global phenomenon that is often discussed through a dual lens of Global North or Global South with countries like the UAE falling between. The study contributed to the debate on the role of HEIs in the transition to OA and in shaping national and regional OA policies. In doing so, it raises several opportunities for future research of regional dimensions similar to the European annual institutional survey on OA and to inform international initiatives about the status of OA in this region. This study is also one of very few if not the only study that touched slightly on UAE science policy and will surely influence future decisions related to institutional and national science and OA policies.

By integrating the practitioners and stakeholders' points of views, this study connects the theoretical to the practical aspects of OA and raises awareness among those involved in research and decision making. A major practical contribution of the present research is that it provides much needed data on the actual views and insights of the HEIs research management units, their everyday preoccupations, and their plans. Another important implication is the need to focus efforts at this level

given that it links directly to national science policy and that it could help mitigate the risks associated with transient researchers.

6.2.3 Publication III

Librarians as gate-openers in open access publishing: A case study in the United Arab Emirates.

This study was co-authored with Tuomas J. Harvainen

The aim of this study was to investigate the level of OA awareness among librarians in the UAE. It also aimed to highlight their role in scholarly communication and specifically in training researchers and patrons on OA policies and mechanisms and on how to access OA resources. In doing so, the study intended to demonstrate how OA has helped reinvent the role of librarians as gate-openers and a driving force behind the eventual success or downfall of the OA movement. More specifically, we wanted to demonstrate what UAE librarians are doing to facilitate users' and researchers' uptake of OA and how their high awareness and perception of OA has contributed to the shift in their role.

This study contributed to the general objective of this thesis since it looked at librarians as key stakeholders that infiltrate all stages of the scholarly communication and thus de facto players in the OA process be it during the production of research, its dissemination, its preservation or during promotion of awareness.

The key research questions this study aimed to answer are: What is the level of OA awareness among librarians in the UAE?; What is the role of UAE librarians in the training of researchers and patrons on OA policies and mechanisms and on accessing OA resources?; How has OA helped reinvent the role of librarians as gate-openers and a driving force behind the eventual success or downfall of the OA movement?; What are UAE librarians doing to facilitate users and researchers' uptake of OA?; How has UAE Librarians high awareness and perception of OA contributed to the shift in their role?

Since the RQs were primarily measuring attitudes, perspectives and perceptions, this study adopted a short quantitative questionnaire as the instrument for gathering the librarians' views and insights. The survey consisted of 21 questions focusing on OA awareness and perception, OA discovery tools, piracy based and academic social networks, OA-related instruction, OA resources integration, and

predatory journals. The survey targeted the UAE librarians who are involved in information literacy, user instruction, and research support.

Results of the survey reveal that the relationships between different stakeholders in scholarly communication have been disrupted by OA. This shift provided librarians with a golden opportunity to re-invent themselves as gate-openers who not only provide access to OA resources but also build capacity in other OA landscape stakeholders. Results show that UAE librarians are aware of OA publishing routes and of predatory journals; they have adopted different instruction methods to educate users on OA resources and OA publishing routes; and they are using and promoting OA resources side-by-side with the traditional subscription-based products. In light of the reported low institutional support for OA reported in Publication II, librarians fail to translate their awareness, expertise and commitment into actions and programs that influence policy and decision making both within their institutions and nationally.

The significance of this study lays in it being one of the first to highlight the gate opener role of librarians in OA. It also provides a rare opportunity for readers of international library journals to be aware of efforts undertaken by their colleagues globally to support the OA movement. Policy level implications of this study lays in librarians being often involved in research related policies development at the institutional level. Therefore, this study could influence decisions on OA policies, predatory publishing, APCs, and self-archiving mandates.

Furthermore, by integrating the practitioners and stakeholders' points of views, this study connects the theoretical to the practical aspects of OA and raises awareness among those involved in research support services and infrastructure. Librarians will be more aware of their pivotal role in scholarly communication and get empowered to support the efforts towards full OA of research. Thus, a major implication for practice stems from our reframing of the role of librarians and as a result empowering them to support the OA movement. As this study is focused on librarians as practitioners, it may also have implications on librarians training programs that would hopefully integrate OA support and dissemination as a key study element. Future studies could easily emulate or build on this study and most importantly adopt our data gathering instrument.

6.2.4 Publication IV

Open access and international co-authorship: a longitudinal study of the United Arab Emirates research output.

This study was co-authored with Mikael Laakso.

The aim of this study was to investigate OA rates in the UAE as it relates to other scholarly communication elements such as share of OA types, local and international co-authorship, journal country, disciplinary differences, and self-archiving venues and versions. The study provided an opportunity to shed light on uncharted areas of OA in the UAE and the region as well as mature methodological approaches to incomplete datasets.

To successfully measure those variables, a longitudinal and national level dataset of articles with at least one UAE-affiliated author was used. Metadata for research articles published over a period of 11 years was extracted from Scopus. Scopus was deemed fit for purpose as it provides detailed metadata and because there is a quasi-total agreement among UAE HEIs and decision makers that Scopus-indexed content is valued and often required for promotion and recognition purposes. Yet, this study involved plenty of data enrichment exercises such as from ISSN Portal, Crossref, Unpaywall, All Science Journal Classification Codes, and manually through publisher websites and web searches.

Results of this study provide novel information on how the national and international journal articles' co-authorship dynamics intertwine. Our results indicate that a higher number of authors and recency of an article are both related to more likelihood of an article being available OA. They also show that the percentage of international research available OA is higher than research with national authors only. Of insignificance in these findings is the rate of OA being connected to the level of inter-continent collaboration. The highest collaboration was recorded with Asia and North America. Yet, the OA rate among articles with co-authors with a European affiliation was the highest. This is probably due to the push among European HEIs and funders to adopt OA and driven by Plan-S and Horizon Europe guidelines. It can be concluded that the UAE is part of the global trend which indicates that co-authored articles are on the rise and that the OA rate is higher among multi-author articles.

Results indicate that articles published in multidisciplinary journals achieved a weighty OA rate of 90% followed by health sciences (55%) and life sciences (50%),

physical sciences (33%) and social sciences and humanities (32%). The highest number of articles were published in the physical sciences.

The study findings also show that even though North American and European journals published the majority of articles with UAE-affiliated researchers, South American journals have achieved the highest OA rate among published articles. This state could be attributed to the bias in Scopus index in terms of journal inclusion and to the long tradition of OA journals in South America. Data on green OA publications indicate that IRs and subject-based repositories are the dominant deposit locations of self-archived OA articles.

This significance of this study lays in its contributions at the methodological, content and OA local perspective levels. This study contributes to integrative method development especially as far as national and longitudinal research is concerned and to help fill the gaps of "fitness to use" in existing data sources metadata. In terms of local context, the study contributes towards better understanding the research landscape behavior of a young country like the UAE. This in turn helps capture how OA is changing globally not only through the Global North and South lenses, but within countries that often fall in-between.

Implications of this study transcend research to influence future science policy directions. UAE decision makers may be called upon to promote inter-continent research collaboration as it is correlated with OA rates.

Limitations of this study emanate from the complexity of data variables associated with inter-continent research collaboration, OA status information, authorship and journal region, and science policies. Future studies are needed to disambiguate some areas of OA research such as investigate the development of specific OA types, pinpoint OA research funding, map science policy developments, use datasets from multiple sources including local journals, and other languages.

6.3 Contextualised Discussion of Findings

The UAE research landscape has specific characteristics that have direct impact on the OA publishing dynamics. Viewing the findings of this study in light of these characteristics is essential for a better understanding of some quasi-contradictory conclusions and statements in research results.

The residency system in the UAE is based on a temporary residence permit that does not culminate into a permanent residence permit or citizenship that is common

in immigrant attracting countries of Western Europe and North America. This results in a high transiency of manpower including researchers. While this should have a negative impact on scholarly output and thus on OA rates and uptake as research needs stability of both funds and workforce, it seems the impact is positive since these researchers may have built better transnational research networks because of their geographical movement. This could also be due to their better understanding of international collaboration mechanisms and benefits. As publication IV shows, the higher the number of co-authors of a work and more geographically collaborative it is, the higher the probability of OA uptake.

It has been observed in this study that unlike in Europe where over 80% of HEIs have an institutional repository (IR) or Canada where the percentage is over 90, the UAE has a weak IR infrastructure. However, this research shows that UAE librarians and libraries are on par with their international counterparts in terms of services related to IRs, awareness of self-archiving practices, and training of users on usage and population of these IRs. Publication IV demonstrates that self-archiving is being used by UAE-affiliated authors with IRs outside the UAE recruiting most self-archived publications. One could easily attribute this to non-UAE co-authors depositing copies in their affiliated IRs. This compensation for weak local IR infrastructure contributed to the country's self-archiving OA rate.

It can be observed from this research that the number of journals published in the UAE as per publication I is disproportionate to the scientific production of the country shown in publication IV. From this perspective, the number of journals is quite high (especially fully OA ones) and warrants a study and analysis of the reasons behind this anomaly. It may just be that the country is attractive to commercial publishers as it is to investors in other economic sectors. A study of publishing behaviours in these journals, editorial practices, editorial board composition, who publishes in these journals, and their funding models will shed light on this observation.

In light of the absence of a national index of articles and the coverage gaps in international bibliographic indexes such as WoS and Scopus, there is a need for different integrative methodological approaches to analyse the scholarly communication ecosystem of the UAE. This is especially important given that a lot of Arabic language content falls outside the inclusion and coverage of these indexes. The perceived absence of prioritization of filling this indexing gap has disfavoured a lot of researchers who publish in local languages, in local publications, and in subjects of local nature. This, in turn, led to a monopolar view to evaluation of

research output resulting in almost all UAE HEIs adopting Scopus as the main reference for researcher evaluation metrics.

One other characteristic of the UAE research landscape is the absence of a clear-cut science policy. The UAE has released many agendas and strategies related to science, research, and innovation in recent years. These may have an indirect impact on research output. However, these fragmented agendas cannot substitute a proper science policy. Noteworthy also is the absence of explicit texts related to OA. This absence of a central government overarching policy is cascaded down to HEIs where OA mandates and policies are scarce.

6.4 Implications for Practice, Education and Future Research

In this study, we have sought to address several research questions related to the state of OA in the UAE. The questions addressed the issue from angles of journals, practitioners (librarians and research management offices), and article output. In this section we present what we believe are the implications of this study on research, practice, education, and policy.

6.4.1 Practice

Our main aim in this study was to draw a 360-degree view of OA in the UAE and to fill an evident research gap thereof. In doing so, we have reported on the practices of HEIs, researchers, librarians and publishers. Accordingly, a number of practical implications can be deduced from this research.

The first practical contribution of this study is that it provides empirical data on the scholarly journals publishing state in the UAE and their inclusion in bibliographic indexes. By shedding light on the quasi absence of local journals in DOAJ, this study could influence practices of these journals and motivate them to seek listing in international indexing services including DOAJ. These results should also be of importance to HEIs research managers and librarians as they provide guidance for researchers on or evaluate appropriate venues to publish research. Researchers especially those with a local content focus or looking for Arabic language publication venues often not listed in international indexes will find some help in this study.

By integrating the practitioners and stakeholders' points of views, this study connects the theoretical to the practical aspects of OA and raises awareness among

those involved in research and decision making. For example, publication II provides much needed data on the actual views and insights of the HEIs research management units, their everyday preoccupations, and their plans. An important implication of this is the evident need to focus efforts at this level given that it links directly to national science policy. Having shown that there is a correlation between increased co-authorship and openness, publication IV will influence the researchers' and research management offices' decisions to boost their international collaborations. This can help mitigate the risks associated with the transient nature of researchers in the UAE.

Publication III has similarly connected the theoretical to the practical aspects of OA and raises awareness among those involved in research support services and infrastructure as it integrates the librarians' points of view. Librarians will likely become more aware of their pivotal role in scholarly communication, and this empowers them to support efforts geared towards research transition to full OA. Thus, a major implication for practice stems from our reframing of the role of librarians as catalysts of the OA movement. As this study is focused on librarians as practitioners, it may also have implications on librarians training programs that would hopefully integrate OA support and dissemination courses.

6.4.2 Research

This study, being one of the first dedicated to the subject of OA in the UAE, raises several opportunities for further and future research. Yet, the research has contributed greatly to research on OA. First, by focusing on the local landscape of a country that is often classified neither under the Global North nor the Global South, this study contributes to a large global body of research on OA and provides grounds for a better understanding of local and regional unique characteristics.

By adopting a research approach in publication II similar to the annual European HEIs institutional OA survey, it shows that this methodology could be extended to other countries and regions to establish comparative reports. On the other hand, this study is one of the first to highlight the gate-opener role of librarians in OA. Future studies may emulate or build on this study and adopt its data gathering instrument.

Finally, this study is one of the first to analyse the relationship between inter-continental co-authorship and openness. It will therefore raise opportunities for further and future research in the area of interplay between co-authorship and

openness. Similarly, it will stimulate further research into research funding dynamics and the free-rider phenomenon as international research networks intertwine.

6.4.3 Policy

Of significance to the UAE scholarly communication landscape is the lacunae revealed by this study in areas of overarching science policy and OA policies. Indeed, this study is one of very few if not the only study that touched slightly on UAE science policy and will no doubt influence future decisions on institutional and national policies. Decision makers could take note that there is a need for a UAE science policy as an umbrella for research funding, publishing, infrastructure, regulations, and dissemination. This study may also inspire debates and further research around these areas.

As librarians are often involved in research policy development at the institutional level, this study could influence their adoption of and stance on OA policies, predatory publishing, APCs, and self-archiving mandates. At the HEIs level, this study is also likely to have implications for policy by influencing the push for more collaboration and reward systems for research collaboration. It may for example motivate the integration of intercontinental collaboration and international research networks in future policies on tenure, promotion, and rewards.

6.5 Limitations of the study

This study has a number of limitations. Notwithstanding that the primary focus of publication I was charting the UAE journals landscape, investigation, identification, and exclusion of predatory journals would have made the study more comprehensive. Further follow-up research is needed to fill this gap.

Publication II had a few limitations. The response rate on the survey was limited. One survey does not yield longitudinal data necessary to better measure the uptake of OA in the UAE. Finally, a distinction between scientific disciplines, and a comparison between institutions teaching in English and those teaching in Arabic would have improved the study.

Limitations of publication III are related to the survey as an instrument. It is hard to verify the accuracy of self-reported results. The small size of the sample limits the possibility of a deeper analysis of the different variables. Results of this study cannot

be generalized given the convenience sampling used in the study. Finally, a comparative study on the role of librarians versus the role of other OA players will provide unequivocal verdict on their primordial role.

Further, the articles chosen for publication IV are from one bibliographic source only. Given the often reported shortcomings of bibliographic databases in terms of coverage, the study would have been more comprehensive with an integrative methods approach coupled with deduplication. The articles were in English-language only. The inclusion of Arabic-language articles and articles from other sources would have provided more accurate results. However, this task is quasi-impossible in the absence of a comprehensive bibliographic database of Arabic articles.

6.6 Conclusions

Overall, this doctoral enquiry has produced many findings and attempted to make a contribution to research on OA with a special focus on the UAE. I believe my research has highlighted a few lacunae in the study of OA. Some of these are related to the nature and characteristics of the country being studied and others to do with bibliometric research methods and resources.

The UAE defies the norms increasingly common and sought in high OA adoption countries. First and most important is the absence of an overarching science policy that encompasses and pushes the agenda of open science. Second, an analysis of the situation reveals absence of incentives, scarese OA related policies, pressure to adopt OA, limited OA infrastructure, and scanty OA funding. Yet, plenty of OA journals are produced in the UAE, librarians are aware and support OA practices, and the percentage of OA articles is on par with the rest of the world. Thus, our findings demonstrated a high commitment towards OA from UAE scholarly communication key players such as librarians, journals, research management offices and researchers in spite of apparent leniency at the level of policy and no apparent prioritization of OA adoption.

This research supports also the statement that the resources of bibliographic data used either for journals or articles are flagrantly succinct and draw a distorted image of reality. The study had to resort to manual data collection as well as integrative resource approaches to collect data on journals published in the UAE. Furthermore, plenty of data enrichment was performed to fill the gaps in OA-related metadata coverage in Scopus for our study on UAE research articles output. With persistent

bias against research output from countries outside the Western European and North American axis in bibliographic databases, a significant part of research output is neglected and thus a full picture of the state of OA cannot be drawn.

A significant contribution of this study is the investigation of the link between intercontinental collaboration and openness. The study provides empirical data in support of more international collaboration and coauthorship as there is an evident correlation between its size and OA uptake. In relation to this, the transient workforce including researchers which is supposed to disrupt research output and thus OA adoption seems to have yielded opposite results as researchers seem to be collaborating more with either other researchers at their home base or in countries where they have worked before. It may also be that researchers from a greater number of countries cross paths as a result of this high mobility.

REFERENCES

ACRL. (2003). Principles and Strategies for the Reform of Scholarly Communication 1. American Library Association. Retrieved March 10, 2023, from http://www.ala.org/acrl/publications/whitepapers/principlesstrategies

Al Marzouqi, H., Alameddine, M., Sharif, A., & Alsheikh-Ali, A. A. (2019). Research productivity in the United Arab Emirates: A 20-year bibliometric analysis. *Heliyon, 5*(12), e02819–e02819. https://doi.org/10.1016/j.heliyon.2019.e02819

ALLEA. (2021). Equity in open access: ALLEA statement. Retrieved August 31, 2023, from https://allea.org/wp-content/uploads/2021/10/ALLEA-Statement-Equity-in-Open-Access-2021.pdf

Alpen Capital. (2018). *GCC education industry. Alpen capital report*. Retrieved from https://argaamplus.s3. amazonaws.com/9e55ad53-477f-48f0-b202-2c2f03d6a03d.pdf.

Alperin, J. P. (2022). Article-processing charges weaken open access. *Nature (London)*, *610*(7931), 233–233. https://doi.org/10.1038/d41586-022-03201-w

Anderson, R. (2018). *Scholarly communication : What everyone needs to know.* Oxford University Press.

Babini, D. (2020). Toward a global open-access scholarly communications system: A developing region perspective. in Eve, M. A.and Gray, J. (eds.) *Reassembling Scholarly Communications Histories, Infrastructures, and Global Politics of Open Access*. Massachusetts Institute of Technology Press. https://doi.org/10.7551/mitpress/11885.003.0033

Bailey, C. W. (2007). Open Access and Libraries. *Collection Management, 32*(3–4), 351–383. https://doi.org/10.1300/J105v32n03_07

Balula, A., Leão, D. (2021). Multilingualism within Scholarly Communication in SSH. Aliterature review. *JLIS.it 12*(2):88−98. DOI:10.4403/jlis.it-12672

Banks, D. (2018). Thoughts on publishing the research article over the centuries. *Publications of the Astronomical Society of Australia, 6*(1), 10. https://doi.org/10.3390/publications6010010.

Bell, S., Foster, N.F. and Gibbons, S. (2005). Reference librarians and the success of institutional repositories. *Reference Services Interview, 33*(3), pp. 283 - 290.

Benjamin, M. (1990). The Scholarly Journal: The Learned Society versus the Commercial Publisher. *Learned Publishing*, *3*(3), 179–181. https://doi.org/10.1002/leap/30054

Birn. R. (1965). Le Journal des Savants sous l'Ancien Regime. *Journal des Savants, 1*(1), 15–35. https://doi.org/10.3406/jds.1965.1091

Björk, B. (2017). Gold, green, and black open access. *Learned Publishing, 30(*2), 173–175. https://doi.org/10.1002/leap.1096

Björk, B. (2019), Open access journal publishing in the Nordic countries. *Learned Publishing, 32*: 227-236. https://doi.org/10.1002/leap.1231

Björk, B.-C., Kanto-Karvonen, S., & Harviainen, J. T. (2020). How Frequently Are Articles in Predatory Open Access Journals Cited. *Publications (Basel), 8*(2), 17–. https://doi.org/10.3390/publications8020017

Bodo, B. (2016). Pirates in the library—an inquiry into the guerilla open access movement. In *SSRN Electronic Journal. 8th Annual Workshop of the International Society for the History and Theory of Intellectual Property*. University of Glasgow, UK. doi:10.2139/ssrn.2816925

Bohannon, J. (2013) Who's Afraid of Peer Review? *Science*, 04 Oct 2013. DOI: 10.1126/science.342.6154.60

Borrego, Á., Anglada, L., & Abadal, E. (2021). Transformative agreements: Do they pave the way to open access? *Learned Publishing, 34*(2), 216–232. https://doi.org/10.1002/leap.1347

Bosch, S., Albee, B. and Romaine, S. (2022). Are we there yet? Periodicals price survey 2022. *Library Journal*, April 14. https://www.libraryjournal.com/story/Are-We-There-Yet-Periodicals-Price-Survey-2022

Bosch, S., and Henderson, K. (2013). The Winds of Change: Periodicals Price Survey 2013. *Library Journal*, April 25. https://www.libraryjournal.com/story/the-winds-of-change-periodicals-price-survey-2013

Boufarss, & Laakso, M. (2020). Open Sesame? Open access priorities, incentives, and policies among higher education institutions in the United Arab Emirates. *Scientometrics, 124*(2), 1553–1577. https://doi.org/10.1007/s11192-020-03529-y

Buranyi, S. (2017, June 27). Is the staggeringly profitable business of scientific publishing bad for science? *The Guardian*. Retrieved from

https://www.theguardian.com/science/2017/jun/27/profitable-business-scientific-publishing-bad-for-science

Butler, D. (2013). Investigating journals: The dark side of publishing. *Nature, 495*(7442), 433–435. https://doi.org/10.1038/495433A

Byrne,D. (2017). Philosophy of Research. *Project Planner*. 10.4135/9781526408495.

Cantrell, & Swanson, J. A. (2020). Funding Sources for Open Access Article Processing Charges in the Social Sciences, Arts, and Humanities in the United States. *Publications (Basel)*, *8*(1), 12–. https://doi.org/10.3390/publications8010012

Carlson, S. (2015). An assessment of institutional repositories in the Arab world. *D-Lib Magazine, 21*(5). https://doi.org/10.1045/may2015-carlson

Carlson, & Pope, B. M. (2009). The "Big Deal": A Survey of How Libraries Are Responding and What the Alternatives Are. *The Serials Librarian, 57*(4), 380–398. https://doi.org/10.1080/03615260903206861

Case, M. (2008). Partners in Knowledge Creation: An Expanded Role for Research Libraries in the Digital Future. *Journal of Library Administration, 48*(2), 141–156. https://doi.org /10.1080/01930820802231336

Chan, D., Kwok, C. and Yip, K. (2005). Changing roles of reference librarians: the case of the HKUST institutional repository. *Reference Services Review, 33*(3), pp. 268 - 282.

Clarivate Analytics. (2019). UAE's place in Web of Science research ecosystem report. Retrieved 22 Mar. 2022 from: https://clarivate.com/webofsciencegroup/wp-content/uploads/sites/2/2019/09/WS371049217_ACVR_UAE_USLetter_CMYK_v8_DIGITAL_SMALL.pdf

Crawford W. (2016). 'Trust me': The other problem with 87 % of Beall's lists. http://walt.lishost.org/2016/01/trust-me-the-other-problem-with-87-of-bealls-lists/.

Cronk, L. (2020). Resourcefully: Let's End the Serials Crisis. *The Serials Librarian, 79*(1-2), 78–81. https://doi.org/10.1080/0361526X.2020.1832016

Demir, S. B. (2018). Predatory journals: Who publishes in them and why? *Journal of Informetrics, 12*(4), 1296–1311. https://doi.org/10.1016/j.joi.2018.10.008.

Denzin, N. K. & Lincoln, Y.S. (2008). Introduction: the discipline and practice of qualitative research In *Strategies of qualitative inquiry*. 3rd ed. Pp.1-43. Los Angeles: Sage Publications.

Dowler, L. (1997). *Gateways to knowledge: The role of academic libraries in teaching, learning, and research*. Cambridge (Massachusetts: MIT Press.

Duignan, J. (2016). *A Dictionary of Business Research Methods*. Oxford University Press. 10.1093/acref/9780191792236.001.0001

Else, H. (2018b). Europe's open-access drive escalates as university stand-offs spread. *Nature, 557(*7706), 479–480. http://doi.org/10.1038/d41586-018-05191-0

Epstein, K. (2012). "Academic spring" sees widening boycott of elsevier. *BMJ : British Medical Journal (Online), 344* doi:https://doi.org/10.1136/bmj.e1469

ESAC Initiative. (n.d.). Common understanding on APCs. Retrieved January 21, 2023, from https://esac-initiative.org/common-understanding-on-apcs/

ESAC Initiative. (2023). Transformative Agreement Registry. Retrieved March 28, 2023, from https://esac-initiative.org/about/transformative-agreements/agreement-registry/

Eve, M. P. (2015). Co-operating for gold open access without APCs. *Insights, 28*(1), 73 77. doi:https://doi.org/10.1629/uksg.166

Finnish National Board on Research Integrity TENK. (2019). *The ethical principles of research with human participants and ethical review in the human sciences in Finland. Finnish National Board on Research Integrity TENK guidelines 3/2019*. Retrieved from: https://www.tenk.fi/sites/tenk.fi/files/Ihmistieteiden_eettisen_ennakkoarvioinnin_ohje_2019.pdf.

Fletcher-Etherington, A. (2022). *Science policy: what, why and how*. Ukri.org. Retrieved 22 June 2022, from https://www.ukri.org/blog/science-policy-what-why-and-how/.

Fredriksson, E. H. (2001). *A Century of Science Publishing: A Collection of Essays*. IOS Press.

Fyfe, A. and Coate, K. and Curry, S. and Lawson, Stuart and Moxham, N. and Røstvik, C.M. (2017) Untangling academic publishing: A history of the relationship between commercial interests, academic prestige and the circulation of research. Discussion Paper. University of St Andrews. Retrieved March 10, 2023, from https://eprints.bbk.ac.uk/id/eprint/19148/1/UntanglingAcPub.pdf

Fyfe, A; Moxham, N; McDougall-Waters, J; Røstvik, C; (2022) *A History of Scientific Journals: Publishing at the Royal Society 1665-2015.* [Book]. UCL Press: London, UK. Retrieved March 10, 2023, from https://discovery.ucl.ac.uk/id/eprint/10156072/1/A-History-of-Scientific-Journals.pdf

Garfield E. (2006). The history and meaning of the journal impact factor. *JAMA, 295*(1), 90–93. https://doi.org/10.1001/jama.295.1.90

Gargouri, Y., Hajjem, C., Larivie`re, V., Gingras, Y., Carr, L., Brody, T., et al. (2010). Self-selected or mandated, open access increases citation impact for higher quality research. *PLoS ONE, 5*(10), e13636.

Gasparyan, A. Y., Yessirkepov, M., Duisenova, A., Trukhachev, V. I., Kostyukova, E. I., & Kitas, G. D. (2018). Researcher and Author Impact Metrics: Variety, Value, and Context. *Journal of Korean Medical Science, 33*(18), e139–e139. https://doi.org/10.3346/jkms.2018.33.e139

GFH. (2016). *GCC education: Sector report*. Retrieved from: https://www.gfh.com/wp-content/uploads/ GFH-Education-Sector-Report.pdf.

Ginsparg, P. (2009). The global village pioneers. *Learned Publishing, 22*(2), 95-100. doi:10.1087/2009203

Greyson, D., Morgan, S., Hanley, G., & Wahyuni, D. (2009). Open access archiving and article citations within health services and policy research. *Journal of the Canadian Health Libraries Association, 30*(2), 51–58.

Gross, & Gross, E. M. (1927). College Libraries and Chemical Education. *Science (American Association for the Advancement of Science), 66*(1713), 385–389. https://doi.org/10.1126/science.66.1713.385

Gulf News (2017). *UAE launches National Strategy for Higher Education 2030*. Retrieved from: https:// gulfnews.com/uae/education/uae-launches-national-strategy-for-higher-education-2030-1.2097191.

Gusenbauer, M. (2022). Search where you will find most: Comparing the disciplinary coverage of 56 bibliographic databases. *Scientometrics, 127*(5), 2683–2745. https://doi.org/10.1007/s11192-022-04289-7

Harnad, S. (2010). Gold Open Access Publishing Must Not Be Allowed to Retard the Progress of Green Open Access Self-Archiving. *Logos (London, England), 21*(3-4), 86–93. https://doi.org/10.1163/095796511X559972

Harnad, S., & Brody, T. (2004). Comparing the impact of open access (OA) vs. non-OA articles in the same journals. *D-lib Magazine, 10*(6), Retrieved from: http://www.dlib.org/dlib/june04/harnad/06harnad.html.

Hinchliffe, L. J. (2019, April 23). Transformative Agreements: A Primer. *The Scholarly Kitchen*. Retrieved from: https://scholarlykitchen.sspnet.org/2019/04/23/transformative-agreements/

Hood, W. W. & Wilson,C. S. (2003). Informetric studies using databases: opportunities and challenges. *Scientometrics, 58*, 587–608. https://doi.org/10.1023/B:SCIE.0000006882.47115.c6

Howell, K. E. (2013). *Empiricism, positivism and post-positivism*. SAGE Publications Ltd, https://dx.doi.org/10.4135/9781473957633

Ibrahim, H., Elhag, S. A., Elnour, S. M., Abdel-Razig, S., Harhara, T., & Nair, S. C. (2022). Medical Resident Awareness of Predatory Journal Practices in an International Medical Education System. *Medical Education Online, 27*(1). https://doi.org/10.1080/10872981.2022.2139169

Ilva, J. (2018). Looking for commitment: Finnish open access journals, infrastructure and funding. Insights - *The UKSG Journal*, 31. https://doi.org/10.1629/uksg.414

Jisc. (2022a). *SHERPA/Juliet*. Retrieved from: https://v2.sherpa.ac.uk/view/funder_visualisations/1.html

Jisc. (2022b). *OpenDOAR*. Retrieved from: https://v2.sherpa.ac.uk/view/repository_by_country/

Johnson, R., Watkinson, A. & Mabe, M. (2018). *The STM Report: an overview of scientific and scholarly publishing*—fifth Edition. STM: International Association of Scientific, Technical and Medical Publishers. Retrieved from: https://www.stm-assoc.org/2018_10_04_STM_Report_2018.pdf

Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a Definition of Mixed Methods Research. *Journal of Mixed Methods Research, 1*(2), 112–133. https://doi.org/10.1177/1558689806298224

Johnson, S., & Potluri, R. M. (2020). Are the UAE academic libraries ready to support research 2.0? *Library Philosophy and Practice*, 1-18. Retrieved from: https://libproxy.tuni.fi/login?url=https://www.proquest.com/scholarly-journals/are-uae-academic-libraries-ready-support-research/docview/2446727936/se-2

Kamal, K. (2018). *Education in the United Arab Emirates*. Retrieved from https://wenr.wes.org/2018/08/ education-in-the-united-arab-emirates.

Khanna, S., Ball, J., Alperin, J. P., & Willinsky, J. (2023). Recalibrating the scope of scholarly publishing: A modest step in a vast decolonization process. *Quantitative Science Studies*, In Press. https://doi.org/10.1162/qss_a_00228

Koelblinger, D., Zimmermann, G., Weineck, S. B., & Kiesslich, T. (2019). Size matters! association between journal size and longitudinal variability of the journal impact factor. *PLoS One, 14*(11) doi:https://doi.org/10.1371/journal.pone.0225360

Laakso, M. (2019). Why we need a public infrastructure for data on open access. *Elephant in the Lab*. https://doi.org/10.5281/zenodo.2540472

Laakso, M., Lindman, J., Shen, C., Nyman, L., & Björk, B.-C. (2017). Research output availability on academic social networks: implications for stakeholders in academic publishing. *Electronic Markets, 27*(2), 125–133. https://doi.org/10.1007/s12525-016-0242-1

Laakso, M., Welling, P., Bukvova, H., Nyman, L., Björk, Bo-Christer, & Hedlund, T. (2011). The development of open access journal publishing from 1993 to 2009. *PLoS ONE*. https://doi.org/10.1371/journal.pone.0020961.

Larivière V, Haustein S, Mongeon P (2015) The Oligopoly of Academic Publishers in the Digital Era. *PLoS ONE 10*(6): e0127502. https://doi.org/10.1371/journal.pone.0127502

Lori, N. (2012). Temporary Workers or Permanent Migrants? The Kafala System and Contestations Over Residency in the Arab Gulf States. In *Center for Migrations and Citizenships, Note de l'Ifri,* 1–35. Paris: Ifri. https://www.ifri.org/en/publications/notes-de-lifri/temporary-workers-or-permanent-migrants-kafala-system-and-contestations

Martín-Martín, A., Thelwall, M., Orduna-Malea, E., & López-Cózar, E. D. (2021). Google Scholar, Microsoft Academic, Scopus, Dimensions, Web of Science, and OpenCitations' COCI: A multidisciplinary comparison of coverage via citations. *Scientometrics, 126*(1): 871–906. https://doi.org/10.1007/s11192-020-03690-4

Mavodza, J. (2022). Research Data Management: A review of UAE academic library experience. *Open Information Science, 6*(1), 16–27. https://doi.org/10.1515/opis-2022-0128

McGuigan, G. S. (2004). Publishing Perils in Academe: The Serials Crisis and the Economics of the Academic Journal Publishing Industry. *Journal of Business & Finance Librarianship, 10*(1), 13–26. https://doi.org/10.1300/J109v10n01_03

Mkansi, M., & Acheampong, E. A. (2012). Research Philosophy Debates and Classifications: Students' Dilemma. *Electronic Journal of Business Research Methods, 10*(2), 132–.

Mongeon, P., Paul-Hus, A. (2016). The journal coverage of Web of Science and Scopus: a comparative analysis. *Scientometrics, 106,* 213–228. https://doi.org/10.1007/s11192-015-1765-5

Mukherjee, B. (2010). Changing scenario of scholarly communication: Journals, e-journals and open access journals. In B. Mukherjee (Ed.), *Scholarly communication in library and information services* (pp. 1-37) Chandos Publishing. doi:https://doi.org/10.1016/B978-1-84334-626-5.50001-X Retrieved

from https://www.sciencedirect.com/science/article/pii/B978184334626550001X

Mukherji, P., & Albon, D. (2023). *Research methods in early childhood : an introductory guide.* SAGE.

Nielsen, P., & Davison, R. M. (2020). Predatory journals: A sign of an unhealthy publish or perish game? *Information Systems Journal (Oxford, England), 30*(4), 635–638. https://doi.org/10.1111/isj.12289

Okerson, A. (1996). University Libraries and Scholarly Communication. In R.P. Peek & G.B. Newby (Eds.) Scholarly Publishing: The Electronic Frontier. Cambridge, MA: The MIT Press, p. 190.

Patel, S. (2015). *The research paradigm – methodology, epistemology and ontology – explained in simple language*. https://salmapatel.co.uk/academia/the-research-paradigm-methodology-epistemology-and-ontology-explained-in-simple-language/

Perrault, A. H. (1995). The Changing Print Resource Base of Academic Libraries in the United States. Journal of Education for Library and Information Science, 36(4), 295–308. http://www.jstor.org/stable/40732545

Piwowar, H., Priem, J., Larivière, V., Alperin, J. P., Matthias, L., Norlander, B., Farley, A., West, J., & Haustein, S. (2018). The state of OA: a large-scale analysis of the prevalence and impact of Open Access articles. *PeerJ, 6,* e4375. https://doi.org/10.7717/peerj.4375

ROARMAP. (2020). Browse by country. Retrieved from: https://roarmap.eprints.org/view/country/145.html

Ryan, J. (2017). Unleash power of scientific research to stimulate the UAE knowledge economy. *The National*. Retrieved from https://www.thenational.ae/business/unleash-power-of-scientifc-resea rch-to-stimulate-the-uae-knowledge-economy-1.68716

Scott, R. E. (2017). Open Access Implications for Information Literacy Services, In Smith, K. (ed.) *Open Access and the Future of Scholarly communication*. Lanham: Rowman & Littlefield.

Shehata, A. M. K., & Elgllab, M. F. M. (2018). Where Arab social science and humanities scholars choose to publish: Falling in the predatory journals trap. *Learned Publishing, 31*(3), 222–229. https://doi.org/10.1002/leap.1167.

Shen, C., & Björk, B. C. (2015). Predatory" open access: A longitudinal study of article volumes and market characteristics. *BMC Medicine, 13*(1), 230–245. https://doi.org/10.1186/s12916-015-0469-2.

Smith, R. (2018). The business of academic publishing: “a catastrophe.” *The Lancet (British Edition)*, 392(10154), 1186–1187. https://doi.org/10.1016/S0140-6736(18)32353-5

Solomon, D.J. and Björk, B.-C. (2012), A study of open access journals using article processing charges. *J Am Soc Inf Sci Tec,* 63: 1485-1495. https://doi.org/10.1002/asi.22673

Stewart, A. (2020). Transformative Agreements and the immediate future of Open Access. *Physiology News, Spring 2020*, 12–13. https://doi.org/10.36866/pn.118.12

STM. (2021). STM Global Brief 2021 – Economics & Market Size. Retrieved from https://www.stm-assoc.org/wp-content/uploads/2021_10_19_STM_Global_Brief_2021_Economics_and_Market_Size-1.pdf

Suelzer, E.M., Jackson, J.L. (2022). Measures of Impact for Journals, Articles, and Authors. *J GEN INTERN MED 37*, 1593–1597 (2022). https://doi.org/10.1007/s11606-022-07475-8

Swan, A. (2012). *Policy guidelines for the development and promotion of open access*. UNESCO. Retrieved 19 Oct. 2021 from: https://unesdoc.unesco.org/ark:/48223/pf0000215863/PDF/215863eng.pdf.multi

Tananbaum, G. (2013). Article-Level Metrics: A SPARC Primer. Retrieved 14 Nov. 2022 from: https://sparcopen.org/wp-content/uploads/2016/01/SPARC-ALM-Primer.pdf

Taubert, N, Hobert, A, Fraser, N, et al. (2019) Open access: Towards a non-normative and systematic understanding. Retrieved from: https://arxiv.org/abs/1910.11568

Teixeira da Silva, J. A., & Kimotho, S. G. (2022). Signs of divisiveness, discrimination and stigmatization caused by Jeffrey Beall’s “predatory” open access publishing blacklists and philosophy. *The Journal of Academic Librarianship, 48(*3), 102418–. https://doi.org/10.1016/j.acalib.2021.102418

Thomes, K., & Clay, K. (1998). University Libraries in transition. *ASEE Prism, 7*(8), 26–29. http://www.jstor.org/stable/24157079

UAE Government Portal. (2022). National Strategy for Higher Education 2030. Retrieved from: https://u.ae/en/about-the-uae/strategies-initiatives-and-awards/federal-governments-strategies-and-plans/national-strategy-for-higher-education-2030

UAE Government Portal. (2022). The Research and Development Governance Policy. Retrieved from: https://u.ae/en/about-the-uae/science-and-technology/the-research-and-development-governance-policy

UAE PMO. (2014). UAE vision 2021. Retrieved from https://www.vision2021.ae/en.

UAE PMO. (2015). UAE national innovation strategy. Retrieved from https://www.moei.gov.ae/assets/download/1d2d6460/National%20Innovation%20Strategy.pdf.aspx.

UAE PMO. (2021). Share of the UAE nationals in the workforce. Retrieved from https://www.vision2021.ae/en/national-agenda-2021/list/card/share-of-uae-nationals-in-the-workforce

Van Noorden R. (2010). Metrics: A profusion of measures. *Nature, 465*(7300), 864–866. https://doi.org/10.1038/465864a

Van Weijen, D. (2012). The language of (future) scientific communication. *Research Trends, 31*, 7–8.

Wang, X., Liu, C., Mao, W., & Fang, Z. (2015). The open access advantage considering citation, article usage and social media attention. *Scientometrics, 103*(2), 555–564. https://doi.org/10.1007/s11192-015-1547-0

Ward, M., & Lavoie, J. (2016). A library-publisher partnership for open access: building an innovative relationship between scholarly publishers and academic libraries. *LIBER Quarterly, 25*(4), 189–204. DOI: http://doi.org/10.18352/lq.10139

West, J. D., Bergstrom, T., & Bergstrom, C. T. (2014). Cost effectiveness of open access publications. *Economic Inquiry, 52*(4), 1315+. https://link.gale.com/apps/doc/A385797618/ITOF?u=tampere&sid=bookmark-ITOF&xid=ea494413

Williams, C. (2019). *Books: The most underrated form of scholarly output?* Retrieved 19 Oct. 2021 from: https://www.altmetric.com/blog/books-the-most-underrated-form-of-scholarly-output

Williamson, K., & Bow, A. (2002). *Research methods for students, academics and professionals: information management and systems* (Second edition.). Centre for Information Studies.

World Bank Group. (2022). Research and development expenditure (% of GDP) - United Arab Emirates. Retrieved from: https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=AE

Zhao, Y., & Zhao, R. (2014). Evolution of the Development of Scientometrics. In *iConference 2014 Proceedings* (p. 905– 912). https://www.ideals.illinois.edu/items/47364

APPENDICES

Appendix A Status of Open Access in the UAE - multi-institutional survey

Appendix 1

Status of Open Access in the UAE - multi-institutional survey

Definition of Important Terms

Institutional Repository (IR) – a digital repository established by a university or other research institution in which members of its community would deposit their digital format scholarly materials such as journal articles, reports, and theses. IRs facilitate wider dissemination of this work and help showcase the institution's research activities.

Article processing charges (APCs) – the fees charged by publishers and paid by authors or their funders to make their work available free online in a fully open access or hybrid journal.

Altmetrics – metrics used as an alternative to citation metrics. Altmetrics track and count the mentions of research results in mainstream social media, news websites and social bookmarking sites. In altmetrics usage features such as the number of views, discussions, followers, shares, and downloads are recorded.

Open Access – in its basic form, open access is the practice of disseminating peer-reviewed scholarly research broadly and freely online without restrictions apart from the right to be cited.

Open Access Journal – academic or scholarly journals which open access to their articles online at no cost to the readers.

Hybrid open access – In this publishing model, authors publish an article in a subscription journal but choose to provide immediate free access to their article by paying a publication fee.

Research data management – part of the research process that deals with organizing and managing data throughout the research cycle. This involves data creation, organization, storage, and sharing. Proper research data management facilitates collaboration and the creation of new research from existing data.

Predatory journals – exploitative journals that charge authors to publish their articles open access. They can be identified by a combination of these characteristics: lack of peer-review, deceptive, lacking transparency, demonstrating poor quality standards, demonstrating unethical research or publication practices, no clear contacts, and dubious editorial practices to guide publication decisions.

Scholarly communications – all the methods used by researchers and scholarly content creators to inform their peers of their accomplishments. This may take the form of monographs, articles, conference papers, reports, websites, emails or mailing lists. The scope of scholarly communication extends to peer review and preservation of scholarly output.

Read and publish – new subscription agreements negotiated between some institutions or consortia and publishers stipulating the payment of subscriptions by the institution (or consortium) but with a commitment by the publishers to make all the articles by authors from those institutions available open access immediately upon publication.

Status of Open Access in the UAE - multi-institutional survey

General

This section includes a few general questions that will help us relate the survey findings to some simple HEI characteristics

1. Institution

Please enter the name of your institution here. Institution names will only be used for verification purpose and demographic grouping of responses and will not be mentioned in the context of any specific results in the eventual publications based on the research.

2. Job title

Please enter your job title. Job titles will only be used for verification purpose and demographic grouping of responses.

* 3. What is the size of the researchers' population at your institution?

- Fewer than 20
- 20-50
- 50-100
- More than 100

* 4. Is your university public or private?

- Public
- Private
- Other (please specify)

Status of Open Access in the UAE - multi-institutional survey

Scholarly Publishing

This section asks questions about the state of scholarly publishing and open access at your institution

5. Approximately, how many scholarly articles have been published by all your researchers in the last 12 months in…

Open access journals	
Subscription-based journals	

6. Does your institution publish a peer-reviewed journal of its own?

- ○ Yes
- ○ No

Status of Open Access in the UAE - multi-institutional survey

* 7. Is this peer-reviewed journal (journals) published by your institution open access?

- ○ Yes
- ○ No
- ○ Other (please specify)

8. Approximately, what percentage of your staff publications are published in non-English-language journals?

* 9. Please indicate which of the following strategies to increase research productivity have been adopted in your institution? Please select any that apply.

- ☐ Recruit faculty members who have extensive research experience
- ☐ Allocate time for faculty to work on internal and external research projects
- ☐ Create research centers in different disciplines
- ☐ Provide research related training and professional development
- ☐ Organize conferences and symposiums
- ☐ Establish a publication support unit
- ☐ Establish a researcher reward program
- ☐ Link promotion with publication records
- ☐ Setup research teams
- ☐ Integrate research components in the curriculum to stimulate students contribution in research activities
- ☐ Encourage institutional, national and international collaboration
- ☐ We do not have any particular strategies to increase research productivity

* 10. What do you perceive to be the preferred/encouraged publication channels at your institution?

	Essential	High priority	Medium priority	Low priority	Not a priority
International English language journals	○	○	○	○	○
International Arabic language journals	○	○	○	○	○
Local English language journals	○	○	○	○	○
Local Arabic language journals	○	○	○	○	○
Scopus or Web of Science indexed journals	○	○	○	○	○

Status of Open Access in the UAE - multi-institutional survey

Open Access, Policies, and Mandates

This section asks questions about your institution's open access policies.

* 11. How familiar are you with the term “Open Access” as applied to research? Please choose *only one* of the following:

- ○ Never heard of it
- ○ Heard of it but don’t know what it means
- ○ Have some idea of what it means
- ○ Have a clear idea of what it means
- ○ I am an expert in open access

12. How is open access perceived by the following staff members at your institution?

	High importance	Moderate importance	Low importance	Not applicable
Early-stage researchers	○	○	○	○
Established Researchers	○	○	○	○
Leading Researchers	○	○	○	○
Institutional leadership	○	○	○	○
Librarians	○	○	○	○

13. If your research administration office perceives any barriers to Open Access at your university, please name up to three.

* 14. Does your institution have an Institutional policy on open access to research publications?

- ○ Yes
- ○ My institution is in the process of developing an Open Access policy (and expects to have one in place within 12 months)
- ○ My institution is planning to develop an Open Access policy (but does not expect to have a policy in place within 12 months)
- ○ My institution is not planning to develop an Open Access policy

Status of Open Access in the UAE - multi-institutional survey

15. Please indicate what are the main elements of your open access policy to research publications. (Please select all that apply)

- [ ] Encouragement policy, recommending researchers to deposit publications in an institutional/shared repository
- [ ] Awareness raising, including training for early-stage researchers on open access to research publications
- [ ] Financial support for researchers to publish their papers in open access
- [ ] Mandate: researchers deposit publications in a repository and make full text open-access within a specified time period
- [ ] Mandate: researchers deposit publications in a repository, this requirement being linked to internal performance evaluation
- [ ] Mandate: researchers deposit publications in a repository, this requirement being linked to an external, national review procedure
- [ ] Mandate requiring publication in open access (gold route/gold open access)

16. Please indicate what are the main motives for implementing an open access policy to research publications at your institution?

- [ ] Increasing institutional visibility
- [ ] Higher research impact
- [ ] Greater public engagement
- [ ] Unlocking knowledge to the whole world
- [ ] Long-term cost-effective access to research findings
- [ ] Receiving more funding
- [ ] Other (please specify)

* 17. Open access (OA) is growing as an alternative to subscription-based access to research. How are subscriptions and open access models perceived in your institution? (select the one that fits best)

- ( ) We are satisfied with the current subscription-based access model and open access is not a priority for us
- ( ) We are satisfied with the current access model, but endorse open access
- ( ) We are not satisfied with the current subscription-based access model and made open access a priority
- ( ) We are not satisfied with the current subscription-based access model, but open access is not a priority for us
- ( ) Other (please specify)

Status of Open Access in the UAE - multi-institutional survey

Funding and Article Processing Fees

This section includes a few questions about funding open access to research results.

* 18. Do you have a formal policy for funding OA publishing?

- ( ) Yes
- ( ) No
- ( ) Under review
- ( ) Other (please specify)

* 19. What funding sources can your researchers draw on to cover article publishing fees?

- [ ] Funds specifically included in research funding
- [ ] Indirect costs administered at faculty/ department level
- [ ] Indirect costs administered centrally
- [ ] Authors own resources e.g. discretionary funds
- [ ] No mechanism to support author pays
- [ ] Other
- [ ] Don't know

Status of Open Access in the UAE - multi-institutional survey

20. Can you share with us your reasons for instituting OA funding? Please check all that apply.

- [ ] Faculty requests
- [ ] Maximises the impact of institution's research
- [ ] Provides incentives for authors to publish open access
- [ ] Fosters experimentation with new initiatives
- [ ] Supports alternative models of scholarly publishing
- [ ] Supports public access policies
- [ ] Part of campus-wide strategy to promote OA
- [ ] Other (please specify)

* 21. If you have a formal policy for author support in covering OA publishing expenses, what types of publications does it cover? Please check all that apply.

- [ ] All peer-reviewed open access journals
- [ ] Subscription journals offering open access options (hybrid)
- [ ] Open access journals from the Directory of Open Access journals
- [ ] Not applicable
- [ ] OA journals from specific publishers through institutional memberships
- [ ] Other forms of OA publication (please specify)

22. If your institution has paid any article processing fees (APCs), how much did the institution approximately spend on APCs in 2018 and on how many articles?

APC amount in US $

Number of articles

23. If your institution didn't pay any APCs, please indicate if any of the following factors were reasons? Please select any that apply.

- [ ] We don't have a budget to support APCs
- [ ] We perceive OA journals to have poor peer review procedures in place
- [ ] We prefer our researchers to publish in paywalled journals
- [ ] The decision on publishing venue is left to the researchers
- [ ] We believe that paywalled journals have a higher impact
- [ ] We are not familiar with open access publishing venues
- [ ] We perceive OA journals to have lower prestige

Status of Open Access in the UAE - multi-institutional survey

Institutional Repositories (IRs)

Questions in this section cover institutional repositories and self-archiving practices.

* 24. Does your institution have an institutional repository/shared repository?

- Yes, my institution has an institutional repository
- Yes, my institution participates in a shared repository
- No
- I don’t know

Status of Open Access in the UAE - multi-institutional survey

* 25. At your institution, are the following ways of self-archiving research outputs generally...

	Mandated/ Required	Encouraged	Tolerated	Discouraged	Don't know	Not applicable
Institutional repository	○	○	○	○	○	○
Subject-based repository	○	○	○	○	○	○
Author/Project website	○	○	○	○	○	○
Academic Social Networks	○	○	○	○	○	○

26. What department(s) or unit(s) at your university are responsible for the development and maintenance of the Institutional Repository? Please choose *all* that apply:

- [ ] My university does not have an Institutional Repository
- [ ] University IT/Campus computing services department
- [ ] University library
- [ ] Maintenance is contracted out to a commercial firm
- [ ] Not sure
- [ ] Other (please specify)

27. Who is responsible for depositing articles in the institutional repository? (Select all that apply)

- [ ] Author at home institution
- [ ] Lead author at any institution
- [ ] Library
- [ ] Provost's office
- [ ] Department/ college
- [ ] Other
- [ ] Not applicable

28. How important are the following factors in encouraging your researchers to self-archive research publications in a repository (green route/green open access)

	High importance	Moderate importance	Low importance	Not applicable
Maximising the visibility of the research to relevant communities	○	○	○	○
Increasing the number of citations	○	○	○	○
Promoting the work of the researchers	○	○	○	○
Mandatory requirement by funding bodies	○	○	○	○
Providing free access to the broadest possible range of audiences	○	○	○	○
Enabling the re-use of research outputs	○	○	○	○
Facing increasing journal subscription costs	○	○	○	○

29. In your opinion, what are your researchers' concerns about self-archiving publications in a repository (green route/green open access)

	High importance	Moderate importance	Low importance	Not applicable
High priority given to publishing in conventional journals	○	○	○	○
Uncertainty about scientific publishers' self-archiving policies	○	○	○	○
Concerns about the quality of open access publications versus traditional research publication channels	○	○	○	○
Limited awareness of open access and its potential benefits	○	○	○	○
Lack of knowledge of how to deposit material in a repository	○	○	○	○
Lack of administrative support to make research outcomes available via open access	○	○	○	○

Status of Open Access in the UAE - multi-institutional survey

Open Access, Promotions and Tenure

This section addresses publishing and open access as a criteria for promotions.

* 30. Does your institution take publishing records into account for tenure and promotion?

- ○ Yes
- ○ No
- ○ Occasionally

* 31. Which of the following metrics are tracked and valued by your institution?

- ☐ Journal impact factor
- ☐ The H-index
- ☐ Citations to individual articles
- ☐ Altmetrics
- ☐ Other (please specify)

* 32. When considering applications for promotion/tenure, how are articles and books published **open access** viewed in your institution?

- ○ Positive
- ○ Neutral
- ○ Negative

Status of Open Access in the UAE - multi-institutional survey

Incentives for Publishing

In this section, you will be asked a few questions about incentives provided by your institution for researchers to publish in open access journals.

* 33. What are the incentives offered by your institution for researchers to publish their research results?

- [ ] Cash bonuses
- [ ] Salary increments based on publishing performance
- [ ] Extra funding for research
- [ ] Priority in promotion
- [ ] Other (please specify)

* 34. Does your institution provide any incentives to encourage researchers to publish **open access**?

- ( ) Yes
- ( ) No
- ( ) I don't know

* 35. Does your research administration office provide education on Open Access for the university community in any of the following ways? Please choose *all* that apply:

- [ ] Public lectures, information sessions or seminars
- [ ] Lectures, information sessions, or seminars for specific departments or programs
- [ ] Printed materials (e.g., brochures, posters, leaflets) about Open Access
- [ ] Other (please specify)
- [ ] Webpage(s) about Open Access
- [ ] No education on Open Access is provided

36. Are there any particular journal rankings or lists (such as Web of Science, Scopus, ABDC Journal Quality List, Harzing or ABS Journal Guide) that are perceived as important by your institution and incentivises researchers to publish in?

Status of Open Access in the UAE - multi-institutional survey

Predatory journals awareness

The following questions cover awareness of predatory open access journals

* 37. Predatory journals charge authors for publishing their articles open access but provide no substantial peer review or indexing to disseminate research findings truly. Please indicate how familiar you are with this concept?

- Fully knowledgeable
- Fairly familiar, but not in full detail
- I do not have a clear idea

* 38. Discriminating between predatory and legitimate open access journals is:

- Very easy
- Easy
- Somewhat difficult
- Difficult
- Very difficult
- Extremely difficult

* 39. Does your institution exclude publication credits from known **predatory journals** while assessing academic promotion applications?

- Yes
- Yes, if the journal is not listed in Scopus or Web of Science
- No
- We are not aware of predatory journals

* 40. Currently, does your college and or department promotion and tenure committee have a list of journals that are viewed as predatory open access journals?

- Yes
- No
- Not sure

Status of Open Access in the UAE - multi-institutional survey

* 41. Does publishing by a tenure and promotion candidate in a journal on this list influence how their publication is perceived?

- ◯ Yes, it influences how their publication is perceived
- ◯ Not applicable
- ◯ No, it does not influence how their publication is perceived

42. We may wish to follow up on your responses to learn more about how scholarly publishing and OA are managed at your institution. If you are willing to participate, please provide your preferred contact information (phone or email) here

Name	
Institution	
Email Address	
Phone Number	

Appendix B Survey instrument – UAE librarians as gate-openers in OA

Implications of open access for information literacy

Informed Consent

Project title: Implications of open access (OA) for information literacy instruction in the UAE

Who is carrying out the study?
Name of Researcher: Mohamed Boufarss Mohamed.boufarss@tuni.fi
Host Institution: Tampere University, Finland

Purpose of the study: This survey is being conducted by Mohamed Boufarss in preparation for an upcoming conference. The survey explores the state of information literacy and open access practices in UAE higher education institutions. The study will also measure instruction librarians involvement in OA promotion.

What does the study involve? This study involves participants filling out an online survey as instruction or information literacy librarians in the UAE HEIs.

How much time will the study take? The online web-based survey will take approximately 10 minutes to complete.

Confidentiality and results dissemination
Responses to the questionnaire are completely anonymous and confidential. An online survey system using Secure Sockets Layer (SSL) encryption will be used to ensure the safety and confidentiality of data. Results will appear in articles, thesis and possibly in other publications, but individual participants will not be identifiable.

Withdrawal from the study
Your participation in this study is totally voluntary. You can withdraw at any time without any consequences or any explanation simply by pressing the “Exit survey" link.

How do I complete this survey? If you want to proceed to the survey, please press “Next”. You use your mouse to point and click on answers and to make your way through the survey.

NOTE: If you have any complaints or reservations about the ethical conduct of this project, you may contact the researcher:

Mohamed Boufarss
Mohamed.boufarss@tuni.fi
Any issues you raise will be treated in confidence and investigated fully and you will be informed of the outcome.

This information sheet is for you to keep. Please print it.

Definition of Important Terms

Institutional Repository (IR) – a digital repository established by a university or other research institution in which members of its community would deposit their digital format scholarly materials such as journal articles, reports, and theses. IRs facilitate wider dissemination of this work and help showcase the institution's research activities.

Article processing charges (APCs) – the fees charged by publishers and paid by authors or their funders to make their work available free online in a fully open access or hybrid journal.

Open Access – in its basic form, open access is the practice of disseminating peer-reviewed scholarly research broadly and freely online without restrictions apart from the right to be cited.

Open Access Journal – academic or scholarly journals which open access to their articles online at no cost to the end user.

Black open access – providing illegal access to pirated pay-walled articles that are not available open access either directly from the publisher of in repositories.

Gold open access – Publishing model based on making publications freely accessible immediately from the moment they are first published in an open access journal.

Green open access – Publishing model based on the author self-archiving a copy of an article published in a subscription journal. Self-archiving provides free access to the article through an institutional or subject repository, or on a website often after an embargo imposed by the publisher.

Hybrid open access – In this publishing model, authors publish an article in a subscription journal but choose to provide immediate free access to their article by paying a publication fee.

Predatory journals – exploitative journals that charge authors to publish their articles open access. They can be identified by a combination of these characteristics: deceptive, lacking transparency, demonstrating poor quality standards, demonstrating unethical research or publication practices, no clear contacts, and dubious publishing fee policies.

Scholarly communications – all the methods used by researchers and scholarly content creators to inform their peers of their accomplishments. This may take the form of monographs, articles, conference papers, reports, websites, emails or mailing lists. The scope of scholarly communication extends to peer review and preservation of scholarly output.

Implications of open access for information literacy

* 1. Your library is associated with a:

- College or technical institute
- University
- Other (please specify)

2. What country is your institution based in?

* 3. What is the size of the student population at your institution?

- Less than 1,000
- 1,000–2,000
- More than 2,000

* 4. What is your job title? .....

* 5. Does your institution have an institutional repository?

- Yes
- No

6. What department(s) or unit(s) at your institution are responsible for the development and maintenance of the Institutional Repository? Please choose *all* that apply:

- [ ] University IT/Campus computing services department
- [ ] University library
- [ ] Maintenance is contracted out to a commercial firm
- [ ] Not sure
- [ ] Other (please specify)

Implications of open access for information literacy

* 7. What open access models are you aware of? (please choose all that apply)

- [ ] Green
- [ ] Gold
- [ ] Black
- [ ] Hybrid
- [ ] None of these

* 8. Are you aware of alternative tools to access Open Access versions of articles such as Unpaywall, Kopernio, OA Button?

- ( ) No
- ( ) Heard of them, but never used them
- ( ) Aware of them and I use them frequently

* 9. In the absence of a subscription-based article, do you primarily suggest for your users to

- ( ) use open access self-archived version of the article
- ( ) find other similar paywalled articles
- ( ) get it through inter-library loan
- ( ) Other (please specify)

* 10. While helping users, have you ever used SciHub or academic social networks such as Researchgate or Academia.edu?

- ( ) Never,
- ( ) Rarely
- ( ) Occasionally
- ( ) Often

Implications of open access for information literacy

* 11. Do you provide instruction on scholarly communication (e.g., open access publishing or open education resources)?

- ( ) Yes
- ( ) No

12. Which education methods do you use when educating users about OA?

- [ ] Individual education
- [ ] Information on library's website
- [ ] Seminars or workshops organized by library
- [ ] Publishing handbooks on OA
- [ ] Posts on social networking sites
- [ ] Lectures for students
- [ ] Webinars organized by library
- [ ] Conferences organized by library
- [ ] Not applicable

Implications of open access for information literacy

13. Please rank the following OA skills from most interesting (1) to least interesting (10) for your users?

Finding OA information

Understanding OA citation advantage

Evaluating OA journals

Copyright and licensing

Strategies to achieve OA

Identification of questionable publishers

Identification of different versions of papers in OA

Self-archiving

Definitions of OA

Altmetrics

* 14. In your opinion, how do open access articles compare to paywalled articles?

- ( ) OA articles are of lower quality
- ( ) OA articles are as good as paywalled articles
- ( ) OA articles are better than paywalled articles

* 15. Have you integrated open access resources in your instruction material?

- [ ] Yes, users are made aware of open access resources
- [ ] Yes, researchers are also encouraged to self-archive their articles or choose Gold open access publishing
- [ ] No, we have not integrated OA resources in our instruction material

* 16. Are you aware of predatory journals?

- [ ] No. I have never heard of this concept
- [ ] Yes. I am familiar with the concept
- [ ] Yes, and I am aware of mechanisms to recognize them
- [ ] Yes, and our users are instructed on how to detect them

* 17. In your opinion, what are the challenges brought about by Open Access for information literacy specialists?

- [ ] Having to learn new information searching tools and methods
- [ ] Difficulty of sifting reputable from predatory journals
- [ ] Convincing users of the quality of OA articles
- [ ] Integration of OA resources in IL instruction
- [ ] Insistence of faculty on paywalled articles and old ILL mechanisms
- [ ] Fear of copyright infringement

* 18. Does your library perform any of the following activities in support of Open Access publishing? Please choose *all* that apply:

- [ ] Utilize the Directory of Open Access Resources (DOAJ), BioMedCentral, or PubMedCentral to identify Open Access resources to put in the catalogue or similar finding aid?
- [ ] Visibly identify resources in the catalogue or other discovery tools as Open Access resources?
- [ ] Hold a membership to one or more Open Access organizations (e.g., Public Library of Sciences, Hindawi, BioMed Central, SPARC)
- [ ] Feature information about Open Access on the library's homepage or from one level below the homepage?
- [ ] Host Open Access journals?
- [ ] None of the above
- [ ] Other (please specify)

* 19. In your view, which of the following are part of your library's mandate? (Please choose *all* that apply)

- [ ] Educate researchers about Open Access in general
- [ ] Educate researchers about the Open Access policies of the funding bodies to which they may be applying for grants
- [ ] Help researchers with funding to pay Open Access publication fees
- [ ] Help researchers learn how to archive copies of their work so that it is Openly Accessible
- [ ] Make sure researchers have complied with funders' Open Access policies
- [ ] Use Open Access to promote the research conducted at your University
- [ ] None of these are within our mandate
- [ ] Other (please specify)

20. We may wish to follow up on your responses to learn more about Open Access at your institution. If you are willing to participate, please provide your preferred contact information (phone or email) here

Name	
Institution	
City/Town	
Email Address	
Phone Number	

PUBLICATION I

Charting the Open Access scholarly journals landscape in the UAE

Mohamed Boufarss

Scientometrics, 122, 1707-1725
https://doi.org/10.1007/s11192-020-03349-0

Scientometrics (2020) 122:1707–1725
https://doi.org/10.1007/s11192-020-03349-0

Charting the Open Access scholarly journals landscape in the UAE

Mohamed Boufarss[1]

Received: 17 October 2019 / Published online: 25 January 2020

Abstract
The purpose of this study is to chart the scholarly journal landscape in the UAE in order to provide a scientific perspective on research productivity, distribution, and access in the country and lay the foundations for further research in this area. The study aims also to contribute to research endeavoring to paint a global picture of scholarly publishing. We carried out a mapping of scholarly journals published in the UAE compiled from international and local sources. The resulting journal list was studied focusing on the share of OA titles, language of publication, discipline, and type of publisher. Our results show that: (1) 534 journals are published in the UAE and that the share of OA is quite noteworthy with about 64% of all online journals; (2) the APC-based OA model is prevalent with around 75% of OA journals levying a publication fee; (3) UAE journals are predominantly in English while the number of Arabic-language journals is marginal; (4) science, technology and medicine prevail as the most prevalent subject areas of the journals; and (5) commercial publishers control most of the publications especially in the medical field. The study lays a foundation for further studies on scholarly journals in the UAE. The combination of regional indexes and international directories to measure the country's scholarly journal output can also be replicated and built upon for other countries where the major international bibliometric databases do not provide a comprehensive representation of scholarly publishing activities.

Keywords Open Access · Scientific publications · Scholarly publishing · DOAJ · ROAD · Ulrichsweb

Introduction

Research is increasingly playing a pivotal role in the economic and social development of nations, especially as more countries are seeking to shift to the knowledge-economy. In the words of Marginson (2012, p. 18), "Research is a public good that enables other public goods and private goods." Consequently, there is mounting pressure on governments to

✉ Mohamed Boufarss
Mohamed.boufarss@tuni.fi

[1] Faculty of Information Technology and Communication Sciences, Tampere University, Tampere, Finland

tap into the opportunities it provides for economic prosperity and well-being of citizens (Macilwain 2010). One way of achieving this is through boosting investments in research universities which are at the center of the global knowledge economy (Altbach 2013).

The UAE higher education system is, by all means, at a fledgling stage. The oldest university, UAE University, was established in 1977. As new entities, the universities in the UAE, along with other countries in the Middle East, have been preoccupied with absorbing the increasing numbers of students (Luescher 2016). The UAE higher education gross enrollment ratio (GER) more than doubled between 2007 and 2016 (Kamal 2018) making it one of the fastest growing in the region (Alpen Capital 2018). Massification of education shifts HEIs' focus from building research capacity to teaching and affects the country's ability to develop a flagship research university. However, Wilkins (2010) asserts that leading UAE universities have recently shown keenness to produce high quality "world-class research". In 2017, the UAE government pledged to boost funding of research as part of the "National Strategy for Higher Education 2030" (Gulf News 2017). This culminated in 2019 with the announecement of a AED 4 billion research and development fund (Sanderson and Khan 2019). *There are signs indicating that these* measures are having an effect on research output. A quick scan of Scival article counts shows that articles by authors with UAE affiliations have increased from about 1977 articles in 2013 to 3753 in 2017.

Research conducted by these university scholars is often expressed as "legitimized scientific and scholarly knowledge, which is published in key journals" (Altbach 2013, p. 8). Because of the unique quality assessment of peer-review, publications in scholarly journals are often considered first-rate scientific knowledge output (Tijssen 2015). With journals being vital instruments for enabling research and its dissemination, they are often at the heart of research assessment debates.

Research assessment relies heavily on publication metrics to measure the international competitiveness of universities and indirectly nations. Meo et al. (2013) argue that bibliometric indicators are essential tools as they quantify the quantity and quality of research output. However, journal indexes and directories that constitute the basis for a country's research productivity assessment and in-depth bibliometric analyses such as the Directory of Open Access Journals (DOAJ), the Directory of Open Access Scholarly Resources (ROAD), Ulrichsweb, Scopus, Web of Science and Scimago are far from exhaustive in capturing all peer-reviewed journals. Almost all these sources tend to be biased towards English language journals (Björk 2019; Mongeon and Paul-Hus 2015). Even in the case of effectively indexed journals, shortcomings in metadata often call for extensive manual data collection in bibliometric studies. However, these international tools have remained central to research assessments as they index many journals and even provide quantitative measures such as impact factors extensively used to assess the impact and quality of research. In a study of research universities in the US and Canada, McKiernan et al. (2019) reveal that impact factors are still widely adopted for academic evaluation.

Until recently, such journal directories and impact measures did not exist in Arab countries. However, attempts are being made regionally to highlight the role of local and non-English language journals in scientific knowledge dissemination. Three noteworthy successful initiatives focusing on Arabic journals are The Arab Impact Factor, Directory of Free Arab Journals, and The Arabic Citations and Impact Factor. Another ambitious project has been recently announced by Elsevier and Association of Arab Universities. It involves hosting an Arab Journals Platform on Elsevier's Digital Commons ("Journals published by Arab…" 2019). Unfortunately, the absence of a reliable national source of essential scholarly publishing data makes the study of OA in the UAE a hard task and justifies the conduct of this journal publishing landscape analysis.

Preliminary scan of some local journals reveals that local institutions tend to publish journals that focus on local issues and priorities. These types of journals, which usually publish and distribute articles at no cost to the author or the reader, are often popular among a close circle of experts and colleagues (Nasser and Abouchedid 2001) resulting in authors becoming visible locally but invisible globally (Hanafi (2011). These journals are also rarely listed in international directories. This may be due to an oversight by the editors of the importance of making their publications visible or failure to meet increasingly demanding inclusion criteria of these indexes and databases as demonstrated by Khalifa (2017). Therefore, these editors miss the opportunity to increase the impact of their journals and to have a wider social and economic impact beyond their proximate environment.

While research on different aspects of journal publishing has been conducted in other parts of the world such as by Björk (2019), Shen (2017), and Wang et al. (2018), no study could be identified on journal publishing in the UAE. Therefore, this study is an important expansion of research on scholarly journal publishing and OA. The more specific research questions are:

How many academic journals are published in the UAE?
In what languages are these journals published?
What is the share of OA journals in the UAE?
What are the subject areas of these journals?

First, this study reviews relevant literature pertaining to the problem being investigated. The literature review covers aspects such as DOAJ as a source of OA data, English versus other languages in scholarly publishing and inclusion of Arab journals in international bibliometric indexes.

Second, we outline the methodology for the study. This involves scanning all major international directories for information on journals published in the UAE, gathering data on existing journals directly using Web searches and browsing HEI websites, and harvesting all titles from any locally or regionally developed directories and lists. The study investigates the different aspects and characteristics of these journals such as language of publication, OA status, subject areas, publication charges, and type of publisher.

The final part of this study summarizes and discusses findings and link them to the regional and global context as well as relevant studies conducted in other countries and areas.

Literature review

Literature on journal scholarly publishing can be perceived to branch out to discuss seven aspects outlined by Wulf and Meadows (2016) namely: publishing ecosystem, publication ethics, publishing business model, peer review, metrics, tools, and licenses. In an increasingly global journal publishing ecosystem, other aspects such as local languages are also discussed. Research pertaining to scholarly publishing ecosystem often brings into play stakeholders such as libraries, publishers and scholars. Publishing business model literature, on the other hand, addresses questions of publication cost, funders, OA models and associated mechanisms. For the sake of staying within the scope of this study, we will review only research related to some of these elements such as language of publication, metrics, indexing tools, OA, and publication fees.

Scholarly journals in the Arab World

While *Journal des Sçavans,* which started publication in 1665, was the first publication to be dubbed an academic journal (Banks 2018), there is some ambivalence on what constitutes the first scholarly journal in the Arab world. Some claim that Syria spearheaded the Arab scholarly journal publishing with The Transactions of The Syrian Society of Arts and Sciences in 1852 (Salisbury 1853). Others believe it was *Ya'sub* medical journal from Egypt in 1865 (Sidqi 2009). On the other hand, *Al-Muqtataf*, published circa 1876 in Lebanon, was considered by some scholars as the "mother of all Arab scholarly journals" (Badran 2014). The situation in the Gulf countries was slightly different as the first "journals" didn't start until the beginning of the 20th century with *Majallat Al-Kuwait* which started in 1929 (Sayed 2015). In the absence of clear data, it can be assumed that the first scholarly journals in the UAE were issued in the beginning of the 80s after the establishment of the United Arab Emirates University.

Arab scholarly journals have come a long way in the last few decades with a lot of journals converting to online and some even jumping on the OA wagon. There seems also to be an upsurge of studies on the different aspects of Arab scholarly journals. In an overarching study of Arab journals indexed in Scopus and WoS, Abd Al-Mukhtar (2019) states that 484 journals are indexed in Scopus and 62 in Web of Science. In another study looking at the situation in Oman, Jabriyah et al. (2017) identified 11 scholarly journals in the country. Of their many recommendations, they stated that these journals could benefit from technical and financial support such as from the Scientific Research Council. They also noted the need for these journals to join regional and international directories such as DOAJ and DEFAJ. In a study of scholarly communication behavior of social sciences and humanities Arab scholars in Egypt and Saudi Arabia, Shehata and Elgllab (2018) discovered that these scholars tend to publish in predatory journals because it is easier and faster to publish in them. In a slightly different study with similar respondents, Shehata (2019) concludes that the researchers chose to publish in printed journals as the promotion systems seem to favor them over exclusively online publications. He also discovered that the promotion mechanisms shun co-authored research and thus researchers tend to collaborate less with other international authors. Furthermore, he states that these researchers rely on Arabic resources to back their research. However, it can be argued that the creation of the Directory of Free Arab Journals (DFAJ) in 2013, the Arab Impact Factor in 2015, and the Arabic Citations and Impact Factor (ARCIF) in 2016 are key milestones in Arab scholarly publishing as they signal a maturity of the scholarly journals landscape in the Arab World.

Share of OA journals

Even though the concept of OA journals dates back to well before the Internet with some journals being circulated through mailing lists in the 80s (Laakso et al. (2011), the advent of the last ushered in a new era where OA journals have become an integral part of the scholarly publishing landscape. The shift of funding from subscription to other models such as institutional sponsorships and article processing fees did not only motivate the creation of new OA journals but also led some toll-access journals to flip to OA.

Most previous bibliometric studies on the share of OA publications are at the article level (Björk et al. 2010; Laakso and Björk 2012; Archambault et al. 2013, 2014; Piwowar et al. 2018). Therefore, Laakso's et al. (2011) and Fukuzawa's (2017) research on OA

journals, albeit old, remain a reference on the share of these journals. Laakso et al. (2011) revealed a staggering annual progress of 18% in OA journals against an average of 3.5% for all journals between 1993 and 2003. Fukuzawa (2017) asserts that the share of OA journals more than doubled between 2004 and 2012 moving from about 7–15% of all journals. This steady progress in OA has been corroborated by a recent groundbreaking preprint of Piwowar et al. (2019). Based on their findings that about a third of all articles are OA and that these OA articles received more than half of all article views in 2019, they predict a sustained decline of the closed access model with 44% of all articles being available as OA and their share in article views rising to 70% by 2025.

In addition to journals which were started with an OA publishing model from the outset, mounting pressure from scholarly publishing stakeholders such as funders, governments and authors is leading a lot of journals to flip from a subscription-based access to OA (Solomon et al. 2016). Furthermore, this study reveals eight internal major drivers of journals converting to OA. These revolve around an increase in these eight aspects: readership, citation rates, advertising revenue, submissions, financial security, competitiveness, additional external funding, and independence. Interestingly, the number of journals flipping to OA is quite interesting as Solomon et al. (2013) estimated that 53% of OA journals in their sample had flipped to OA.

APC-based Open Access model

Libraries discontent with the toll-access model and the ensuing financially restrictive "big deals" resulted in their revolt against this model (McKenzie 2018). This dissatisfaction has manifested itself in increasing deal cancellations as demonstrated by SPARC (2019) cancellation data and in increasing cases of libraries negotiating the inclusion of OA and article processing charges (APCs) in the same deals (Morais and Borrell-Damián 2019).

The drawbacks of serials bundling into big deals as well as the advent of and success of many OA journals motivated the emergence of the APC-based publishing model. Author-side payments, which were popular among journals in the late 70 s, were reintroduced by some journals with the advent OA (King and Alvarado-Albertorio 2008). It is noteworthy, however, that most OA journals do not charge any publication fees (Crawford 2015; Johnson et al. 2018).

The APC-based OA model is apparently effective. It contributed around 49% of all OA articles in 2011 (Laakso and Björk 2012). Furthermore, the spike in the UK OA output between 2009 and 2016 was attributed to APCs and Gold OA (Larivière and Sugimoto 2018). Other European countries are apparently adopting this model. 40% of EU universities are financially supporting Gold OA (Morais and Borrell-Damián 2019). Moreover, Crawford (2019a) estimated that the global revenue from APCs was over 649 million USD in 2018.

But not everyone believes APC-based OA is a solution. Thibault et al. (2018) and Green (2018) assert that these fees did not solve the serials crisis and that Green OA remains the ultimate solution to boost OA. APC-based publishing was also criticized by Shah and Gul (2013) and Tenopir et al. (2017) as it disadvantages authors who cannot afford APCs especially from developing countries. This concern is shared by Beasley (2016) who believes that APCs constitute a significant economic barrier to stakeholders such as "authors, institutions, funding agencies and governments". Furthermore, there are currently no mechanisms in place to guarantee that APCs are offset by lower subscription costs (Björk and Solomon 2014a, b).

English predomination of scholarly publishing

Different languages, from Sumerian to Greek, Arabic, Latin, and recently French, German and English, have served as the main lingua franca of scholarly communication throughout the ages (Hamel 2007). English has, however, become the de facto language of international science in recent decades (Research Trends 2008; Cianflone 2014). Van Weijen (2012) estimates that around 80% of all journals indexed in Scopus were in English. Banks (2018) has even put the share of English publications at over 90% in 2005. As English is dominant in high ranking international journals, Hamel (2007) made an unequivocal statement that research findings must be published in English if their authors seek recognition from peers.

English hegemony in scholarly publishing is echoed beyond English-speaking countries to encompass speakers of other languages, including Arabic (Al-Aufi 2012). This domination implies that many non-native English speakers have already adopted English for preparing publications (Hamel 2007). In the case of Arab authors, Al-Aufi (2012) cites several reasons. First, adoption of English as a language of teaching science disciplines in most Arab academic institutions resulted in researchers writing in English. Second, Arabic scholarly journals are nonexistent or very limited in some disciplines. Finally, dwindling Arabic publications put pressure on Arabic journals that fail to attract quality research articles and eventually perish. Crawford (2019b) seconds this assumption when he states that dominance of English had an impact on local journals of which the majority have witnessed a shrinkage. Al-Aufi's (2012) respondents have also argued against publishing in Arabic journals because of their lower quality, limited distribution, and little positive impact on job offers or promotions. This Arab scholars' preoccupation with international impact, citations and recognition has been echoed by MoChridhe (2019) who states that due to the "snowball effect of existing impact metrics", non-English language papers will receive less citations.

Even though Arabic has been sidelined by English as the predominant language of science, one can argue along the lines of Hamel (2007) that democratization of science and promoting public debates dictates using local languages. Similarly, Curry and Lillis (2018) warn that this globally spreading trend is a threat to scholarship as it entails "loss of knowledge locally" and shackling the "development of local research cultures and societies more broadly". Van Weijen (2012) asserts that even though English continues to be the preferred language of publishing, a reasonable amount of research especially in the soft sciences is still published in native languages.

Non-native English authors such as Arab scholars are disadvantaged even further as they strive to increase impact and exposure through OA. In making the case against the dominance of English as it relates to OA, MoChridhe (2019) argues that the cost of editing articles often paid by these scholars constitutes another "hidden paywall". These researchers may be compelled to pay extra costs related to translating, proofreading and editing their publications on top of publication fees.

Journal indexes and OA data

DOAJ is often used as a source of data in different bibliometric studies analyzing the share of OA journals. Yet, numerous studies reveal that DOAJ is not a perfect resource for all studies on OA publishing growth. It does not, by design, provide an exhaustive coverage of

all OA journals (DOAJ 2019a, b), and exhibits bias against non-English journals as stated by Björk (2019). Björk (2017) estimates that there were around 20,000 OA journals in 2017 and that only 9000 of those were listed in DOAJ.

However, this limitation is not exclusive to DOAJ. Laakso et al. (2011, p. 2) state that the "lack of comprehensive indexing for both OA journals and their articles" is compelling researchers to use alternative sources and data collection methods. Similarly, a comparative study of WoS and Scopus versus Ulrich's directory by Mongeon and Paul-Hus (2015) unveiled biases in subject and language coverage. They, consequently, cautioned against using these services in comparative studies and called for the development of local and subject-specific indexes. This has been also substantiated by Somoza-Fernández et al. (2018). In their study of The Emerging Sources Citation Index (ESCI), they concluded that it has limitations in terms of geographical and language coverage. Nevertheless, having a comprehensive and inclusive tool would be very *quixotic, to say the least.* For this reason and in the absence of a more comprehensive and inclusive tool, DOAJ remains an invaluable resource. It has helped provide some idea on the global and regional OA journals landscape.

Low presence of journals from the UAE and the Middle East in international indexes and directories may be due to many reasons. Nasser and Abouchedid (2001) alluded to sub-par peer review tradition among Arab scholars as they usually publish through their own institutions' journals without "proper editorial and refereeing process." This was corroborated in a study by Khalifa (2017) which revealed that none of the 6 Arab OA journals he analyzed met the inclusion criteria in Scopus or WoS and only one met the requirements of DOAJ. In a global-scale study of DOAJ listed journals, Crawford (2019b) states that the UAE counts 15 journals in 2018. ROAD ISSN International Centere, on the other hand, lists around 85 UAE OA journals. The Directory of Free Arab Journals (DFAJ), a regional Arab OA journals directory, lists 5 journals under UAE. This huge disparity in reported numbers of UAE OA journals highlights the disparities in indexes inclusion criteria.

Arab journals and impact measures

Bibliometrics can be loosely defined as the quantitative analysis of research literature using citations to measure the scientific impact of journals, institutions and authors. The most popular and widely used bibliometric indicator is the ISI Journal Impact Factor (JIF). This measure of journal quality and prestige was designed to be used by libraries to gauge which journals to subscribe to (Garfield 2006), but gradually became widely established as a proxy for single journal and scholar research quality. Kurmis (2003) and Vanclay (2009) have criticized this limitation of JIF as well as its discipline-related bias and prejudice. These shortcomings could not be rectified by other alternative journal impact measures such as Scimago Scientific Journal Rankings (SJR), Journal Usage Factor (JUF), Source Normalized Impact per Paper (SNIP), and Google h5-index. Altmetrics, introduced later, are meant to address some of the limitations of and compliment these outlet-based bibliometrics by tracking impact and visibility of individual research items through a capture of social media and other web statistics such as likes, shares, mentions, downloads, views and discussions.

In recent years, two local impact factors targeting Arabic language journals have emerged in the Arab world. The Arab Impact Factor was established by the Association of Arab Universities. It released its first annual report in 2015 with only 29 journals. The

Arab Impact Factor uses quantitative and qualitative evaluation criteria such as number of citations, academic originality and quality, editorial board, publication regularity, peer-review, and adherence to scholarly publishing ethics (Kabil 2015).

The Arabic Citations and Impact Factor (ARCIF), however, was established by a commercial publisher, eMarifa. Its first report, released in 2016, included 362 Arabic journals. ARCIF website promises no bias against any discipline but does not disclose how differentiation between disciplines is factored in. One of the objectives it set for itself is to become a reference for improving the international rankings of Arab universities by eliminating bias against them.

The Arab scholarly publishing landscape is expecting a new citation index in 2020. In partnership with Clarivate Analytics, the Egyptian Knowledge Bank will be launching The Arabic Citation Index (ARCI) (Skelton 2018). This tool aims to highlight the research output of the Arab countries especially in the humanities and social sciences which are often neglected in international databases such as ISI and Scopus as well as boost the international rankings of Arab universities (Sawahel 2018).

Methodology

Previous bibliometric studies of scholarly publishing landscapes in national contexts have utilized two distinct approaches. Journal level analyses such as Björk's (2019), and article level studies such as Mikki et al. (2018) and Wang et al. (2018). Notwithstanding their approach, these studies reveal and corroborate the existence of a shortcoming in bibliometrics indexing services as identified by Mongeon and Paul-Hus (2015) and later by Somoza-Fernández et al. (2018). These services' biases in subject, geographical and language coverage limits their effectiveness in comparative studies. In order to overcome these indexing coverage limitations, data for this study was aggregated in line with Björk's (2019) methodology from a combination of local, regional and international sources. While Björk (2019) utilized Scopus as the main international non-OA dedicated source of journals published in the countries of interest, we have used Ulrichsweb which has proven to have more journal indexing coverage than some other indexes as stated by Mongeon and Paul-Hus (2015). This study opted to complement Ulrichsweb data with data from other sources. The following sources were used to extract data on all journals meeting criteria of being a scholarly peer-reviewed journal, active and from publishers registered in the UAE:

- Scimago journal and country Ranking
- Ulrichsweb Serials Directory
- Directory of Open Access Journals (DOAJ)
- Directory of Open Access Scholarly Resources (ROAD)
- SherpaRomeo
- Websites of UAE higher education institutions
- The Arabic Citations and Impact Factor (ARCIF)
- Directory of Free Arab Journals (DFAJ)
- Arab Impact Factor (AIF)
- A general search on Google for any scholarly journals published in the UAE

The data was extracted from all these sources between the months of February and April 2019. After extraction, a couple of non-journal records were removed from the Scimago

data (139 journals). The full data on UAE journals was exported from Ulrichsweb (560 journals). 196 titles of these have ceased publication, are duplicated records, have unclear status or on CD-ROM. The remaining 364 active print and online journals were added to the final collated list. An additional 84 titles were added from ROAD. SherpaRomeo was then browsed for publisher policies revealing a list of 9 OA journals. The list of journals manually collected from DOAJ was 18 journals. Data on another 91 titles was manually collected from HEIs and publishers' websites, ARCIF, DFAJ and AIF. Three titles in print were isolated leaving us with a total of 88 online journals. All data was then collated into one worksheet (696 journals). This list was deduplicated leaving a total of 534 unique journal titles. Metadata collected from all sources, and manually from the journals' websites, when not available, includes ISSN, title, publisher, start year, language, frequency, URL, print versus online status, OA status, APC, and subject area. Figure 1 shows the contribution of each source to the initial dataset as well as title overlaps. "Other sources" includes all the other sources used in this study but not explicitly listed in the Venn diagram.

The final collated list was then filtered to study aspects such as the share of OA journals in the UAE, language distribution, type of publisher (HEI, commercial or governmental publishers), and discipline. In the instances where explicit metadata on these aspects is absent in the source from which data was extracted, a manual verification on the journal website was performed. For discipline analysis, journals were assigned a subject based on the title, metadata from the indexing service or based on the scope of the journal.

Results

Overview of UAE journals

Data collected from the different sources used in this study identified a total of 534 unique titles published in the UAE. Nearly 71% (377) of these were available online.

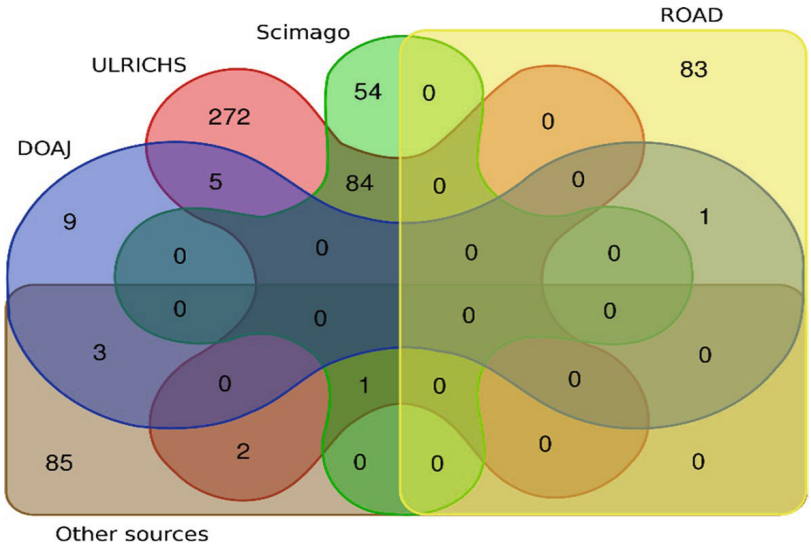


Fig. 1 Journal titles sources overlap and contribution to the dataset. Created with http://bioinformatics.psb.ugent.be/webtools/Venn/

Table 1 Overview of journals in the UAE

Source	All journals	Print	Online	OA
Ulrich's	364	154	210	111
Scimago	139	–	139	35
DOAJ	18	–	18	18
ROAD	84	–	84	84
Others	91	3	88	86
Total	696	157	539	334
Unique titles	534	157	377	240

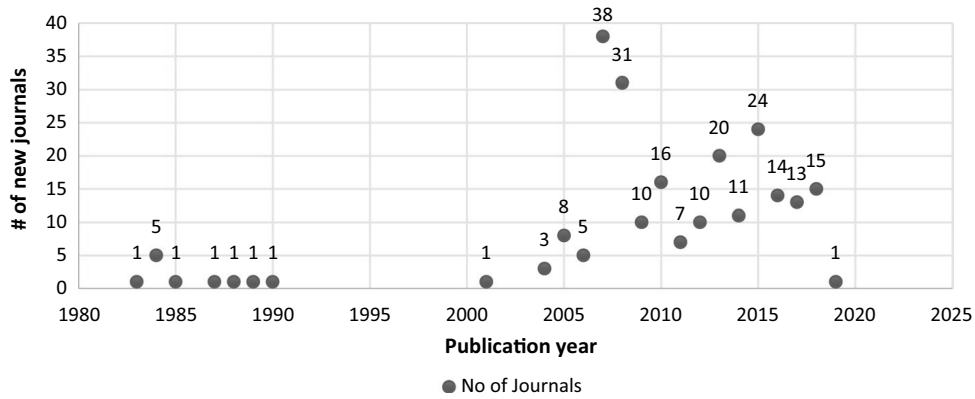


Fig. 2 UAE OA journals by year of publication

About 64% (240) of these online journals are OA. While 111 OA journals are listed in Ulrichsweb, only 18, 35 and 84 are listed in DOAJ, Scimago and ROAD, respectively. 85 OA titles identified from HEI websites and other sources such as ARCIF, DFAJ, and AIF were not indexed in any of these international indexes and directories.

Table 1 shows that print journals represent only about 30% of all journals. Almost all print titles except 3 are listed in Ulrichsweb.

OA journals publication year

The results obtained from analysis of journal publication year are shown in Fig. 2. This data covers only journals that are current and OA. These results indicate that the oldest UAE journal published its first issue in print long before being available online and OA back in 1983. The number of journals released per year picked up around 2004 to hit an all-time high of 38 in 2007, before receding to a range of 7–24 journals per year. The gap of a decade from 1990 to 2001 where no journals are recorded is due to the fact that we added the date the first print issue was published as the date the journal flipped to OA could not be identified. The data recorded after 2000 is in alignment with the important developments in the OA movement such as: the release of Eprints

Table 2 Born OA versus converted OA journal by type of publisher

Type of publisher	Started as OA	Converted to OA
Commercial publishers	189	1
HEIs	10	22
Government entities and associations	15	3
Total	214	26

Table 3 OA journals APC by type of publisher

	APC	No APC	No data
Commercial Publishers	154	22	14
HEIs	4	28	0
Government and Associations	9	8	1
All OA journals	167	58	15

software (2000); Open Journal System (2001); DSpace; and Budapest open Access Initiative (2002).

Born versus converted OA journals

Further analysis of the OA journals' segment shows that a total of 214 titles started as OA and that 26 print journals flipped to OA (Table 2). Almost all journals from commercial publishers started as OA (189 of 190). 22 of the 32 journals published by universities previously in print converted to OA. 15 journals published by government entities and associations started as OA and only 3 converted from print to OA.

Article processing charges

Analysis of APC status demonstrates that a confirmed 70% of OA journals in the UAE are charging publication fees (Table 3). About 92% of these are published by commercial publishers. In fact, 81% of all OA journals owned by these publishers collect APCs. In contrast, only around 13% of HEIs charge author fees. Nearly 50% of OA journals published by government entities and associations are not charging APCs. APC data could not be collected for 15 journals and thus were excluded from the analysis.

Further examination of APC data as shown in Fig. 3 reveals that the biggest share of journals (83) charge APCs in the 40–500 USD segment. A further 72 journals charge between 501 and 1000 USD. Only 3 journals charge more than 1001 USD. No data could be collected on 15 OA journals. The average fee charged by journals with confirmed APCs stands at around 496 USD.

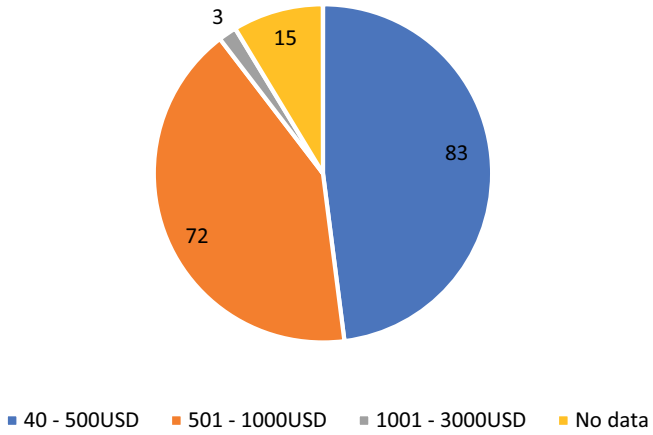


Fig. 3 OA journals APC segments

Table 4 UAE journals by language of publication

Language	Print	Online	OA
Arabic	3	2	2
English	151	353	216
Multilingual	3	22	22

Language of publication

Table 4 presents the breakdown of the UAE print, online and OA journals by language. The predominance of English as a language of publication among the UAE scholarly journals is obvious. 96% or 151 out of the 157 print journals are accepting only articles written in English. Similarly, 94% of online journals are in English. This is cascaded down to OA journals of which 90% or 216 out of 240 publish only articles in English. Surprisingly, Arabic-language journals represent only less than 1% of the, print, online, and OA Journals. The few Arabic and multilingual OA journals are predominantly in the humanities and social sciences with 20 out of 24 titles. These are mostly published by universities or government entities (21 titles).

Type of publisher

Table 5 shows that the UAE journal publishing landscape is dominated by a few commercial publishers like Bentham, Science Publications, Scholars Middle East, Tathqeef and Science Publishing Corporation. Together, they account for over 92%, 76%, and 62% of print, online, and OA journals, respectively. Journals published by educational institutions account for only about 3%, 9%, and 13% of all, print, online and OA journals, respectively. The remaining quarter of all OA journals are published by associations, government entities and small publishers. Bentham Publishers dominates the journal publishing landscape across all categories. Interestingly, the data reveals that all online journals published by government entities and associations are OA.

Table 5 Journals by type of publisher

Publisher	Print	Online	OA
Bentham	115	201	64
Science Publications	28	31	31
Universities	5	32	32
Scholars Middle East	0	22	22
Tathqeef	0	16	16
Science Publishing Corporation	1	16	16
Associations	2	12	12
Government Entities	1	6	6
Others	5	41	41

Breakdown by subject

Data in Table 6, conclusively, shows that the medical field and affiliated sub-fields dominate the UAE journals output with 78 print, 176 online, and 80 OA titles. Engineering is the second strongest discipline with 42 online and 15 print journals. Almost all online journals in business, humanities, agricultural and veterinary sciences, education, law, IT and environmental studies are OA. In contrast, only around 46% of journals in medical sciences and 61% in engineering are OA. Further analysis reveals that a little more than 50% of OA journals in the humanities and social sciences are published by universities and government entities. It can be seen from the data in Table 6 that all education journals are published online and are OA.

Discussion

Given the wide disparity in the coverage of the journal directories and indexes and in the absence of local indexing services, this study cannot unequivocally claim to have captured every single journal published in the UAE. Nevertheless, it provides the best available scan

Table 6 Journals distribution by discipline

Subject	Print	Online journals	OA
Medical sciences	78	176	80
Engineering	15	42	25
Business and management	2	28	28
General sciences	9	27	22
Humanities and social sciences	2	19	18
Agriculture and veterinary sciences	5	16	15
Chemistry	16	14	3
Biology	17	14	10
Education	0	10	10
Law	2	6	6
IT	6	8	7
Environmental sciences	4	11	10
Others	1	6	6

of the country's scholarly journal landscape. 78 journals of which 76 are OA identified by this study did not appear in any of the major indexes and directories including DOAJ. This study has also conclusively demonstrated that ROAD is more exhaustive than DOAJ and Scimago in indexing OA journals. This may be attributed to differences in inclusion criteria or lack of awareness of OA journal directories among journal editors in the UAE. Our findings are also in agreement with Björk's (2019) assertion of the limitation in DOAJ journal coverage. This may also be the result of tighter inclusion criteria (Khalifa 2017) or the delisting of journals policy introduced by DOAJ in 2014 (Marchitelli et al. 2017).

The share of OA journals published in the UAE at nearly 64% of all online journals is quite considerable and ahead of most Nordic countries studied by Björk (2019) with the exception of Iceland which achieved a rate of 67%. This could be due to factors such as dominance of commercial publishers driven by a desire to increase income from publication fees, appropriate funding of journals by government, universities and associations, and availability of disposable income enabling researchers to pay APCs. This claim is further supported by the fact that 93% of all journals that started as OA are owned by commercial publishers. Furthermore, 81% of all OA journals published by these publishers collect APCs.

Analysis of OA journals year of publication reveals that the years publishing peaked correspond to the entry of new commercial publishers such as Bentham into the UAE market. The increase in OA journal publishing after 2000 is consistent with Laakso et al. (2011) who reported an upsurge in OA journals from 2000 and 2009.

The share of born OA journals is quite considerable at nearly 89% of all OA journals and well ahead of the 79% reported by Solomon et al. (2013) among countries such as USA and Germany and 39% for Nordic countries cited by Björk (2019). This high percentage is probably fueled by the increase in internet penetration and entry of new commercial publishers. A substantial share of print journals published mainly by HEIs have also moved online and are made available OA.

The average APC of around $496 collected by publishers in the UAE is sub-par to Shamash's (2016) £1745 for 2014–2015 and Björk and Solomon's (2014) $1418–$2097. This study's conclusion that 70% of OA journals in the UAE charge APCs is in stark contradiction with Crawford's (2019b) findings which showed that about 71% of OA journals do not charge a fee.

Consistent with Banks' (2018) statement that the majority of world scholarly journals are published in English, almost all UAE journals with the exception of a few bilingual and a couple of Arabic titles are in English. It can be argued that UAE publishers are exacerbating the demise of the local language in scholarly publishing by not providing an adequate number of Arabic-language journals. This may also suggest that UAE researchers fit into Hamel's (2007) profile of authors seeking international peer recognition and higher citation rates or driven by funders incentivizing publications in journals indexed only by Scopus or WoS. Bearing in mind that these indexing services have been proven to be biased towards English-language publications (Archambault et al. 2006; Van Weijen 2012; Mongeon and Paul-Hus 2015; Somoza-Fernández et al. 2018), it comes as no surprise that the number of Arabic-language journals is quite limited. This low count can also be attributed to Al-Aufi's (2012) conclusion that the shift to teaching of scientific disciplines in most Arab universities resulted in scholars adopting English as a language of publication. This conviction is shared by Raven (2011) who states that English is the language of instruction at federal universities and the language of business in the UAE.

The UAE scholarly publishing landscape is clearly dominated by a few commercial publishers. Bentham spearheads this with a share of around 56% of all online and 27% of all

OA journals. The result of this study indicating that 76% of online and 62% of OA UAE journals are published by commercial publishers is in stark contradiction with Bjork's (2019) findings that 53% of OA journals in Nordic countries were published by universities or affiliated presses and Ilva's (2018) statement that most Finnish journals are owned by scholarly societies. The fact that UAE HEIs' share of OA journals stands at a mere 13% further supports conclusions of Austin et al. (2014) and Chapman et al. (2014) that UAE HEIs focus on teaching, to the detriment of research. Nonetheless, the conclusion that all 32 online journals published by universities are OA suggests that funding may have a direct impact on the degree of openness.

Data on distribution of journals by discipline reveals predominant interest in the sciences, technology, medicine (STM) disciplines. This may have several possible explanations such as the UAE government's expressed prioritization of science and technology in the UAE Vision 2021, and the presence of large commercial publishers interested in these disciplines. Furthermore, the observed varying degrees of openness by discipline reveals that apart from health sciences and engineering, primarily dominated by commercial publishers, the UAE has almost achieved total openness across all other disciplines.

The dominance of English-language journals and commercial publishers in the UAE may lead us to question the relevance of journal publisher countries. After all, globalization of the scholarly publishing ecosystem has led to the emergence of publishers with journals beyond geographic and linguistic boundaries of their countries of operation. A case in point is Elsevier which, even though based in the Netherlands, publishes many journals which are global in their reach and relevance.

Conclusion

This study set out to chart the scholarly journal landscape in the UAE with the objective of laying foundations for future in-depth research on scholarly publishing and OA. Our results indicate that DOAJ, ROAD and even regional indexes such as ARCIF and Arab Impact Factor are limited in their coverage of locally published journals. We found that Ulrichsweb lists more OA journals than indexed in DOAJ and ROAD directories, the first go-to services for OA bibliometric analyses. The evidence from this study suggests that the share of OA journals in the UAE is quite significant and that most charge APCs albeit well below international average.

This study's second major finding was that, in line with the rest of the world, the local language (Arabic) has been sidelined by English as the main language of publication regardless if the journal is in print, online or OA. Future studies could explore if this situation is due to publishers pushing for more international exposure, as a result of low supply of manuscripts in Arabic, or as an outcome of other factors such as promotion and appraisal policies.

One of the more significant findings to emerge from this study is that the publishing landscape is dominated by a few commercial publishers and not by universities and associated presses as expected. Further research is required to determine why this is the case and what are the incentives for commercial publishers to establish journals in the UAE. The delisting of some UAE journals by DOAJ based on publishers' suspicious editorial practices warrants also an in-depth study of commercial publishers in the UAE. A study on authors affiliation will also shed some light on whether the journals target local authors or a broader author base.

Finally, this study looked at journals' distribution by discipline. This reveals a predominance of medical sciences and highlights that humanities and social sciences occupy a marginal place. Regardless of discipline, the level of openness is lower among journals owned by the big commercial publishers.

This work is only a first step to draw a comprehensive picture of the UAE scholarly publishing in general and OA in particular. Forthcoming studies will look at UAE affiliated authors' article output, funding and support for OA, institutional attitudes to OA, and OA policies and mandates.

Acknowledgements This study was completed as part of a PhD program in Information Studies and Interactive Media at Tampere University, Finland. I gratefully acknowledge the guidance and invaluable advice of my supervisors Associate Prof. J. Tuomas Harviainen of Tampere University, and Associate Prof. Mikael Laakso of Hanken School of Economics.

References

Abd Al-Mukhtar, A. M. A. (2019). *Arab Universities' scientific periodicals in global citation databases: An analytical study* (Arabic) (Unpublished master's dissertation). Minia University, Egypt.

Al-Aufi, A. S. (2012). Domination of English and its impact on the Arabic System of Scholarly Communication. *Journal of Arts and Social Sciences [JASS], 3*(1), 5–28. https://doi.org/10.24200/jass.vol3iss1pp5-28.

Alpen Capital. (2018). *GCC education industry*. *Alpen capital report*. Retrieved from https://argaamplus.s3.amazonaws.com/9e55ad53-477f-48f0-b202-2c2f03d6a03d.pdf.

Altbach, P. G. (2013). Advancing the national and global knowledge economy: The role of research universities in developing countries. *Studies in Higher Education*. https://doi.org/10.1080/03075079.2013.773222.

Arab Impact Factor. Retrieved from http://www.arabimpactfactor.com/.

Archambault, E., Amyot, D., Deschamps, P., Nicol, A., Rebout, L., & Roberge, G. (2013). *Proportion of Open Access peer-reviewed papers at the European and world levels 2004–2011*. Montreal: Science-Metrix. Retrieved from http://www.science-metrix.com/pdf/SM_EC_OA_Availability_2004-2011.pdf.

Archambault, É., Amyot, D., Deschamps, P., Nicol, A. F., Provencher, F., Rebout, L., & Roberge, G. (2014). *Proportion of open access papers published in peer-reviewed journals at the European and world levels–1996–2013*. Montreal: Science-Metrix. Retrieved from http://science-metrix.com/sites/default/files/science-metrix/publications/d_1.8_sm_ec_dg-rtd_proportion_oa_1996-2013_v11p.pdf.

Archambault, É., Vignola-Gagne, É., Côtè, G., Larivière, V., & Gingras, Y. (2006). Benchmarking scientific output in the social sciences and humanities: The limits of existing databases. *Scientometrics, 68*(3), 329–342.

Austin, A. E., Chapman, D. W., Farah, S., Wilson, E., & Ridge, N. (2014). Expatriate academic staff in the United Arab Emirates: The nature of their work experiences in higher education institutions. *Higher Education, 68*(4), 541–557. https://doi.org/10.1007/s10734-014-9727-z.

Badran, A. H. (2014). Al Muqtataf journal: A history and scientific role (1867–1952) [Arabic]. *Dirāsāt, 36,* 131–148. https://doi.org/10.12816/0008502.

Banks, D. (2018). Thoughts on publishing the research article over the centuries. *Publications of the Astronomical Society of Australia, 6*(1), 10. https://doi.org/10.3390/publications6010010.

Beasley, G. (2016). Article processing charges: A new route to open access? *Information Services & Use, 36*(3/4), 163–170. https://doi.org/10.3233/ISU-160815.

Björk, B.-C. (2017). Journal portals—An important infrastructure for non-commercial scholarly open access publishing. *Online Information Review, 41*(5), 643–654. https://doi.org/10.1108/OIR-03-2016-0088.

Björk, B.-C. (2019). Open access journal publishing in the Nordic countries. *Learned Publishing, 27*(2), 273-10. https://doi.org/10.1002/leap.1231.

Björk, B. C., & Solomon, D. (2014). *Developing an effective market for open access article processing charges*. Retrieved from https://wellcome.ac.uk/sites/default/files/developing-effective-market-for-open-access-article-processing-charges-mar14.pdf.

Björk, B. C., & Solomon, D. (2014b). How research funders can finance APCs in full OA and hybrid journals. *Learned Publishing*. https://doi.org/10.1087/20140203.

Björk, B. C., Welling, P., Laakso, M., Majlender, P., Hedlund, T., et al. (2010). Open access to the scientific journal literature: Situation 2009. *PLoS ONE, 5*(6), e11273. https://doi.org/10.1371/journal.pone.0011273.

Chapman, D., Austin, A., Farah, S., Wilson, E., & Ridge, N. (2014). Academic staff in the UAE: Unsettled journey. *Higher Education Policy, 27*(1), 131–151. https://doi.org/10.1057/hep.2013.19.

Cianflone, E. (2014). Communicating science in international English: Scholarly journals, publication praxis, language domain loss and benefits. *Círculo de Lingüística Aplicada a La Comunicación, 57,* 45–58. https://doi.org/10.5209/rev_CLAC.2014.v57.44514.

Crawford, W. (2015). *Open-access journals: Idealism and opportunism. Library technology reports*. Chicago: ALA TechSource.

Crawford, W. (2019a). *Gold open access 2013–2018: Articles in journals (GOA4)*. Livermore, CA.: Cites & Insights Books. Retrieved from https://waltcrawford.name/goa4.pdf.

Crawford, W. (2019b). *Gold open access by country 2013–2018.* Livermore, CA.: Cites & Insights Books. Retrieved from https://waltcrawford.name/goacntry4.pdf.

Curry, M. J., & Lillis, T. (2018). The dangers of English as lingua franca of journals. Retrieved from https://www.insidehighered.com/views/2018/03/13/domination-english-language-journal-publishing-hurting-scholarship-many-countries.

DOAJ. (2019b). *Myth-busting: All open access journals can be listed in DOAJ*. Retrieved from https://blog.doaj.org/2019/09/17/myth-busting-all-open-access-journals-can-be-listed-in-doaj/.

DOAJ. (2019b). *Myth busting: DOAJ is not inclusive*. Retrieved from https://blog.doaj.org/2019/07/31/myth-busting-doaj-is-not-inclusive/.

Fukuzawa, N. (2017). Characteristics of papers published in journals: An analysis of open access journals, country of publication, and languages used. *Scientometrics, 112*(2), 1007–1023. https://doi.org/10.1007/s11192-017-2414-y.

Garfield, E. (2006). The history and meaning of the journal impact factor. *Journal of the American Medical Association, 295*(1), 90–93.

Green, T. (2018). *We're still failing to deliver open access and solve the serials crisis: To succeed we need a digital transformation of scholarly communication using internet-era principles.* https://doi.org/10.5281/zenodo.1410000.

Gulf News. (2017). *UAE launches National Strategy for Higher Education 2030*. Retrieved from https://gulfnews.com/uae/education/uae-launches-national-strategy-for-higher-education-2030-1.2097191.

Hamel, R. E. (2007). The dominance of English in the international scientific periodical literature and the future of language use in science. *AILA Review, 20*(1), 53–71. https://doi.org/10.1075/aila.20.06ham.

Hanafi, S. (2011). University systems in the Arab east: Publish globally and perish locally vs publish locally and perish globally. *Current Sociology, 59*(3), 291–309. https://doi.org/10.1177/0011392111400782.

Ilva, J. (2018). Looking for commitment: Finnish open access journals, infrastructure and funding. *Insights—The UKSG Journal, 31*(25), 1–9. https://doi.org/10.1629/uksg.414.

Jabriyah, H., Harasi, N., & Kelou, S. M. (2017). Peer-reviewed scholarly journals in Oman: Their reality and received support [Arabic]. *Iraqi Journal of Information Science, 18*(1–2), 1–27.

Johnson, R., Watkinson, A. & Mabe, M. (2018). *The STM Report: An overview of scientific and scholarly publishing, 5th Edition*. https://www.stm-assoc.org/2018_10_04_STM_Report_2018.pdf.

Journals published by Arab research community set to benefit from greater global visibility. (2019, March 14). Retrieved from https://www.elsevier.com/about/press-releases/science-and-technology/journals-published-by-arab-research-community-set-to-benefit-from-greater-global-visibility.

Kabil, T. (2015). Arab Impact Factor [Arabic]. Retrieved from http://arsco.org/article-detail-596-8-0.

Kamal, K. (2018). *Education in the United Arab Emirates*. Retrieved from https://wenr.wes.org/2018/08/education-in-the-united-arab-emirates.

Khalifa, M. (2017). Evaluation of Arab scientific journals according the international criteria of citations databases and journals directories: Library and information science journals as a model [Arabic]. *Cybrarians Journal,* (48). Retrieved from http://www.journal.cybrarians.org/images/048/Cybrarians_Journal_048_Papers_05.pdf.

King, D. W., & Alvarado-Albertorio, F. M. (2008). Pricing and other means of charging for scholarly journals: A literature review and commentary. *Learned Publishing, 21*(4), 248–272. https://doi.org/10.1087/095315108X356680.

Kurmis, A. P. (2003). Understanding the limitations of the journal impact factor. *The Journal of Bone and Joint Surgery. American Volume, 85*(12), 2449–2454. https://doi.org/10.2106/00004623-200312000-00028.

Laakso, M., & Björk, B. C. (2012). Anatomy of open access publishing: A study of longitudinal development and internal structure. *BMC Medicine*. https://doi.org/10.1186/1741-7015-10-124.

Laakso, M., Welling, P., Bukvova, H., Nyman, L., Björk, Bo-Christer, & Hedlund, T. (2011). The development of open access journal publishing from 1993 to 2009. *PLoS ONE*. https://doi.org/10.1371/journal.pone.0020961.

Larivière, V., & Sugimoto, C. R. (2018). Do authors comply when funders enforce open access to research? *Nature News, 562,* 483–486. https://doi.org/10.1038/d41586-018-07101-w.

Luescher, T. M. (2016). Higher education expansion in Africa and Middle East. In *Encyclopedia of international higher education systems and institutions* (Vol. 64, pp. 1–3). Dordrecht: Springer. http://doi.org/10.1007/978-94-017-9553-1_54-1.

Macilwain, C. (2010). What science is really worth. *Nature News, 465,* 682–684.

Marchitelli, A., Galimberti, P., Bollini, A., & Mitchell, D. (2017). Improvement of editorial quality of journals indexed in DOAJ: A data analysis. *JLIS. it, 8*(1), 1–21. https://doi.org/10.4403/jlis.it-12052.

Marginson, S. (2012). The "Public" contribution of universities in an increasingly global world. In *Universities and the public sphere: Knowledge creation and state building in the era of globalization*. https://doi.org/10.4324/9780203847848.

McKenzie, L. (2018). *"Big Deal" Cancellations Gain Momentum.* Retrieved from https://www.insidehighered.com/news/2018/05/08/more-institutions-consider-ending-their-big-deals-publishers.

McKiernan, E. C., Schimanski, L. A., Muñoz Nieves, C., Matthias, L., Niles, M. T., & Alperin, J. P. (2019). Use of the journal impact factor in academic review, promotion, and tenure evaluations. *ELife*. https://doi.org/10.7554/elife.47338.

Meo, S. A., Al Masri, A. A., Usmani, A. M., Memon, A. N., & Zaidi, S. Z. (2013). Impact of GDP, spending on R&D, number of universities and scientific journals on research publications among Asian countries. *PLoS ONE*. https://doi.org/10.1371/journal.pone.0066449.

Mikki, S., Gjesdal, Ø., & Strømme, T. (2018). Grades of openness: Open and closed articles in Norway. *Publications, 6*(4), 46-12. https://doi.org/10.3390/publications6040046.

MoChridhe, R. (2019). Linguistic equity as open access: Internationalizing the language of scholarly communication. *Journal of Academic Librarianship, 45*(4), 423–427. https://doi.org/10.1016/j.acalib.2019.02.006.

Mongeon, P., & Paul-Hus, A. (2015). The journal coverage of Web of Science and Scopus: A comparative analysis. *Scientometrics, 106*(1), 213–228. https://doi.org/10.1007/s11192-015-1765-5.

Morais, R. & Borrell-Damián, L. (2019). *Open access: 2017–2018 EUA survey results*. Retrieved from https://www.eua.eu/downloads/publications/2017-2018%20open%20access%20survey%20results.pdf.

Nasser, R., & Abouchedid, K. (2001). Problems and the epistemology of electronic publishing in the Arab world: The case of Lebanon. *First Monday*. https://doi.org/10.5210/fm.v6i9.886.

Piwowar, H., Priem, J., Larivière, V., Alperin, J. P., Matthias, L., Norlander, B., et al. (2018). The state of OA: A large-scale analysis of the prevalence and impact of open access articles. *PeerJ, 6,* e4375. https://doi.org/10.7717/peerj.4375.

Piwowar, H., Priem, J., & Orr, R. (2019). The Future of OA: A large-scale analysis projecting Open Access publication and readership. *BioRxiv*, 795310. https://doi.org/10.1101/795310.

Raven, J. (2011). *Word emiratizing the education sector in the UAE: Contextualization and challenges*. Retrieved from https://pdfs.semanticscholar.org/51da/24bf7cea5c7568652471f0b1f1a6ec91a1ef.pdf?_ga=2.103563784.92852872.1568286845-906255112.1568286845.

Research Trends. (2008). English as the international language of Science. *Research Trends, 6,* 1–9.

Salisbury, E. (1853). II. Syrian society of arts and sciences. *Journal of the American Oriental Society, 3,* 477–486. https://doi.org/10.2307/3217830.

Sanderson, D., & Khan, S. (2019). Ghadan 21: Abu Dhabi to boost business and ecotourism with major new reforms. *The National.* Retrieved from https://www.thenational.ae/uae/government/ghadan-21-abu-dhabi-to-boost-business-and-ecotourism-with-major-new-reforms-1.878805#14.

Sawahel, M. (2018). *New research index to enhance Arabic academic footprint*. Retrieved from https://www.universityworldnews.com/post.php?story=20180607144307817.

Sayed, F. S. (2015). *The most prominent modern events (1900–2014) [Arabic]*. Beirut: Maktabat Hassan Al-Asriyah.

Shah, T. A., & Gul, S. (2013). Philosophy of escapism in the open access world: Studying author pay model. *Library Review*. https://doi.org/10.1108/lr-09-2012-0104.

Shamash, K. (2016). *Article processing charges (APCs) and subscriptions—Monitoring open access costs*. London: JISC. Retrieved from https://www.jisc.ac.uk/sites/default/files/apc-and-subscriptionsreport.pdf.

Shehata, A. M. K. (2019). Exploring the scholarly communication styles of Arab social science and humanities scholars. *Learned Publishing, 32*(4), 304–311. https://doi.org/10.1002/leap.1253.

Shehata, A. M. K., & Elgllab, M. F. M. (2018). Where Arab social science and humanities scholars choose to publish: Falling in the predatory journals trap. *Learned Publishing, 31*(3), 222–229. https://doi.org/10.1002/leap.1167.

Shen, C. (2017). Open access scholarly journal publishing in Chinese. *Publications*. https://doi.org/10.3390/publications5040022.

Sidqi, H. (2009). *Scientific journalism: Between theory and practice [Arabic]*. Cairo: Al-Maktaba Al-Akadimiyah.

Skelton, V. (2018). *Arabic citation index announced*. Retrieved from https://www.infotoday.eu/Articles/News/Featured-News/Arabic-Citation-Index-announced-125303.aspx.

Solomon, D., Laakso, M., & Björk, B.-C. (2013). A longitudinal comparison of citation rates and growth among open access journals. *Journal of Informetrics, 7*(3), 642–650. https://doi.org/10.1016/j.joi.2013.03.008.

Solomon, D., Laakso, M., & Björk, B.-C. (2016). *Converting scholarly journals to open access: A review of approaches and experiences*. Cambridge, MA: Harvard Library Office for Scholarly Communication. Retrieved from https://dash.harvard.edu/bitstream/handle/1/27803834/DASH%20Version-Journal-flipping-final-Aug4-2016-print-2.pdf?sequence=3.

Somoza-Fernández, M., Rodríguez-Gairín, J.-M., & Urbano, C. (2018). Journal coverage of the emerging sources citation index. *Learned Publishing, 31*(3), 199–204. https://doi.org/10.1002/leap.1160.

SPARC. (2019). *Big deal cancellation tracking*. Retrieved from https://sparcopen.org/our-work/big-deal-cancellation-tracking/.

Tenopir, C., Dalton, E., Christian, L., Jones, M., McCabe, M., Smith, M., & Fish, A. (2017). Imagining a gold open access future: attitudes, behaviors, and funding scenarios among authors of academic scholarship. *College & Research Libraries, 78*(6). https://doi.org/10.5860/crl.78.6.824.

Thibault, R. T., Macpherson, A., Harnad, S., & Raz, A. (2018). *The Rent's too high: Self-archive for fair online publication costs*. http://doi.org/10.1109/VTSA.2009.5159273.

Tijssen, R. (2015). Research output and international research cooperation in African flagship universities. In N. Cloete, P. Maassen & T. Bailey (Eds.), *Knowledge production and contradictory functions in african higher education*. Cape Town: African Minds.

Van Weijen, D. (2012). The language of (future) scientific communication. *Research Trends, 31,* 7–8.

Vanclay, J. K. (2009). Bias in the journal impact factor. *Scientometrics, 78*(1), 3–12. https://doi.org/10.1007/s11192-008-1778-4.

Wang, X., Cui, Y., Xu, S., & Hu, Z. (2018). The state and evolution of Gold open access: A country and discipline level analysis. *Aslib Journal of Information Management, 70*(5), 573–584. https://doi.org/10.1108/AJIM-02-2018-0023.

Wilkins, S. (2010). Higher education in the United Arab Emirates: An analysis of the outcomes of significant increases in supply and competition. *Journal of Higher Education Policy and Management, 32*(4), 389–400.

Wulf, K., & Meadows, A. (2016). Seven things every researcher should know about scholarly publishing. *Scholarly Kitchen*. Retrieved from https://scholarlykitchen.sspnet.org/2016/03/21/seven-things-every-researcher-should-know-about-scholarly-publishing.

PUBLICATION II

Open Sesame? Open access priorities, incentives, and policies among higher education institutions in the United Arab Emirates

Mohamed Boufarss & Mikael Laakso

Scientometrics, 124, 1553-1577
https://doi.org/10.1007/s11192-020-03529-y

Scientometrics (2020) 124:1553–1577
https://doi.org/10.1007/s11192-020-03529-y

Open Sesame? Open access priorities, incentives, and policies among higher education institutions in the United Arab Emirates

Mohamed Boufarss[1] · **Mikael Laakso**[2]

Received: 13 February 2020 / Published online: 8 June 2020

Abstract
Higher education institutions (HEIs) have an instrumental role in the move towards Open Access (OA) by shaping the national strategies, policies, and agendas. This study sets out to explore the role of HEIs in the United Arab Emirates (UAE) OA uptake and reflect on the ongoing international initiatives pushing for universal OA to research. The study is based on an online survey targeted at UAE higher education institutions research management units. In order to measure the institutional views, only one response was solicited from each institution. A total of 19 valid responses were received, making up 47% of HEIs included in the population of organisations. Our results suggest that there is low commitment to OA among UAE HEIs as attested by the low number of OA policies, scarce OA funding, limited proliferation of institutional repositories, perceived lack of urgency to migrate from current access models, and little consideration of OA for promotion purposes. The study is the first of its kind in the UAE, Arab and Middle Eastern countries, providing rare insight into a growing phenomenon that is global, yet most vocally discussed from a western perspective and context. The study contributes to the debate on the role of HEIs in the transition to OA and in shaping national and regional OA policies, as well as informing international initiatives about the current status of OA in the region.

Keywords Open access · Scholarly publishing · Research universities · Open access policies

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s11192-020-03529-y) contains supplementary material, which is available to authorized users.

✉ Mohamed Boufarss
Mohamed.boufarss@tuni.fi

Mikael Laakso
Mikael.laakso@hanken.fi

[1] Faculty of Information Technology and Communication Sciences, Tampere University, Tampere, Finland

[2] Department of Management and Organisation, Hanken School of Economics, Helsinki, Finland

Introduction

Around a decade ago, Ofek (2011) stated that "Today...the spirit of science in the Muslim world is as dry as the desert". Anecdotal statements such as this referring to the low scientific research and publication output in the UAE are often made within academia and beyond as people believe that the heydays of Arab civilization and scientific prosperity are long gone. There is, however, increasing evidence that scientific research is gaining strength in the UAE. The steady advancement of the UAE in international rankings and indexes such as QS World University Rankings and Global Knowledge Index, as well as promising UAE initiatives that aim to boost scientific research output are a testament to this change (Quacquarelli Symonds Limited, 2019; Times Higher Education 2019). As higher education institutions (HEIs) in the UAE increasingly compete with their international counterparts, engagement and involvement in scholarly communication initiatives such as open access (OA) seems inevitable. The UAE makes for an interesting context since research is growing and being shaped nationally at a time when possibilities for OA have become available.

OA, where access to research articles or monographs is provided online for free, has been seen by some as a path to break free of the increasingly expensive current reader-pays or double-dipping models while also unlocking access to research publications for an unlimited audience (King and Alvarado-Albertorio 2008). At the detailed level, many mechanisms could lead to publications becoming available OA, but traditionally a distinction between two different OA routes is made. Gold OA, where the publication is made OA on the web directly by the publisher, often through the payment of an article processing charge (APC) (Esposito 2016). In Green OA, however, free access to the publication (often in accepted manuscript format) is provided through a repository or the author's or institutional website. As this model has the potential to achieve OA targets, researchers' attitude toward the use of APCs to advance OA remains ambivalent.

Universities around the world have seen mounting pressure from national and international science policy, and to an increasing degree research funders, to provide open and equitable access to research outputs. Reactions to these demands are often framed in the form of OA initiatives and policies. Recent data from the Registry of Open Access Repository Mandates and Policies (ROARMAP) and SHERPA/Juliet reveal a high concentration of OA policies in Europe and the Americas (ROARMAP 2020; JISC 2020). The year 2012 marked the beginning of some of the strongest OA policies in the UK such as the Finch Report, Wellcome Trust reinforced OA policy, and RCUK new OA policy (Rumsey 2017). This culminated in the establishment of the Research Excellence Framework (REF 2014) and the upcoming REF 2021. Similar efforts are led by the Scholarly Publishing and Academic Resources Coalition (SPARC) in the USA. The recently enacted OPEN Government Data Act (S. 760 / H.R. 1770) and the related upcoming rumored revision of the US government OA policy aim to push towards immediate OA to all public-funded research.

As institutional and even national efforts are challenged to create radical change in scholarly publishing that transcends borders, some multi-institutional and multi-national initiatives have started to emerge. These include, among others, the European Union's H2020 Programme, Plan S, OA2020, and AmeliCA. The H2020 Programme is the European Union's main mechanism for distributing research funding which stipulates that "each beneficiary must ensure open access to all peer-reviewed scientific publications" (European Commission …, 2017, p. 5). OA2020 is another initially European but currently global initiative that aims to boost the transformation of existing paywalled journals to OA with

minimal additional cost (Max Planck Digital Library 2020). On the other side of the Atlantic, the Open Knowledge for Latin America and the Global South started the AmeliCA initiative in 2018 with the objective of putting academia back in charge of scholarly publishing through diamond open access, i.e. journals that are free for both authors and readers (AmeliCA 2020). Plan S, launched by a coalition of research funders (cOAlition S), is an international initiative that aims to make all research funded by cOAlition S funders available as immediate OA by 2021.

OA transcends the initial motivator of public good to other objectives such as boosting research impact, increasing institutional visibility, and guaranteeing long-term cost-effective access to research. Mueller-Langer et al. (2020) have demonstrated that providing OA to journals boosts research output by up to 29.6%. There are increasing indicators that HEIs in the UAE are striving to achieve all or some of these goals. However, a scan of existing literature reveals limited research on OA in the UAE. Tennant et al. (2016) state that "At the current stage, Open Access has become such a global issue that it is critical for all involved in scholarly publishing, including policymakers, publishers, research funders, governments, learned societies, librarians, and academic communities, to be well-informed on the history, benefits, and pitfalls of Open Access." By studying scholarly publishing and OA in the UAE, this study will illuminate the economic, social, ethical and academic impacts of OA and inform future publishing policies and strategies development and implementation.

The objective of this study is to assess current awareness, support, policies, and practices related to scholarly journal publishing among UAE HEIs, particularly in relation to OA publishing. In doing so, it seeks to contribute to the ongoing debate on the global changes in scholarly publishing in general and OA in particular. Furthermore, it tries to discover what HEIs in the UAE are doing in relation to OA, including an investigation of existing OA policies and funding options available to authors to publish OA. It will also examine how HEIs in the UAE assess publications and publication activity of researchers in the context of promotion and performance appraisals of faculty.

We are in particular interested in the organizational level rather than the behaviour and attitudes of individual researchers. HEIs interface more directly with national science policy, whereas individuals can be assumed to be more concerned with more immediate and practical aspects of their work. Organisations are also not mobile, with a large part of the research conducting staff in the UAE being expats, we are concerned with better understanding the organisations who plan to remain actors in the landscape for the long term. The level of domain expertise concerning publishing needed to reflect upon the themes in focus also support the notion of gathering insights from experts being able to answer on behalf of organisations.

Literature review

Scientific research environment in the UAE

The UAE has seen a progressive increase in scientific research and scholarly publishing output in recent years as attested by different rankings and indexes. The Global Knowledge Index 2018 (UNDP & MBRF, 2018) and Arab Knowledge Index 2016 (UNDP & MBRF 2016) have both put the UAE ahead of all other Arab countries in several categories. According to Nature Index 2018 (Springer Nature 2018), the UAE is second

place after Saudi Arabia among Arab countries ranked in terms of the fractional count of research published between 1 and 2017 and 30 November 2018. Only the two countries have made it to the top 50 countries among Arab states in this index.

This increase in scientific research output and publications is mainly due to the UAE embarking on an ambitious program to boost education and research in STEM, and putting the country on track of the knowledge-based economy as outlined in UAE vision 2021 (UAE PMO 2014). This transition is also guided by the UAE National Innovation Strategy (UAE PMO 2015). Initiatives and programs that support these visions and strategies range from a National Agenda for Scientific Research to Preparing for a Nobel Program (Gulf News 2016).

The country counts currently over 70 officially licensed universities according to the Commission for Academic Accreditation (CAA) and the UAE Ministry of Education websites. Many of these universities are offering master's and PhD degrees (Mitterlehner 2013). Recent CAA data lists over 300 licensed master's and doctorate programs. Moreover, The National Strategy for Higher Education 2030 clearly pledges support for research by creating research oriented educational institutions and funding research output (Gulf News 2017). This commitment materialized in 2019 with the announcement of an Abu Dhabi AED 4 billion (over one billion USD) research and development fund (Sanderson & Khan, 2019).

Although proper research infrastructure seems to be in place, some like Ryan and Daly (2018) suggest that there is a "lack of research-intensive institutions" in the country. Furthermore, Chapman et al. (2014) have underlined the absence of appropriate conditions for increased research productivity in the UAE. This is especially the case for expatriate faculty (Austin et al. 2014). A probable explanation according to numerous studies is the emphasis on teaching to the detriment of research at HEIs. For example, Austin et al. (2014) found that most faculty were on a teaching load of between 70 and 80% leaving them with little time to conduct research. In that respect, Miller, Coble & Lusk (2013) reported a negative impact on the number of Web of Science-indexed publications among faculty with a teaching load greater than 25%. Similarly, Ryan and Daly (2018) assert that focus of UAE recruiters solely on financial incentives "may be contributing to attracting the wrong type of faculty, who are less likely to be high performing researchers."

Another major issue facing research in the UAE is the transient nature of the academic workforce. In 2017, the share of UAE nationals in the total workforce across all sectors stood at only 7.19% (UAE PMO 2019). This is reflected in the percentage of teaching staff at UAE universities. Spender and Bardsley (2009) state that "all of Zayed University's 265 academics, nearly all the 1,092 academic staff at the Higher Colleges of Technology and 570 out of 747 academics at UAE University were expatriates." Similarly, a GFH (2016) report states that expatriate faculty represented "92% and 98% in public and private universities respectively" in 2014. Within this context, Ryan (2017) concludes that as stability of funding, personnel, and strategies are the cornerstone of research, "stability is not a characteristic of higher education institutions in the UAE." Instability of funding emanates from the country's limited expenditure on R&D amounting to a mere 0.96% of GDP in 2016 according to the most recent World Bank data.

Finally, the UAE is facing the same challenges as other Arab countries when publishing research. Nasser & Abouchedid (2001) believe that the development of local Arab journals is shackled by academic favouritism and nepotism, low financial support for research, limited number of local journals, low international circulation, limited freedom of academic expression, and tendency to serve mostly affiliated or local authors. Lages, Pfajfar,

& Shoham (2015) have outlined further issues associated with publishing on the Middle East in international journals as

> "*a limited number of region studies to draw from, limited exposure to international scholars' work and lack of competent collaborators, a need for high-quality writing, and difficulty in becoming members of "in-clubs" in the West*".

Researcher appraisal and incentives

Tenure and promotion

Criteria often used by institutions to appraise faculty and researchers' applications for promotion and tenure can vary from one institution to another depending on its own priorities (Jolson 1974). It seems, however, that the focus has recently shifted to research output as one of the main criteria for researcher assessment leading to the "publish or perish" phenomenon. As publication output has become a *de facto* main measure of promotion applications, some researchers are investigating the most efficient ways to assess it. A major study by Moher et al. (2018) studied 21 documents related to faculty incentives and rewards in North America and Europe. A common point among most of the documents is the use of the journal impact factor (JIF) as a measure to assess the impact of faculty to the detriment of other criteria and metrics. Bales et al. (2019) argued that tenure and promotion committees should focus on the quality of the actual publication rather than on the journal where it appeared. The San Francisco Declaration on Research Assessment (DORA) and The Leiden Manifesto are two successful initiatives that introduce new factors and measures for consideration in assessing research impact. For some countries, however, publication in a journal indexed in Scopus or WoS is viewed as a testament to the quality of the article, irrespective of JIF or article citation count (Pudovkin 2018).

While an increasing number of institutions and funders are mandating OA or encouraging researchers to provide free access to their publications, little research is available on factoring OA publications in promotion applications. Alperin et al. (2018) analyzed review, tenure and promotion documents at several Canadian and American universities to assess how the public dimension is perceived when assessing researchers work. Contrary to their expectations that emphasis will be put on OA as an embodiment of "public patronage", there is still a focus on traditional publishing venues and metrics. Worse yet, the few documents that mentioned the OA concept were warning against publishing in OA venues. Similarly, Creaser (2010) states that many researchers are skeptical of OA publications "both as authors and as users of scholarly material". Odell, Coates and Palmer (2016), however, highlighted a success story at Indiana University-Purdue University Indianapolis (IUPUI) which managed to amend promotion and tenure policies to reward OA publications. Likewise, Morais and Barrell-Damián (2019) report that over 25% of European universities factor OA publications in faculty appraisals and promotions.

Incentivizing research publications

Ever since the UK introduced the Research Assessment Exercise (RAE) in 1986, a lot of other countries have adopted performance-based research funding systems (PRFSs) or a cash-per-publication approach to boost research publications output. Hicks (2012) identified at least 14 such PRFSs in 2010. Franzoni, Scellato and Stephan (2011) show that

there is indeed a correlation between publication submissions and incentives especially cash bonuses. Quan, Chen and Shu (2017) conclude that some Chinese researchers can get cash rewards ranging from 30 to 165,000 USD per paper published in journals indexed by WoS. In the Arab world, the highest known cash-per publication rewards amount to 19,999, 13,733 and 5,195 USD in Saudi Arabia, Qatar and Oman, respectively (Abritis and McCook, 2017). Turkey is another country that has introduced cash rewards to increase publication output. However, while these incentives have led to an increase in the number of articles published by Turkish authors, there has been an upsurge of publications in predatory journals and conferences (Demir, 2018). Similar trends have been reported among Italian scholars of which about 5% have published in potentially predatory journals (Bagues, Sylos-Labini & Zinovyeva, 2019). Similarly, Butler (2003) concludes that incentives have boosted Australian journal publications whereas research impact has declined simultaneously. This can be attributed to the Australian research reward system based solely on quantitative measures. PRFSs and direct incentives have their pros and cons, but there is no doubt that institutions and countries continue using them in their quest to enhance the quality and quantity of their research publications.

Chapman et al. (2014) draw a gloomy picture of the research landscape at UAE HEIs. Their research concludes that there were no incentives to do research in the country's HEIs. Similarly, Austin et al. (2014) claim that "research is typically neither expected nor emphasized." They further claim the absence of appropriate conditions to promote research productivity especially for expatriate faculty members. This research environment may be alienating research-focused faculty (Ryan and Daly (2018). The situation is somehow different in a few top public and semi-public universities where "Research is a relatively new expectation" (Chapman et al. 2014). There is also increasing evidence that some local universities are introducing financial rewards to stimulate scholarly publishing. UAEU, Zayed University, Jumeirah University and Ajman University are among the UAE HEIs that have disclosed their policies on financial rewards for research papers published in Scopus indexed journals. Badri and Abdulla (2004) claim that UAEU academic promotion process puts research on par with teaching. Similarly, the University of Sharjah's annual awards policy provides a higher financial reward for outstanding research than for outstanding teaching.

Open access in the UAE

One of the first studies that, albeit indirectly, tackled OA in the UAE was conducted by Taha (2007). This study, examining e-learning at the United Arab Emirates University, concludes that providing access to OA resources is one of the library's priorities. A couple of years later, a study of attitudes of faculty towards OA in Tunisia, Morocco, Oman and UAE by Gdoura (2009) concludes that there was high awareness of OA concepts among the respondents but little desire to auto-archive or pay APCs. Another survey of faculty attitudes towards OA and IRs at the Petroleum Institute by Boufarss (2011) reports marginal awareness of OA and little previous self-archiving experience among faculty. It also asserts that boosting self-archiving rests with institutions since respondents would comply with institutional OA mandates. A similar study by Kaba and Said (2015) at Al Ain University of Science and Technology concludes that faculty "possess a good knowledge and a positive perception of OA resources". They also found a correlation between the level of awareness or use and perception of OA resources. These findings were corroborated by Mavodza (2013) who stated that in line with the rest of the world "access to OA research

information is appreciated, and researchers are also involved with contributing scholarly research in OA journals." Indeed, a recent scan of scholarly journals in the UAE by Boufarss (2020) reveals a prevalence of both OA journals (about 64% of all online journals) and author-pays OA model (around 75% of OA journals charge APCs).

As early as 2009, Fitzgerald & Olwan (2009) called on UAE institutions to develop repositories and offer incentives to researchers to provide OA to their research. However, Carlson (2015) confirms the hypothesis cited by Boufarss (2011) and Sajjad Ahmed & Al-Baridi (2012) that OA and institutional repositories (IRs) in the Arab countries had remained at an "infancy stage". The study reported the existence of a limited number of repositories in the UAE and absence of related policies, mandates and clear OA guidelines. Furthermore, there were no policies listed in ROARMAP and only three repositories are listed in OPENDOAR under UAE. For the sake of comparison, a share of over 90% of Canadian research universities had an IR already in 2009, and over 80% of European universities currently have a digital repository or participating in a shared repository while a similar percentage of institutions have institutional policies on OA (Greyson et al. 2009; Morais and Borrell-Damián 2019).

With an estimated OA percentage level of 25.33% and 24% in 2017 and 2018 (Scimago, 2019), the UAE is at par with most other countries. It can be argued, however, that these figures are justifiable given that the UAE is a country that is just a little over two decades old and that Scimago does not include all local and regional journals. The Emirates Publishers Association was not created until 2009 and even though the country's publishing plan as laid out by Al Qasimi (2017) does not specifically touch on scholarly journal publishing, it is a very ambitious program and aims to make of the UAE a publishing industry world leader.

Controversial issues in OA

Some of the highly debated aspects associated with OA include APCs, predatory journals and academic social networks (ASNs). The rising APCs, predatory publishing creating hesitation about even new legitimate journals, as well as ASNs facilitating infringement of copyright led many to argue against OA funding and its institutional or governmental support.

Even though most OA journals do not charge any publication fees (Crawford 2019; Johnson et al. 2018), there is increasing evidence that OA publishing based on author-side payments, so called article processing charges (APCs), is taking off. The upsurge in OA in the UK between 2009 and 2016 was attributed to the support of APCs and Gold OA (Larivière and Sugimoto 2018). Correspondingly, the total global revenue from APCs was estimated at over 649 million dollars in 2018 (Crawford 2019). However, publishing OA articles in hybrid journals without publishers adjusting subscription fees to offset the APCs would lead to double dipping (Björk and Solomon 2014, 2014b). Furthermore, APCs can disadvantage authors with limited funding, especially from developing countries (Shah and Gul 2013; Tenopir et al. 2017). Mischo and Schlembach (2011) have also reported concerns over APCs with regards to "cost to authors, …and journals expanding article acceptances to make money". Moreover, APC payments fall mostly on authors or their funders and the majority of the few institutions covering APCs use existing library budgets rather than additional allocated funds (Bauer et al. 2013; Lara 2014; Fernandez and Nariani 2011).

Nothing captures the current state of researchers' scramble to publish at all costs better than the Goodhart law as phrased by Marilyn Strathern: "When a measure becomes a target, it ceases to be a good measure." Blind focus of academic institutions on quantitative metrics for faculty appraisals is pushing the latter to fall prey to what Beall (2012) and Anderson (2012) dubbed as "predatory publishers". The share of articles published by alleged predatory journals had increased from 53,000 to 2010 to an estimated 420,000 articles in 2014 (Shen and Björk 2015). However, these journals will likely have minimal impact as recent analysis by Björk, Kanto-Karvonen and Harviainen (2019) has shown that most of the articles they publish receive little to no citations.

Demir (2018) claims that the UAE is one of the top ten countries with predatory journals listed in Beall's now defunct list of predatory journals. Furthermore, the editor of an OA journal published in the UAE had to resign after the journal accepted a hoax article for publication against a fee (Gilbert 2009). While no research could be identified on the number of articles published by UAE authors in predatory journals, the presence of predatory publishers in the country may be a tell-tale sign of a response to an existing demand.

Björk (2017), talks about an even more radical and disruptive trend in OA he refers to as "black OA". He defines it as the illegal access provided by social sites or piracy-based platforms to millions of pay-walled articles. ASNs such as ResearchGate and Academia.edu are disrupting traditional academic publishing models by providing authors with alternative means to share and access research articles (Laakso et al. 2017; Lovett et al. 2017) often in clear violation of copyright laws and author-publisher agreements. Laakso and Polonioli (2018) labelled ASNs as a catalyst of copyright infringement. Indeed, Jamali (2017) suggests that 51.3% of articles posted in ResearchGate breached copyright and publishers' OA policies. Similarly, Himmelstein et al. (2018) claim that Sci-Hub, a widely criticized academic content platform for hosting pirated content, provides free access to 85.1% of all articles otherwise available only behind paywalls. Moreover, even in the presence of an IR, researchers are increasingly opting to share their research through ASNs (Lovett et al. 2017). Borrego (2017) conclusively shows a notable disparity between Spanish authors' deposition of articles in their IRs and in Research Gate with 11.1% and 54.8%, respectively. Furthermore, Laakso and Polonioli (2018) state that IRs scored "second lowest" among eight different web locations for dissemination of research articles. Harle (2016), for his part, sees that the uptake of piracy-based alternatives is inevitable if access costs are not cut especially for the developing world.

Method

Institutions

The primary aim of this multi-institutional study was to investigate scholarly publishing and OA practices in the UAE. Preliminary analysis of WoS ResearcherID affiliations revealed that most researchers work for universities. Thus, the study focuses on HEIs deemed to have measurable research output. To determine which institutions are research-intensive or have some assessable research productivity, the Commission for Academic Accreditation list of higher education institutions, Scimago Institutions Rankings, QS World University Rankings, and Web of Science researcher affiliations were analyzed.

A total of 50 institutions offering masters and Ph.D. degrees were initially identified. 10 institutions were removed because a direct contact could not be identified, their website

did not provide any indication of ongoing research or interest thereto, or the institutions are branch campuses of international institutions with no local research administration offices. A final population of 40 institutions was selected. We then created a contacts list of the key personnel in charge of/or involved with research at those institutions. These contacts were selected from the HEIs research administration offices whenever that was possible. In the few cases where a research in-charge could not be identified, the heads of academic departments or librarians were added to the contact list. These respondents were solicited to forward the survey to any staff better suited to respond on behalf of their university. All contact information was gathered from the entities' websites. All institutions meeting the research component criteria above were invited to take part in this survey.

Data collection procedure

This study used a multi-institutional quantitative online survey as the main instrument to collect data. The survey consists of 42, mostly close-ended, questions. The questions in the survey were informed by instruments in previous studies namely Greyson et al. (2009), Creaser (2010), Miller, et al. (2013), Bauer et al. (2013), Lara (2014), Fernandez and Nariani (2011), Morais and Borrell-Damian (2018), Kipphut-Smith et al. (2018), Beshyah et al. (2018), and Bales et al. (2019). The questions were, however, extensively customized to fit around the areas this study is addressing. As the survey seeks to provide a bird's-eye view of scholarly articles publishing and OA in the UAE HEIs, it was split into sections, namely: general demographics, scholarly publishing, OA policies, APCs and OA funding, incentivizing research, researcher promotion and publishing output, IRs and self-archiving, and awareness of predatory journals.

The survey was created and administered using Surveymonkey. Responses were solicited between May and October 2019. It was tested by the researcher and several colleagues for any content or technical issues before being distributed. The survey instrument is provided as Appendix 1. A personalized email invitation with a link to the online survey was sent to all persons listed in the HEIs contact list. Only one response was solicited per institution. In line with "*the ethical principles of research with human participants and ethical review in the human sciences in Finland*" (TENK, 2019), our survey invitation included a summary of the study, an informed consent, ethical reassurances, and the right to withdraw from the study. Reminder emails, slightly reformulated from the initial invitation, were sent at weekly intervals to non-respondents. By the end of the survey period, data was collected from 19 universities. The anonymised responses are available as a dataset in Zenodo (Boufarss and Laakso 2020).

Results and discussion

Of the 40 invitations sent, we received a total of 19 responses. The overall response rate was around 47% (63% of private universities, and 37% public universities). Respondents on behalf of their institutions included research administration directors, academic managers, deans, and librarians.

This part of the study presents and discusses the results of the multi-institutional survey. In line with the survey structure, it is divided into six sections, each of which presents the responses to the related set of questions.

State of scholarly publishing

This section focuses on questions pertaining to the size of the researchers' population, number of scholarly articles published, peer-reviewed journals, languages of publication, and strategies for boosting research productivity.

Table 1 shows that over a third of responding institutions have between 20 and 50 researchers. 26% of the institutions have between 50 and 100 and a similar percentage of institutions have over 100 researchers. Almost 50% of private institutions have between 20 and 50 researchers.

In response to a question on scholarly articles published by all researchers in the last 12 months, most of the 14 responding institutions indicated that about 80% of all articles published by their researchers were in subscription-based journals with an overall average of 73 articles versus only 18 in OA journals (Table 2).

When asked if the institution publishes a peer-reviewed journal of its own, almost 73% (11) responded negatively. 50% (2) of the institutions that were involved in journal publishing indicated that their journal(s) were OA.

When asked about the approximate percentage of staff publications in non-English-language journals, the highest percentage given was 15 and the majority of the institutions that responded to this question indicated 0%. A further related question on the preferred and encouraged publication channels (Fig. 1) revealed strong preference for international English-language journals and Scopus or WoS indexed journals with over 80% of

Table 1 Size of researcher population ($n=19$)

Fewer than 20	10.5%	2
20–50	37%	7
50–100	26%	5
More than 100	26%	5

Table 2 Number of articles published in OA and paywalled journals in the last 12 months ($n=15$)

	Average number	Total number
Open access journals	18	249
Subscription-based journals	73	1028

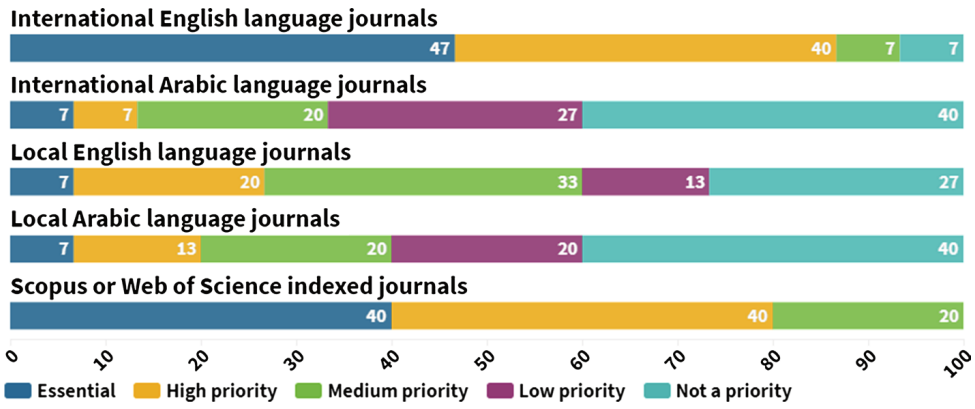


Fig. 1 Favored and encouraged publication channels by languages ($n=15$)

Table 3 Strategies to boost research productivity ($n=15$)

Recruit faculty members who have extensive research experience	67%	10
Allocate time for faculty to work on internal and external research projects	53%	8
Create research centers in different disciplines	33%	5
Provide research related training and professional development	53%	8
Organize conferences and symposiums	53%	8
Establish a publication support unit	13%	2
Establish a researcher reward program	27%	4
Link promotion with publication records	60%	9
Setup research teams	33%	5
Integrate research components in the curriculum to stimulate student's contribution in research activities	47%	7
Encourage institutional, national and international collaboration	73%	11
We do not have any particular strategies to increase research productivity	20%	3

the institutions considering these "essential" and "high priority". On the other hand, both international and local Arabic-language journals were in the majority of responses reported as "not a priority" or "low priority". In contrast, local English-language journals were looked at more positively with nearly 60% indicating these as "essential", "high priority", and "medium priority". These trends resonate with Al-Aufi's (2012) conclusion that Arab scholars have been found to shun local and Arabic journals.

The majority of the institutions that responded to a question on strategies adopted by their institution to encourage and promote research productivity put emphasis on research collaboration (73%), recruiting faculty with research experience (67%), and linking promotion with publishing records (60%). The least emphasized strategies include "establishing a publication support unit" (13%) and "establishing a reward system" (27%). 20% of the institutions indicated that they do not adopt strategies to increase research productivity (Table 3).

Open access policies

The second section of the survey was concerned with institutional OA policies, perception of OA, and features of OA policy.

More than 73% of the respondents to a question on familiarity of the term "Open Access" as applied to research indicated that they have a clear idea of what OA is. This percentage is in line with findings by Greyson et al. (2009) who reported that 66% of their respondents had a clear idea of what OA stands for. A further 20% stated that they were OA experts in stark contrast to Greyson et al. (2009) conclusion that only 11% of librarians and none of the research administrators reporting to be experts in OA. A further 7% stated that they have some idea of what OA is about. This is again in contrast with the higher percentage reported among Greyson et al. (2009) respondents. It can be argued that these disparities can be attributed to the increasing awareness of OA and OA becoming mainstream since 2009.

When the universities were asked about the strategic importance of OA for different university stakeholders, Fig. 2 shows that it has high or moderate importance to all of them. However, it holds the highest importance for librarians followed by early stage researchers than for any other university stakeholders. One may claim that this is because libraries are bearing the burden of buying subscriptions at a time of dwindling budgets. Surprisingly,

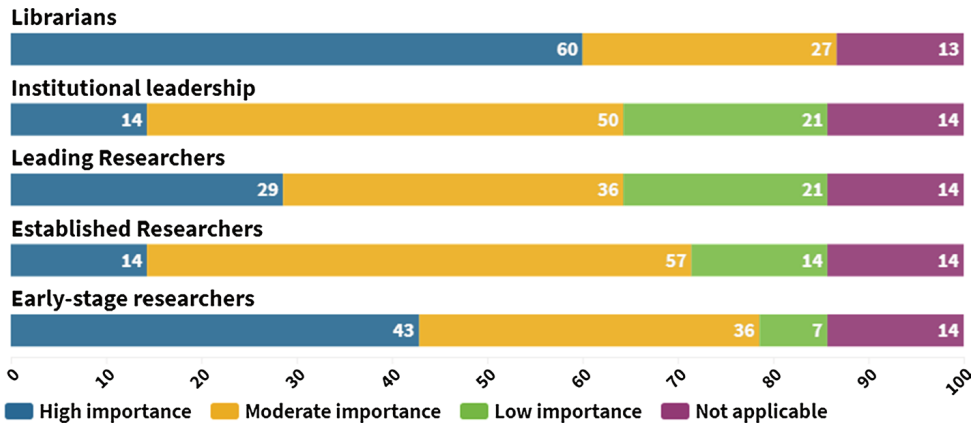


Fig. 2 Strategic importance of OA for different HEI stakeholders ($n = 15$)

OA has a low importance for leading researchers and institutional leadership at 21% (3) each. The EUA survey (Morais & Borrell-Damian 2018) found OA to be" important or very important for all professional groups" especially for institutional leadership.

Responses to a question on the availability of an OA policy indicate that only a mere 7% of institutions have an OA policy. A further 13% are planning a policy to be released in the next 12 months. Another 27% have plans in place for an OA policy but not in the next 12 months. However, 53% indicated that they are not planning to develop an OA policy. These findings are in stark contrast to the results from Morais & Borrell-Damian (2019) European survey which reveals that over 60% of HEIs have an OA policy in place and a further quarter were developing one and only 12% don't have an OA policy. Similarly, Kipphut-Smith et al. (2018) reports that nearly 90% of the surveyed COAPI institutions have an OA policy. This anomaly may be related to low awareness of OA, absence of self-archiving infrastructure or strategic vision.

86% of those institutions with an OA policy stated that its main purpose is to encourage researchers to self-archive their publications. A further 71% indicated that its main objective is raising awareness of OA. 43% indicated financial support of OA publishing as an element in their OA policy. 57% of the respondents have a mandate element in their policy. The order of importance reported here matches that showcased by Morais & Borrell-Damian (2018) among EU universities with the exception of the financial support element that scored second lowest among UAE HEIs. This could be attributed to rampant absence of financial support for OA in the UAE. However, these findings are contradicting Kipphut-Smith et al. (2018) who state that about a quarter of their respondents have an encouragement OA policy and that over half have a rights-retention mandate requiring authors to deposit in an IR upon acceptance of the article for publication.

When responding to a question on motives for the OA policy, all institutions cited higher research impact as a main motive. This is closely followed by "increasing institutional visibility" and "long-term cost-effective access to research". "Greater public engagement" surprisingly came at the bottom of the list. Only 29% cited "receiving more funding" as a motive. Similarly, only 43% listed "unlocking knowledge to the whole world" as a motive. These figures are in agreement with EU universities responses in terms of a strive for higher research visibility and impact (Morais and Borrell-Damian 2018).

Table 4 Existence of an institutional OA policy

Does the university have an institutional OA policy? (n = 15)		
Yes	7%	1
My institution is in the process of developing an Open Access policy (and expects to have one in place within 12 months)	13%	2
My institution is planning to develop an Open Access policy (but does not expect to have a policy in place within 12 months)	27%	4
My institution is not planning to develop an Open Access policy	53%	8
Elements of the OA policy (n = 7)		
Encouragement policy, recommending researchers to deposit publications in an institutional/shared repository	86%	6
Awareness raising, including training for early-stage researchers on open access to research publications	71%	5
Financial support for researchers to publish their papers in open access	43%	3
Mandate: researchers deposit publications in a repository and make full text open access within a specified time period	57%	4
Mandate: researchers deposit publications in a repository, this requirement being linked to internal performance evaluation	57%	4
Mandate: researchers deposit publications in a repository, this requirement being linked to an external, national review procedure	57%	4
Mandate requiring publication in open access (gold route/gold open access)	0%	0
Motives for instituting an OA policy (n = 7)		
Increasing institutional visibility	85%	6
Higher research impact	100%	7
Greater public engagement	14%	1
Unlocking knowledge to the whole world	43%	3
Long-term cost-effective access to research findings	71%	5
Receiving more funding	29%	2
Other (please specify)	0%	0
Extent of satisfaction with current access model (n = 15)		
We are satisfied with the current subscription-based access model and open access is not a priority for us	7%	1
We are satisfied with the current access model, but endorse open access	73%	11
We are not satisfied with the current subscription-based access model and made open access a priority	0%	0
We are not satisfied with the current subscription-based access model, but open access is not a priority for us	20%	3
Other (please specify)	0%	0

In response to a question on satisfaction with the current access model, the majority reported that they are satisfied with the current access model but are endorsing OA. It is surprising that OA is low on the agenda of the responding HEIs even among those not satisfied with the current access model. As the majority of universities in Europe are exerting efforts to revise subscription contracts in support of OA and APCs (Morais and Borrell-Damian 2019), further research is required to verify if this is due to availability of enough funds to libraries in the UAE, purchase of limited resource packages by the libraries due to low researcher pressure, reliance on pirated content, or any other reasons (Table 4).

Table 5 OA funding among UAE HEIs

Sources of OA funding (n = 15)		
Funds specifically included in research funding	53%	8
Indirect costs administered at faculty/ department level	33%	5
Indirect costs administered centrally	7%	1
Authors own resources e.g. discretionary funds	27%	4
No mechanism to support author pays	27%	4
Other	0%	0
Don't know	7%	1
Reasons for instituting OA funding (n = 12)		
Faculty requests	42%	5
Provides incentives for authors to publish open access	33%	4
Supports alternative models of scholarly publishing	67%	8
Part of campus-wide strategy to promote OA	0%	0
Maximises the impact of institution's research	50%	6
Fosters experimentation with new initiatives	25%	3
Supports public access policies	25%	3
Other (please specify)	8%	1
Types of OA publications covered by funding (n = 12)		
All peer-reviewed open access journals	25%	3
Open access journals from the Directory of Open Access journals	17%	2
OA journals from specific publishers through institutional memberships	33%	4
Subscription journals offering open access options (hybrid)	33%	4
Not applicable	25%	3
Other forms of OA publication (please specify)	17%	2
Reasons for not paying APCs (n = 10)		
We don't have a budget to support APCs	70%	7
We prefer our researchers to publish in paywalled journals	10%	1
We believe that paywalled journals have a higher impact	10%	1
We perceive OA journals to have lower prestige	0%	0
We perceive OA journals to have poor peer review procedures in place	0%	0
The decision on publishing venue is left to the researchers	60%	6
We are not familiar with open access publishing venues	10%	1

OA funding

This section of the survey looked at OA funding aspects such as OA funding policy, APC funding resources, motives for OA funding, publications covered by funding, motives for non-payment of APCs (Table 5).

In a response to a question on the existence of an OA funding policy in the institution, over 73% of the HEIs reported that they do not have a policy to fund OA. Only 13% of all universities have a policy for funding OA. There is no significant difference between private and public institutions in this aspect. These figures are in stark contrast to the situation in Canada where a quarter of respondents have an OA funding policy in

place, nearly a further third have one under review, and around 44% don't have a policy (Fernandez and Nariani 2016). This could be attributed to the perception of OA as low quality or merely to the fact that it is not a priority in the UAE.

Respondents were asked about sources of funds to support OA. Consistent with Creaser (2010), the majority (53%) of HEIs reported funds earmarked as part of research funding as the main source. Another third, against 15% reported by Creaser (2010), listed indirect costs administered under departments or research units. A further 27% listed authors' own resources as a source of funding. A similar percentage said that they do not have a mechanism in place to support OA funding. However, both UAE and Canadian figures are inconsistent with findings of Lara (2014) which report that nearly half of the respondents listed the author's own resources as the main source of APCs.

When asked about the reasons for instituting OA funding, 67% of HEIs reported "Supports alternative models of scholarly publishing" as the main reason. This was followed by "Maximizes the impact of institution's research" and "Faculty requests" with 50% and 42%, consecutively. However, none of the responding institutions selected "Part of campus-wide strategy to promote OA" as a reason. These findings are partly consistent with the conclusions of Fernandez and Nariani (2016) who concluded that support of alternative models was the main reason for OA funding and campus-wide OA strategy being the least important reason.

In terms of the types of OA publications covered by the funding policy, there seems to be no significant differences between publications incentivized by the UAE HEIs. This may signal a low understanding or awareness of nuances between different OA models as well as DOAJ. Some of these data is inconsistent with Fernandez and Nariani (2016) who reveal that hybrid OA is the least supported channel. For Canadian libraries, DOAJ-listed journals seem to be privileged with 35% of respondents stating that they cover their APCs.

In response to a question on the reasons the institution did not pay any APCs, over two thirds of the respondents reported that they do not have a budget to support APCs. 60% indicated that the decision on the publishing venue rests with the authors. Surprisingly, 10% reported that they prefer their authors to publish in paywalled journals, they perceive paywalled journals to have higher impact, and are not familiar with OA publishing venues. However, it is interesting that none of the respondents perceive OA journals to have lower prestige or having lower peer review practices.

Self-archiving and Institutional Repositories

Questions in this section cover self-archiving and IRs aspects namely: availability of IRs, self-archiving preferences, department in charge of IR and self-archiving, and factors affecting self-archiving decisions.

In stark contrast with previous studies (Carlson, 2015 and OPENDOAR, 2018), only a little over half of the responding universities reported having an IR. This number remains well below the over 80% of European universities (Morais and Borrell-Damián, 2019) and the over 90% of Canadian research universities (Greyson et al. 2009) which reported having a repository of their own or participating in a shared one.

Similar to Creaser (2010), IRs are the most prominent location where self-archiving is required or recommended. 43% (3) of the responding UAE universities mandate it and the remaining 57% (4) are encouraging it. While a similar number encourage using subject-based repositories, about 29% (2) tolerate it. An equal percentage (43%) encourage and tolerate using author-project websites. Surprisingly, about 14% (1) require self-archiving in ASNs while a further 29% (2) and 43% (3) encourage and tolerate it, respectively (Fig. 3).

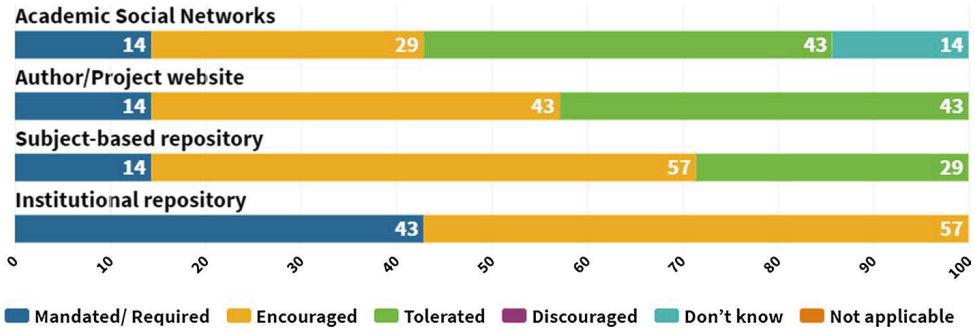


Fig. 3 Self-archiving channels perception at the institution ($n=7$)

Table 6 Who oversees the IR? ($n=7$)

My university does not have an Institutional Repository	29%	2
University IT/Campus computing services department	14%	1
University library	86%	6
Maintenance is contracted out to a commercial firm	14%	1
Not sure	14%	1
Other (please specify)	29%	2

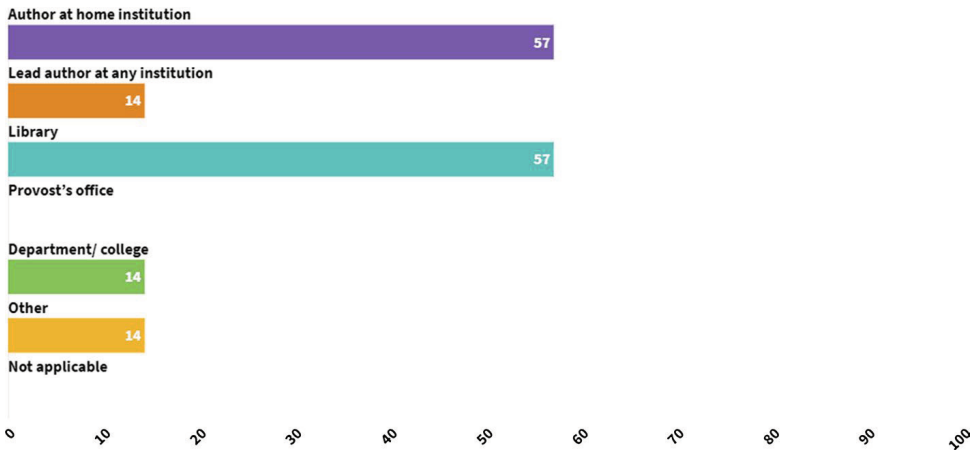


Fig. 4 Who is in charge of self-archiving at the HEI? ($n=7$)

We then asked universities about the department that oversees their IR. The university library was predominantly selected as the department managing the IR. Around 14% stated that their IT unit is in charge of the IR. A similar percentage reported that the management of their IR was outsourced (Table 6).

In-line with Kipphut-Smith et al. (2018), around 57% (4) of HEIs selected the library and author at home institution as the primary units responsible for depositing articles equally (Fig. 4).

In response to a question on the importance of factors for encouraging self-archiving, HEIs regard increasing citations as the highest important factor followed equally by

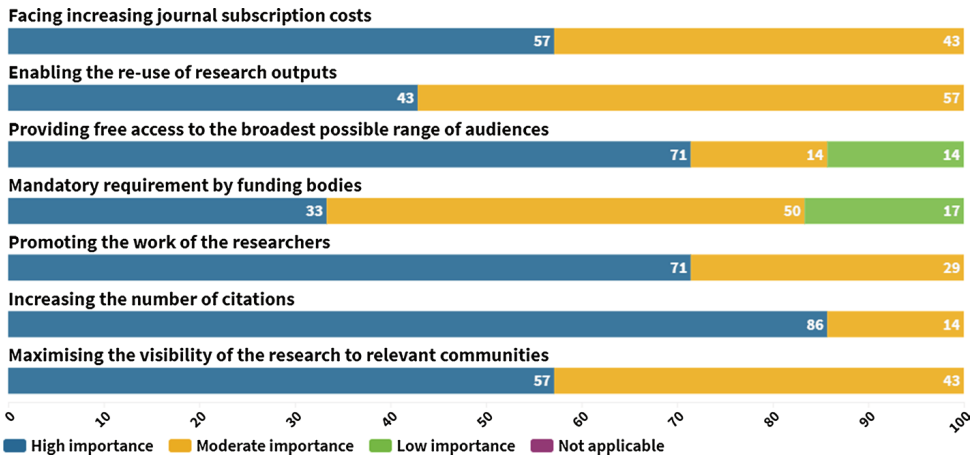


Fig. 5 Important factors for encouraging self-archiving ($n=7$)

promoting the work of the researchers and providing free access to the widest audiences (Fig. 5). Unlike in European universities where "mandatory requirement by funding bodies" was viewed as an important factor (Morais and Borrell-Damián 2018), it scored lower in the UAE. This can be attributed to the absence of OA-mandating funding mechanisms, policies, and procedures in the country.

Incentives for OA

The aim of this section was to elicit responses on questions related to publication records for tenure and promotion, tracked and valued metrics, perception of OA articles for promotion purposes, types of incentives, incentivizing OA publication, education on OA, and incentivized journals.

To the question of "Does the institution take publishing records into account for tenure and promotion purposes?" over half of the institutions responded (8) answered that they take publication records into account for promotion while a surprising 29% (4) said it was only occasionally done. An unexpected 14% (2) said that they do not take publication records into account during tenure and promotion evaluations.

The high percentage of universities tracking and valuing the JIF and a low number selecting altmetrics is a suggestion that UAE HEIs like many universities around the world have not yet embraced the calls of initiatives such as DORA and The Leiden Manifesto that call for more diverse ways of evaluating research output (Fig. 6). Even though still widely used to assess researchers, use of JIF has been widely criticized (Kurmis, 2003; Vanclay, 2009; Moher et al. 2018).

While the majority of HEIs (79%−11) reported a neutral position towards OA publications during tenure and promotion assessment, only about a fifth (3 HEIs) look at them positively. This may be associated with low awareness of the public good dimension of OA as well as OA being low on the HEIs priorities list.

Two thirds of the universities (8) have tied publication output with priority in promotion. Nearly 42% (5) reward researchers with extra funding for research. Around 17% (2) are catching up on the global trend of cash-for-publication as shown by Abritis and McCook (2017) either in the form of direct cash bonuses or by providing salary

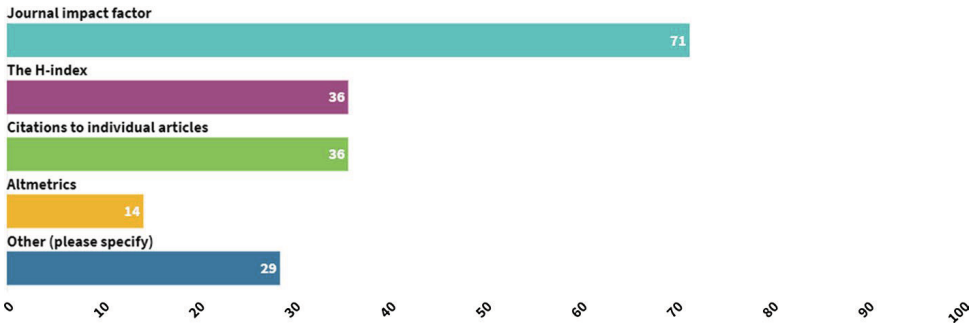


Fig. 6 Tracked and valued metrics ($n = 14$)

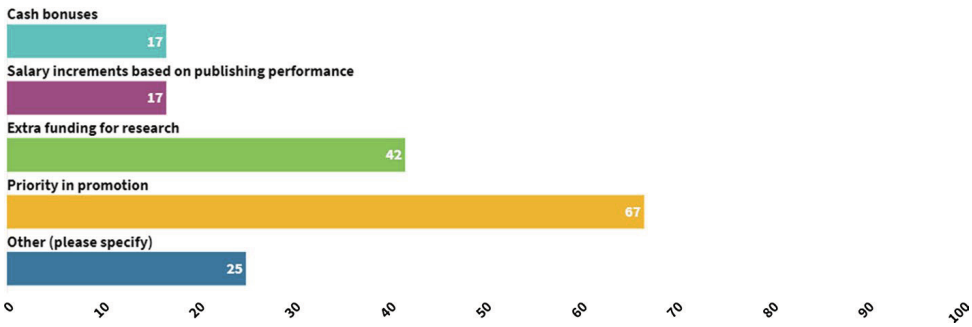


Fig. 7 Types of incentives given to researchers to publish ($n = 12$)

increments. Free text responses falling under "other" response choices include conference attendance funding for prolific researchers. These results may be somehow contradictory to the researchers' expectations. In a survey by Miller, Coble & Lusk (2013), most of the researchers prefer "merit-based salary raises" as an incentive. Similarly, Franzoni, Scellato & Stephan (2011) demonstrated a positive impact of cash bonuses on publication output (Fig. 7).

Our survey results show that OA is low on the UAE HEIs agendas as only about 8% (1) of the organizations offer their researcher incentives to publish OA. About two thirds (8) responded that they do not incentivize publishing OA while a quarter (3) did not know if their institution does or not.

When asked about the kind of OA education they offer their research communities, three quarters of the universities stated that they do not provide any (Fig. 8). Only about 17% (2) provide direct training in the form of lectures and information sessions. A similar number distribute printed brochures and pamphlets about OA. Only about 8% (1) have a webpage about OA. These findings conflict with Greyson et al. (2009) who found that about 58% of the library respondents were offering OA lectures and that 63% were providing printed materials promoting OA.

Free text responses to a final question on any particular journal rankings or lists (such as Web of Science, Scopus, ABDC Journal Quality List, Harzing or ABS Journal Guide) that are perceived as important by the institution and incentivizes researchers to publish in show a predominance of Scopus as a reference list.

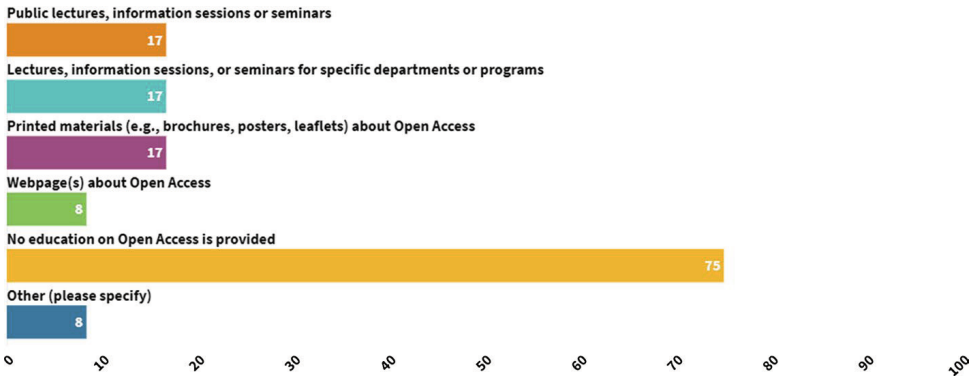


Fig. 8 Education on OA for research community ($n = 12$)

Predatory journals

In the final part of the survey, HEIs were asked five questions on their awareness and perception of predatory journals and articles in predatory journals.

In response to a question on their familiarity with predatory journals, half of the respondents (6) stated that they are fully knowledgeable of the concept. A further third (4) reported that they are fairly familiar with it. Only 17% (2) did not have a clear idea about predatory journals. This is consistent with Beshyah et al. (2018) who discovered that nearly half of their respondents had never heard of (32%) or have a faint idea (18 and 11%) about predatory journals.

Regarding difficulty in distinguishing predatory from legitimate OA journals, a third of the HEIs (4) indicated that it was easy. However, in line with Beshyah et al. (2018), 42% (5), 17% (2) and 8% (1) expressed the belief that it was somewhat difficult, difficult, and extremely difficult, respectively.

In terms of excluding publications in predatory journals during promotion applications evaluation, 25% (3) of HEIs stated that they did. A third (4) indicated that they did only if the journal was not listed in Scopus or WoS. Surprisingly, about 8% (1) reported not excluding them and a further third (4) stated they were not aware of predatory journals.

Concerning the availability of a list of journals perceived as predatory in the HEI, only a little over 17% (2) indicated that they have while a third (4) reported that they don't. Half of the respondents (6) said that they are not sure. In contrast, 79% of Bales, et al. (2019) respondents stated they don't and 8% said they do. Given that only 13% of their respondents were not sure that a list existed against half of this survey's respondents, the percentage of HEIs keeping a list is proportionate.

In response to a final question on whether publishing by a tenure and promotion candidate in a journal on this list influences how their publication is perceived, half (4) of the responding HEIs believe it does. Similarly, Bales, et al. (2019) found that the majority of their respondents looked sceptically at publications in such journals during tenure and promotion evaluations.

Conclusions

The results of this survey suggest that there seems to be a generally positive perception of OA among UAE HEIs, coupled with moderate adoption of OA policies and practices. However, the results also indicate that a lot still needs to be done to create a culture that is conducive for a move to a higher priority for OA adoption. All indicators point to OA being low on the UAE HEIs priorities and that considerable improvements pertaining to awareness, policies, best practices, and infrastructure are required if the share of OA publications is to grow.

In terms of the state of scholarly publishing, there is still a predominance of publications in paywalled versus OA journals among UAE HEIs in spite of reported international reversal of this trend in favour of OA (Piwowar et al. 2019). In line with international trends (Banks 2018; van Weijen 2012; Al-Aufi 2012), there is a clear preference for English-language, international journals and Scopus or WoS indexed journals at the detriment of local and Arabic-language journals. Finally, HEIs use a combination of strategies to boost research publications, mainly by promoting research collaboration, recruiting faculty with previous research experience, and linking promotion with publishing records.

The survey indicates that UAE HEIs are mostly aware of the OA concept. However, this awareness has not translated into actions as the majority of responding HEIs do not have an OA policy. In contrast, the majority of European institutions have an OA policy or in the process of adopting one (Morais and Borrell-Damian 2018). This disparity could be attributed to the fact that OA is high on the agenda of institutional leadership at European institutions (Morais and Borrell-Damian 2018). The majority of UAE responding HEIs reported being satisfied with the current access model, where the few existing UAE policies aim to raise awareness of OA but not mandating OA or providing APC support. Findings suggest that instituting OA policies at these institutions is mainly motivated by the desire to boost research impact and increase institutional visibility rather than by public good or sharing knowledge with the world. This aligns them with North American universities for which "public patronage" of research was a low priority (Alperin et al. 2018).

We found that some institutions do not have a policy on funding OA publishing. Sources of OA funding are mainly included in the research funding, indirect costs at departmental level and from authors' own resources. Instituting an OA policy is often driven by a desire to support alternative scholarly publishing models and maximizing research impact. In terms of types of journals, HEIs do not seem to distinguish between gold and hybrid journals when it comes to funding OA publishing.

Although over half of the HEIs now have an IR, this remains a subpar achievement compared with 80% of European universities (Morais and Borrell-Damián 2019) or over 90% of Canadian institutions over 10 years ago (Greyson et al. 2009). However, IRs remain the officially endorsed channel for self-archiving while alternative means such as ASNs are not shunned. This survey reveals the pivotal role of the university library in campus scholarly publishing as it leads both in repository management and self-archiving of materials.

Our research shows a humble research incentivizing approach among UAE HEIs. As expected, most HEIs factor publishing records in promotion appraisals. The JIF remains the most tracked and valued metric despite being widely criticized as a research quality assessment tool (Moher et al.2018) and calls for recognizing the merits of the actual work and not the publication venue (Balez et al. 2019). However, the results also reveal that OA is not seen as a priority since most HEIs do not incentivize OA publishing, perceive OA publications neutrally during promotions, and offer no education on OA for researchers.

This diverges from some institutions in North American and Europe reporting to have adopted tenure and promotion policies that factor OA publications in faculty appraisals (Odel et al. 2016; Morais and Barrell-Damián, 2019).

The survey results indicate that UAE HEIs do not appear to have mechanisms in place to deal with predatory journals. The majority are not aware of these journals, do not keep a list of potential predatory journals, and admit the challenge of identifying them. This is alarming since the UAE is one of the top ten countries claimed as the contact location on the predatory journals' websites according to Demir (2018). On the other hand, HEIs seem to put emphasis on journals being indexed in Scopus and WoS, albeit some of these may also be predatory journals that managed to get indexed in these services as demonstrated by Bagues, Sylos-Labini & Zinovyeva (2019).

The level of awareness and adoption of OA among UAE HEIs suggests that if the UAE is to increase its presence in the OA movement, nation-wide strategies aligned with international initiatives such as OA2020 and Plan S need to be adopted. These strategies should translate into actionable policies and initiatives at the institutional and national level. We encourage replication of the survey in other parts of the world (provided as Appendix 1) in order to collectively collate a more nuanced representation of the true global stance towards OA. As OA seems to be the inevitable direction scholarly publishing at large is going there should be more knowledge concerning the current adoption, interest, and commitment to facilitate that change in various parts of the world.

We acknowledge a few limitations in our study. First, the survey return rate was less than 50%, and not all respondents answered all survey questions. Second, a single survey does not generate longitudinal data which would provide a better measurement of the OA uptake. Finally, no distinction was made between scientific disciplines, and no comparison was made between institutions teaching in English and Arabic languages. Research on OA in the UAE is at its early stages, and further research is needed before we can fully understand the role that HEIs might play in improving the uptake of OA. Future studies on OA in the UAE may also investigate individual researchers' attitudes, experiences, and behaviors.

Acknowledgements The authors gratefully acknowledge the invaluable advice and input of Associate Prof. J. Tuomas Harviainen of Tampere University.

References

Abritis, A., & McCook, A. (2017). Cash incentives for papers go global. *Science, 357*(6351), 541-. https://doi.org/10.1126/science.357.6351.541.

Al-Aufi, A. S. (2012). Domination of English and its impact on the Arabic System of Scholarly Communication. *Journal of Arts and Social Sciences, 3*(1), 5–28. https://doi.org/10.24200/jass.vol3iss1pp5-28.

Al Qasimi, B. (2017). UAE's publishing industry: A vision of an avant-garde nation. *Publishing Research Quarterly, 33*(1), 37–40. https://doi.org/10.1007/s12109-016-9494-z.

Alperin, J. P., Muñoz Nieves, C., Schimanski, L., Fischman, G. E., Niles, M. T., & McKiernan, E. C. (2018). How significant are the public dimensions of faculty work in review, promotion, and tenure documents? *Humanities Commons* [preprint]. https://doi.org/10.17613/M6W950N35.

AmeliCA. (2020). *About AmeliCA*. Retrieved from http://amelica.org/index.php/en/about.

Anderson, K. (2012). "Predatory" Open Access Publishers - The Natural Extreme of an Author-Pays Model. *The Scholarly Kitchen*. Retrieved from https://scholarlykitchen.sspnet.org/2012/03/06/predatory-open-accesspublishers-the-natural-extreme-of-an-author-pays-model/.

Austin, A. E., Chapman, D. W., Farah, S., Wilson, E., & Ridge, N. (2014). Expatriate academic staff in the United Arab Emirates: The nature of their work experiences in higher education institutions. *Higher Education, 68*(4), 541–557. https://doi.org/10.1007/s10734-014-9727-z

Bagues, M., Sylos-Labini, M., & Zinovyeva, N. (2019). A walk on the wild side: 'Predatory' journals and information asymmetries in scientific evaluations. *Research Policy, 48*(2), 462–477. https://doi.org/10.1016/j.respol.2018.04.013.

Bales, S., Hubbard, D. E., van Duinkerken, W., Sare, L., & Olivarez, J. (2019). The use of departmental journal lists in promotion and tenure decisions at American research universities. *The Journal of Academic Librarianship, 45*(2), 153–161. https://doi.org/10.1016/j.acalib.2019.02.005.

Banks, D. (2018). Thoughts on publishing the research article over the centuries. *Publications of the Astronomical Society of Australia, 6*(1), 10. https://doi.org/10.3390/publications6010010.

Bauer, B., Gumpenberger, C., Haas, I., Katzmayr, M., Ramminger, E., & Reinitzer, D. (2013). open access bestandsaufnahme an österreichischen universitäten: Ergebnisse einer umfrage im auftrag des forums universitätsbibliotheken österreichs (UBIFO). *Mitteilungen der Vereinigung Österreichischer Bibliothekarinnen & Bibliothekare, 66*(3–4), 535–558.

Beall, J. (2012). Predatory publishers are corrupting open access. *Nature*, (489). Retrieved from https://www.nature.com/polopoly_fs/1.11385!/menu/main/topColumns/topLeftColumn/pdf/489179a.pdf.

Beshyah, S. A., Hajjaji, I. M., & Elbarsha, A. (2018). Awareness of predatory journals among physicians from Africa and the Middle East: An exploratory survey. *Ibnosina Journal of Medicine and Biomedical Science*. https://doi.org/10.4103/ijmbs.ijmbs_45_18.

Björk, B. C. (2017). Gold, green, and black open access. *Learned Publishing, 30*(2), 173–175. https://doi.org/10.1002/leap.1096.

Björk, B. C., Kanto-Karvonen, S., & Harviainen, J. T. (2019). How frequently are articles in predatory open access journals cited. Publications, 8(2). https://doi.org/10.3390/publications8020017.

Björk, B. C., & Solomon, D. (2014a). Developing an effective market for open access article processing charges. *Final Report*. https://doi.org/10.6084/m9.figshare.951966.

Björk, B. C., & Solomon, D. (2014b). How research funders can finance APCs in full OA and hybrid journals. *Learned Publishing, 27*(2), 93–103. https://doi.org/10.1087/20140203.

Borrego, Á (2017). Institutional repositories versus ResearchGate: The depositing habits of Spanish researchers. *Learned Publishing, 30*(3), 185–192. https://doi.org/10.1002/leap.1099.

Boufarss, M. (2011). If we build it, will they come? A survey of attitudes toward institutional repositories among faculty at the Petroleum Institute. *International Journal of Library Science, 3*(1), 1–14.

Boufarss, M. (2020). Charting the Open Access scholarly journals landscape in the UAE. *Scientometrics*. https://doi.org/10.1007/s11192-020-03349-0.

Boufarss, M., & Laakso, M. (2020). UAE HEIs open access institutional survey [Data set]. Zenodo. https://doi.org/10.5281/zenodo.3831192.

Butler, L. (2003). Explaining Australia's increased share of ISI publications-the effects of a funding formula based on publication counts. *Research Policy, 32*(1), 143–155. https://doi.org/10.1016/s0048-7333(02)00007-0.

Chapman, D., Austin, A., Farah, S., Wilson, E., & Ridge, N. (2014). Academic staff in the UAE: Unsettled journey. *Higher Education Policy, 27*(1), 131–151. https://doi.org/10.1057/hep.2013.19.

Coalition, S. (2019). *Plan S: Making full and immediate Open Access a reality*. Retrieved from https://www.coalition-s.org.

Crawford, W. (2019a). *Gold Open Access 2013–2018: Articles in journals (GOA4)*. Livermore, CA.: Cites & Insights Books. Retrieved from https://waltcrawford.name/goa4.pdf.

Crawford, W. (2019b). *Gold Open Access by Country 2013–2018.* Livermore, CA.: Cites & Insights Books. Retrieved from https://waltcrawford.name/goacntry4.pdf.

Creaser, C. (2010). Open Access to research outputs—Institutional policies and researchers' views: Results from two complementary surveys. *New Review of Academic Librarianship, 16*(1), 4–25. https://doi.org/10.1080/13614530903162854.

Demir, S. B. (2018). Predatory journals: Who publishes in them and why? *Journal of Informetrics, 12*(4), 1296–1311. https://doi.org/10.1016/j.joi.2018.10.008.

Esposito, J. (2016). For Scholarly Communications, Double-dipping is Double the Fun. *The Scholarly Kitchen.* Retrieved from https://scholarlykitchen.sspnet.org/2016/08/01/for-scholarly-communications-double-dipping-is-double-the-fun/.

European Commission Directorate-General for Research & Innovation. (2017). *H2020 programme guidelines to the rules on open access to scientific publications and open access to research data in horizon 2020*. Retrieved from: https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-pilot-guide_en.pdf.

Fernandez, L., & Nariani, R. (2011). Open access funds: A Canadian library survey. *The Canadian Journal of Library and Information Practice and Research*. https://doi.org/10.21083/partnership.v6i1.1424.

Finnish National Board on Research Integrity TENK. (2019). *The ethical principles of research with human participants and ethical review in the human sciences in Finland. Finnish National Board on Research Integrity TENK guidelines 3/2019.* Retrieved from: https://www.tenk.fi/sites/tenk.fi/files/Ihmistieteiden_eettisen_ennakkoarvioinnin_ohje_2019.pdf.

Fitzgerald, B. F., & Olwan, R. (2009) Copyright and innovation in the digital age: The United Arab Emirates. In *E Commerce and Intellectual Property Conference*, May 2009, UAE University, Abu Dhabi. https://eprints.qut.edu.au/21020/1/c21020.pdf.

Franzoni, C., Scellato, G., & Stephan, P. (2011). Changing incentives to publish. *Science, 333*(6043), 702–703. https://doi.org/10.1126/science.1197286.

Gdoura, W. (2009). Le Libre Accès dans les Universités Arabes: Opinions et Pratiques des Chercheurs et des Editeurs. In *World Library and Information Congress: 75th IFLA General Conference and Council*. Retrieved from https://www.ifla.org/past-wlic/2009/142-gdoura-fr.pdf.

GFH. (2016). *GCC education: Sector report*. Retrieved from https://www.gfh.com/wp-content/uploads/GFH-Education-Sector-Report.pdf.

Gilbert, N. (2009). Editor will quit over hoax paper. *Nature news*. https://doi.org/10.1038/news.2009.571.

Greyson, D., Vézina, K., Morrison, H., Taylor, D., & Black, C. (2009). University supports for open access: A Canadian National Survey. *Canadian Journal of Higher Education*, *39*(3), 1–32..

Gulf News (2016). *UAE initiatives a giant step to promote science.* Retrieved from https://gulfnews.com/opinion/editorials/uae-initiatives-a-giant-step-to-promote-science-1.1919870.

Gulf News (2017). *UAE launches National Strategy for Higher Education 2030*. Retrieved from https://gulfnews.com/uae/education/uae-launches-national-strategy-for-higher-education-2030-1.2097191.

Harle, J. (2016). High prices to access scholarly research could drive developing country researchers to use pirate sites like SciHub. *LSE: Impact Blog*. Retrieved from http://blogs.lse.ac.uk/impactofsocialsciences/2016/02/26/high-prices-scholarly-research-developing-country-researchers-scihub/.

Hicks, D. (2012). Performance-based university research funding systems. Research Policy, 41(2), 251–261. https://doi.org/10.1016/j.respol.2011.09.007.

Himmelstein, D. S., Romero, A. R., Levernier, J. G., Munro, T. A., McLaughlin, S. R., Tzovaras, G., B., & Greene, C. S. (2018). Sci-Hub provides access to nearly all scholarly literature. *ELife*. https://doi.org/10.7554/eLife.32822.

Jamali, H. R. (2017). Copyright compliance and infringement in ResearchGate full-text journal articles. *Scientometrics, 112*(1), 241–254. https://doi.org/10.1007/s11192-017-2291-4.

Jisc. (2020). *SHERPA/Juliet statistics.* Retrieved from: https://v2.sherpa.ac.uk/view/funder_visualisations/1.html.

Johnson, R., Watkinson, A., & Mabe, M. (2018). *The STM Report: An overview of scientific and scholarly publishing, 5th Edition*. https://www.stm-assoc.org/2018_10_04_STM_Report_2018.pdf.

Jolson, M. A. (1974). Criteria for promotion and tenure - A faculty view. *Academy of Management Journal, 17*(1), 149. https://doi.org/10.5465/254779.

King, D. W., & Alvarado-Albertorio, F. M. (2008). Pricing and other means of charging for scholarly journals: a literature review and commentary. *Learned Publishing, 21*(4), 248–272. https://doi.org/10.1087/095315108X356680.

Kipphut-Smith, S., Boock, M., Chapman, K., & Willi Hooper, M. (2018). Measuring Open Access Policy Compliance: Results of a Survey. *Journal of Librarianship and Scholarly Communication, 6*(1), eP2247. https://doi.org/10.7710/2162-3309.2247.

Kurmis, A. P. (2003). Understanding the limitations of the journal impact factor. *The Journal of Bone and Joint Surgery. American Volume, 85*(12), 2449–2454. https://doi.org/10.2106/00004623-200312000-00028.

Laakso, M., Lindman, J., Shen, C., Nyman, L., & Björk, B. C. (2017). Research output availability on academic social networks: implications for stakeholders in academic publishing. *Electronic Markets*. https://doi.org/10.1007/s12525-016-0242-1.

Laakso, M., & Polonioli, A. (2018). Open access in ethics research: An analysis of open access availability and author self-archiving behaviour in light of journal copyright restrictions. *Scientometrics, 116*(1), 291–317. https://doi.org/10.1007/s11192-018-2751-5.

Lara, K. (2014). *Open Access Library Survey. An investigation of the role of libraries in open access funding and support within institutions*. Retrieved from http://www.pcgplus.com/wp-content/uploads/2014/09/PCG-Open-Access-Library-Survey-2014.pdf.

Larivière, V., & Sugimoto, C. R. (2018). Do authors comply when funders enforce open access to research? *Nature news*. https://doi.org/10.1038/d41586-018-07101-w.

Lovett, J. A., Rathemacher, A. J., Boukari, D., & Lang, C. (2017). Institutional repositories and academic social networks: Competition or complement? A study of open access policy compliance vs. researchgate participation. *Journal of Librarianship and Scholarly Communication, 5*(1), eP2183. https://doi.org/10.7710/2162-3309.2183.

Mavodza, J. (2013). A review of the open access concept in the UAE. *New Library World, 114*(5/6), 259–266.

Max Planck Digital Library. (2020). *OA2020: be informed.* Retrieved from: https://oa2020.org/be-informed/.

Miller, J. C., Coble, K. H., & Lusk, J. L. (2013). Evaluating top faculty researchers and the incentives that motivate them. *Scientometrics, 97*(3), 519–533. https://doi.org/10.1007/s11192-013-0987-7.

Mischo, W. H., & Schlembach, M. C. (2011). Open access issues and engineering faculty attitudes and practices. *Journal of Library Administration, 51*(5–6), 432–454. https://doi.org/10.1080/01930826.2011.589349.

Mitterlehner, B. (2013). *Quality enhancement in tertiary education in the United Arab Emirates: An assessment of an international knowledge hub*. Saarbrucken: Akademiker Verlag.

Moher, D., Naudet, F., Cristea, I. A., Miedema, F., Ioannidis, J. P. A., & Goodman, S. N. (2018). Assessing scientists for hiring, promotion, and tenure. *PLoS Biol, 16*(3), e2004089. https://doi.org/10.1371/journal.pbio.2004089.

Morais, R., & Borrell-Damián, L. (2018). *Open access: 2016–2017 EUA survey results*. Retrieved from https://www.eua.eu/resources/publications/324:open-access-in-european-universities-results-from-the-2016-2017-eua-institutional-survey.html.

Morais, R., & Borrell-Damián, L. (2019). *Open access: 2017–2018 EUA survey results*. Retrieved from https://www.eua.eu/downloads/publications/2017-2018%20open%20access%20survey%20results.pdf.

Mueller-Langer, F., Scheufen, M., & Waelbroeck, P. (2020). Does online access promote research in developing countries? Empirical evidence from article-level data. *Research Policy, 49*(2), 103886. https://doi.org/10.1016/J.RESPOL.2019.103886.

Nasser, R., & Abouchedid, K. (2001). Problems and the epistemology of electronic publishing in the Arab world: The case of Lebanon. First Monday, 6(9). https://doi.org/10.5210/fm.v6i9.886.

Odell, J., Coates, H., & Palmer, K. (2016). Rewarding open access scholarship in promotion and tenure: driving institutional change. *C&RL News*, *77*(7). Retrieved from https://crln.acrl.org/index.php/crlnews/article/view/9518/10823.

Ofek, H. (2011). Why the Arabic World Turned Away from Science? *The New Atlantis*, (30), 3–23. Retrieved from https://www.thenewatlantis.com/publications/why-the-arabic-world-turned-away-from-science.

Piwowar, H., Priem, J., & Orr, R. (2019). The Future of OA: A large scale analysis projecting Open Access publication and readership. *BioRxiv*, 795310. https://doi.org/10.1101/795310.

Pudovkin, A. I. (2018). Comments on the Use of the Journal Impact Factor for Assessing the Research Contributions of Individual Authors. Frontiers in Research Metrics and Analytics, 3(2). https://doi.org/10.3389/frma.2018.00002.

QS Quacquarelli Symonds Limited. (2019). World University Rankings, Q. S. QS 2020. Retrieved from https://www.topuniversities.com/university-rankings/world-university-rankings/2020.

Quan, W., Chen, B., & Shu, F. (2017). Publish or impoverish: An investigation of the monetary reward system of science in China (1999–2016). *Aslib Journal of Information Management, 69*(5), 486–502. https://doi.org/10.1108/AJIM-01-2017-0014.

ROARMAP. (2020). *Data visualisations.* Retrieved from: http://roarmap.eprints.org/dataviz2.html.

Rumsey, S. (2017). OA in the UK: State of the Nation. *International Journal of Legal Information, 45*(1), 56–61. https://doi.org/10.1017/jli.2017.15.

Ryan, J. (2017). Unleash power of scientific research to stimulate the UAE knowledge economy. *The National*. Retrieved from https://www.thenational.ae/business/unleash-power-of-scientific-research-to-stimulate-the-uae-knowledge-economy-1.68716.

Ryan, J. C., & Daly, T. M. (2018). Barriers to innovation and knowledge generation: The challenges of conducting business and social research in an emerging country context. *Journal of Innovation & Knowledge, 4*(1), 47–54. https://doi.org/10.1016/j.jik.2017.10.004.

Sajjad Ahmed, S., & Al-Baridi, S. (2012). An overview of institutional repository developments in the Arabian Gulf Region. *OCLC Systems & Services: International Digital Library Perspectives, 28*(2), 79–89. https://doi.org/10.1108/10650751211236613.

Sanderson, D., & Khan, S. (2019). Ghadan 21: Abu Dhabi to boost business and ecotourism with major new reforms. *The National.* Retrieved from https://www.thenational.ae/uae/government/ghadan-21-abu-dhabi-to-boost-business-and-ecotourism-with-major-new-reforms-1.878805#14.

SCImago. (2019). *SJR - SCImago Journal & Country Rank*. Retrieved from https://www.scimagojr.com/countrysearch.php?country=ae.

Shah, T. A., & Gul, S. (2013). Philosophy of escapism in the open access world: Studying author pay model. Library Review, 62(4/5). https://doi.org/10.1108/LR-09-2012-0104.

Shawabka, Y. A., & Bouazza, A. S. (2007). *Trends of Faculty at the UAE University towards the Open Access System of Scientific Information*, The Eighteenth Conference of the Arab Federation for Libraries and Information (AFLI), Jeddah 17–20 November 2007. (in Arabic).

Shen, C., & Björk, B. C. (2015). Predatory" open access: A longitudinal study of article volumes and market characteristics. *BMC Medicine, 13*(1), 230–245. https://doi.org/10.1186/s12916-015-0469-2.

SPARC. (2019). *Big Deal Cancellation Tracking*. Retrieved from https://sparcopen.org/our-work/big-deal-cancellation-tracking/.

Spender, T., & Bardsley, D. (2009). University study faults lack of tenure. *The National*. Retrieved from https://www.thenational.ae/uae/education/university-study-faults-lack-of-tenure-1.489374.

Springer, & Nature, (2018). *Nature index: 2018 tables*. Retrieved from https://www.natureindex.com/annual-tables/2018.

Taha, A. (2007). Networked e-information services to support the e-learning process at UAE University. *The Electronic Library, 25*(3), 349–362. https://doi.org/10.1108/02640470710754850.

Tennant, J. P., François, W., Jacques, D. C., Paola, M., Collister, L. B., & Chris, H.. H. J. (2016). The academic, economic and societal impacts of open access: An evidence-based review. *F1000Research, 5*. https://doi.org/10.12688/f1000research.8460.1.

Tenopir, C., Dalton, E., Christian, L., Jones, M., McCabe, M., Smith, M., & Fish, A. (2017). Imagining a gold open access future: attitudes, behaviors, and funding scenarios among authors of academic scholarship. College & Research Libraries, 78(6). https://doi.org/10.5860/crl.78.6.824.

Times Higher Education. (2019). Emerging Economies University Rankings 2019. Retrieved from https://www.timeshighereducation.com/world-university-rankings/2019/emerging-economies-university-rankings#!/page/0/length/25/sort_by/rank/sort_order/asc/cols/stats.

UAE PMO. (2014). UAE vision 2021. Retrieved from https://www.vision2021.ae/en.

UAE PMO. (2015). UAE national innovation strategy. Retrieved from https://www.moei.gov.ae/assets/download/1d2d6460/National%20Innovation%20Strategy.pdf.aspx.

UAE PMO. (2019). Share of the UAE nationals in the workforce. Retrieved from https://www.vision2021.ae/en/national-agenda-2021/list/card/share-of-uae-nationals-in-the-workforce.

United Nations Development Programme and Mohammed bin Rashid Al Maktoum Knowledge Foundation, (2016). *Arab Knowledge Index 2016*. Retrieved from http://knowledge4all.com/AKDataVisualizationIndex.aspx?language=en&year=2016#StartPage.

United Nations Development Programme and Mohammed bin Rashid Al Maktoum Knowledge Foundation, (2018). *Global Knowledge Index 2018: data visualization*. Retrieved from http://knowledge4all.com/en/DataVisualization.

Vanclay, J. K. (2009). Bias in the journal impact factor. *Scientometrics, 78*(1), 3–12. https://doi.org/10.1007/s11192-008-1778-4.

Van Weijen, D. (2012). The language of (future) scientific communication. *Research Trends, 31*, 7–8.

PUBLICATION III

Librarians as gate-openers in open access publishing: A case study in the United Arab Emirates

Mohamed Boufarss & J. Tuomas Harviainen

The Journal of Academic Librarianship, 47(5),
https://doi.org/10.1016/j.acalib.2021.102425

The Journal of Academic Librarianship 47 (2021) 102425

Contents lists available at ScienceDirect

The Journal of Academic Librarianship

journal homepage: www.elsevier.com/locate/jacalib

Librarians as gate-openers in open access publishing: A case study in the United Arab Emirates

Mohamed Boufarss *, J. Tuomas Harviainen

Tampere University, Faculty of Information Technology and Communication Sciences, Tampere, Finland

ARTICLE INFO

Keywords:
Open access
Scholarly publishing
Academic librarians

ABSTRACT

The advent of open access (OA) has changed the scholarly communication landscape resulting in disruption of traditional relationships between different stakeholders. Thus, the gatekeeping role of academic librarians has been impaired. However, by assuming the role of gate-openers, librarians have become facilitators of OA uptake in the United Arab Emirates. Results of the UAE librarians survey show that they are aware of OA routes and predatory journals; they are using different instruction methods to educate users on OA resources and publishing; and they harness OA resources along the traditional subscription-based products. Readers of international library journals need to be aware of efforts undertaken by their peers to advance OA mandate outside the Eastern European and North American context, often dominating scholarly communication studies.

Introduction

Libraries and librarians have always played a pivotal role in the creation, preservation and dissemination of knowledge. The methods, mechanisms, tools and practices associated with their role have been changing along with scholarly communication developments. From clay tablets and books chained to shelves, to e-resources, librarians have always been involved in the process of sharing knowledge. Currently, as the international research community is increasingly embracing Open Access (OA) as a new publishing and access model, librarians are at the heart of the transition. Consequently, they will have to tackle the new challenges and opportunities they present for them (Ojennus, 2020). In the words of Cryer and Collins (2011, p. 106), librarians can change scholarly publishing with little acts such as "pointing a patron towards a policy, mentioning open access funding opportunities in passing, activating access to an open access journal or creating an informative Web guide."

According to Boufarss and Laakso (2020), the push to adopt OA "transcends the initial motivator of public good to other objectives such as boosting research impact, increasing institutional visibility, and guaranteeing long-term cost-effective access to research." OA has also been increasingly considered a respite from the costly reader-pays models often associated with double-dipping (King & Alvarado-Albertorio, 2008). However, the OA based on the author-pays or the article processing charges (APC) model presents other ethical challenges. It creates a new form of divide that disadvantages authors, institutions, funders, and even governments who do not have enough funds to pay APCs especially from developing countries (Beasley, 2016; Shah & Gul, 2013; Tenopir et al., 2017). The absence of a mechanism to offset APCs by lowering subscription cost in this model (Björk & Solomon, 2014a, 2014b) is another major drawback.

Librarians are to a great extent involved in all aspects, stages, processes and debates surrounding all types of open access be it Gold, Green or other shades. Academic and other research institution librarians (for the rest of this article, shortened to just 'librarians', for readability) are engaged in the management of institutional repositories (IRs), OA awareness, training researchers on copyright and funder policies, facilitating access to the increasing number of OA resources, and even funding OA. As part of library instruction and information literacy mandate, researchers are being trained on self-archiving, encouraged to use OA resources, and warned of the perils of predatory journals.

Several previous studies have examined the role of libraries and librarians in OA in other parts of the world, librarians' perception of OA, and the role of librarians in IRs (Bailey, 2007; Greyson et al., 2009; Mercer, 2011; Palmer et al., 2009; Rockman et al., 2005; Gibbons, 2004; Bell et al., 2005; Chan et al., 2005). However, no studies on OA and librarians in the United Arab Emirates (UAE) or OA and library instruction could be identified. The focus of this study on a Middle Eastern country is of particular importance as the scholarly publishing landscape diverges from the situation in Europe and the Americas where there is a

* Corresponding author.
E-mail addresses: mohamed.boufarss@tuni.fi (M. Boufarss), tuomas.harviainen@tuni.fi (J.T. Harviainen).

https://doi.org/10.1016/j.acalib.2021.102425
Received 24 March 2021; Received in revised form 4 July 2021; Accepted 5 July 2021
Available online 16 July 2021

push from funders, higher education institutions (HEIs) and governments to adopt OA routes. Initiatives such as Plan S, H2020, AmeliCA and OA 2020 are testament of this push. Even China pledged support for Plan S and started aligning its science policies to limit paywalled content publishing (Schiermeier, 2018). A quick analysis of the situation in the Middle East reveals absence of such initiatives and nation-wide strategies. Yet, the HEIs and research landscape in these countries have followed in the footsteps of similar institutions in other parts of the world leading to an increased need for high-quality resources as well as raising scientific research output. Investigating the gate-opener role of librarians under these muddled circumstances could set this study apart.

The UAE, particularly, makes for an important subject of enquiry on OA support and uptake because it combines several factors at the core of OA discussions. First, the UAE is the second richest country in the Middle East and North Africa as per the World Bank GDP per capita data in 2018 (World Bank, 2020). Second, the UAE has the practice of employing a career-oriented academic expatriate workforce that is likely to publish in high impact channels with good visibility. Albeit a key distinctive feature of these scholars emanates from the highly transient nature of the workforce in the UAE as highlighted by Ali (2011) and Bel-Air (2018). Expatriates represented over 90% of the total UAE workforce in 2017 (UAE PMO, 2019). This "structural gap" that characterizes the UAE labor market in terms of the expatriate workforce predominance over the local workforce (Ministry of Economy (UAE), 2019) coupled with the "sense of insecurity" among the expatriate workforce created by the temporary status of employment residency visas (Middle East Centre, 2015) distinguishes the scholars including librarians in the UAE from scholars in most other parts of the world where naturalization is the norm.

The sense of transience carries over to perceptions on publishing, in a manner that makes the UAE region particularly interesting for research in that area. Given the high number of expatriate scholars and their temporary assignments, UAE institutions are easily seen as well-paying temporary stepping-stones in a scholar's career, used while building up personal credentials for employment elsewhere. As Alami et al. (2014) put it "The fight for more visibility and higher rankings on the global higher-education stage has wealthy Gulf Cooperation Council countries scrambling for international academic talent, and offering salary packages with a reputation for being generous." This can lead to prioritization of prestigious channels "to maintain the academic currency required to remain mobile" (Austin et al., 2014) as well as a lack of a shared publication strategy. Within the pressure from these constraints, academic librarians provide researchers with crucial resources and infrastructure facilities to assist in their endeavor to publish internationally, which is why we focus on their role in this article.

This study investigates the level of OA awareness among librarians in the UAE. It also highlights their role in the training of researchers and patrons on OA policies and mechanisms and on accessing OA resources. In doing so we aim to demonstrate how open access has helped reinvent the role of librarians as gate-openers and a driving force behind the eventual success or downfall of the OA movement. More specifically, we seek to demonstrate what UAE librarians are doing to facilitate users and researchers' uptake of OA and how their high awareness and perception of OA has contributed to the shift in their role.

For the purpose of this article, the concept of gatekeeper is inspired by Bell's (2009) definition that librarians make the decision on what resources to buy and infrastructure and mechanisms to access them by users. On the contrary, the gate-opener concept, in the OA context, is defined here as the totality of services and tools provided by librarians in support of OA such as training, outreach, infrastructures, funding and access.

Review of literature

Role of librarians and libraries in OA

There are ample examples in literature that libraries and librarians are key players in advancing the OA agenda. Bailey (2007) provides an extensive account of the role of libraries in open access ranging from providing enhanced access to OA resources, becoming publishers of OA works, establishing institutional digital archives, building OA computer systems, digitizing out-of-copyright works, preserving OA material, and providing support for article processing charges. Indeed, Greyson et al. (2009) found that librarians surpass research administrators in their perception of the mandate for promoting OA. They further stated that the majority of libraries were performing OA awareness bolstering activities through user education or supporting OA infrastructure development.

Libraries can boost the transition to OA through partnerships with journal publishers. The Canadian Research Knowledge Network (CRKN) and the Érudit Consortium (Érudit) collaboration (Ward & Lavoie, 2016) and the National Library of Finland and the Federation of Finnish Learned Societies partnership (Ilva, 2018) that aim to provide financial support for journals to flip to OA are examples of libraries role in supporting journals to move to OA. These partnerships are based on finding a common ground as a basis for a new business model that incentivizes journals to transition to OA. At the other extreme side of the pendulum, Lewis (2017) suggested that libraries should commit 2.5% of their budget to build open scholarly commons. This is based on an unorthodox vision of an open scholarly commons with a mandate of discovery, access and preservation of scholarly content not in partnership with publishers or journals but with governments, funders, scholarly societies, universities, and foundations.

Librarians' perception of OA

Various studies have explored the librarians' perception and awareness of OA. Mercer (2011), who upon finding that nearly half of all articles authored by academic librarians were open access in 2008, concluded that academic librarians had a generally positive perception of open access. Another early study that examined the librarians' perceptions and attitudes towards OA by Palmer et al. (2009) concluded that even though librarians had a positive attitude towards OA, their associated actions and behaviors were slightly conservative. This was seconded by a much recent and slightly different study of LIS faculty attitudes towards OA by Peekhaus and Proferes (2016), who found that the majority of their respondents are willing to comply with Gold and Green (self-archiving) mandates and that they are "very critical of what is perceived to be detrimental control exercised by for-profit publishers over the scholarly communication system."

Librarians' knowledge transcends overarching OA awareness to higher awareness of predatory journals. Hebrang Grgić and Guskić (2019) found that about half of the surveyed librarians are familiar with the term against about a mere 10% of researchers. Thus, Ifijeh (2017) sees that librarians being "custodians of knowledge" should spearhead the efforts to raise awareness of researchers of predatory journals.

Librarians' role in institutional repositories management

Research on institutional repositories is burgeoning with evidence that librarians are pioneers of their establishment, management, and continuous population with research output. Rockman et al. (2005) claim that librarians have all the tenets for a successful institutional repository management. They are aware of the benefits of OA as they have felt the pinch of increasing resource costs on their budgets. They have metadata and preservation expertise. They are the hub within their universities and have been providing informational and technological support to their different stakeholders. This is reiterated by Gibbons

(2004) who asserts that libraries have the expertise, trust, and connections with stakeholders necessary for running an effective IR.

The role of reference librarians in the success of IRs has been specifically highlighted. Bell et al. (2005) state that they populate the repository, assist users with access to existing resources, and create new, institutionally unique resources. Similarly, Chan et al. (2005) state that they establish IR goals and scope, evaluate the system and content, develop strategies and procedures, interpret publishers' policies, collect content, and perform promotional duties. This was corroborated by Boufarss and Laakso (2020), who acclaim "the pivotal role of the university library in campus scholarly publishing as it leads both in repository management and self-archiving of materials."

OA and disintermediation of libraries

Travica (1999) stated that "the author-publisher-jobber-bookstore-library-commercial information provider-user circle" with the library as one of the mediators was changing due to "modern push technologies" that enabled some members of the circle to bypass others. Similarly, other researchers such as Esposito (2011), Ball (2012) and Tara (2014) noted that advances in technology, changes in educational landscape and open access have disintermediated the library and librarians since users now have direct access to resources. Koltay (2017) stated that the absence of gatekeepers including librarians results in readers having to act as gatekeepers themselves. Librarians have always been mediators between users and stacks of books and online databases, either as access facilitators or as trainers. In doing so, they have curated quality information and built-in tacit information literacy skills. One may even argue that when designing discovery systems, they are often trapped in a "user-based and cognitive approaches to knowledge organization" mindset criticised by Hjørland (2013). And yet, it is not all doom and gloom. The absence of focus on information literacy elicits apprehension of "the burgeoning trash that clings to the quality data" (Tara, 2014, p. 202) providing opportunities for re-intermediation of the library and librarians. Ball (2012) stated that while big deals with publishers "removed selection decisions from librarians" and OA is providing research to all without intermediaries, IRs are a way to re-intermediate the library as a collector of institutional research output.

Mullen (2010, p. 147) suggests that librarians should also start advocating OA resources alongside the traditional subscription-based materials both for readers and authors. Similarly, in his defense of expanding use of gatekeeping theory in LIS, Ojennus (2020, p. 398) argues that digital repositories and open access journals along with other additional resources which have been seen as undermining the gatekeeping function of libraries, may be reincarnated as "alternate channels for information". Scott (2017) believes that "information literacy instruction provides another opportunity for librarians to be leaders in the OA landscape". In fact, an increasing number of teaching librarians are using OA materials in their instruction (Fargo McKinnon & S. Helge, 2014, p. 14). However, not everyone agrees with this. Esposito (2011) concluded that libraries have speeded their own disintermediation when they advocated the creation of IRs as a means of disintermediating publishers who responded by introducing the article processing charge based OA model. Whether libraries shot themselves in the foot when they endorsed IRs or not, there are always ways to reincarnate their role exactly like they survived the advent of the Internet, Google and e-books. Bell (2009), in a non-OA context, called for a shift from this gatekeeper role to a gate-opener one, in which a librarian's role with library users is expanded into helping creativity and student accomplishments. The same notion can be nowadays carried over to the OA sector, in librarians also helping scholars to find the most suitable publication channels for their work.

Methodology

The role of libraries and librarians in the publishing paradigm shift has been extensively covered in literature. The most pronounced takeaway from most of the studies is that they have been and continue exerting efforts to boost the move to OA driven by financial, ethical and social motives. This study sought to investigate the changing role of librarians from gatekeepers to gate-openers not only by promoting OA resources but also by financially supporting OA publications, training researchers on OA publishing and predatory journals, and establishing and managing local digital archives. To investigate this shift from collection development to access facilitation, this study adopted a short quantitative questionnaire as the instrument for gathering librarians' views and insights. The survey consists of 21 questions focusing on OA awareness and perception, OA discovery tools, piracy based and academic social networks, OA-related instruction, OA resources integration, and predatory journals.

The survey targeted the UAE librarians who are involved in information literacy, user instruction, and research support. Respondents are all members of the Information Literacy Network of the Gulf (ILN-GCC), a regional network of information literacy librarians. The ILN-GCC is a professional development and best practices exchange platform for librarians from different library types and sizes. As the network includes a few members from other Arabian Gulf countries, responses were solicited only from those based in the UAE. The survey invitation included a brief explanation of the study, the estimated duration of the survey, and a link to the survey where the respondents will first view the informed consent form and definitions of key terms before they begin the survey. The survey was open from May 2019 to May 2020. A total of 56 valid responses were received. Of the 56 respondents, 36 respondents worked for a university, 13 for a college or technical institute, six for schools, and one for some other organization.

Characteristic		Number (%)
Affiliation	University	36 (64)
	College or Technical Institute	13 (23)
	Other	6 (11)
Institution size	More than 2000	34 (61)
	1000–2000	10 (18)
	Less than 1000	12 (21)

Results

Awareness and perception of OA

Results of a question examining librarians' awareness of Gold, Green, Hybrid and Black OA routes indicated that librarians are highly aware of the different OA routes (see Fig. 1), demonstrating that while their work focus may have been in other areas, well over 60% of the respondents were aware of the three most prominent OA publication types.

About two thirds were familiar with Hybrid, Gold and Green OA. Over a quarter were however not aware of "Black" OA (a concept that we for the sake of its terminological novelty explained in the survey). Only 13% were not familiar with any OA route. For the sake of clarity and brevity, all other shades of OA such as diamond and gratis were omitted from the survey.

In response to a question on their perception of OA versus paywalled articles, the majority of UAE librarians (83%) considered OA articles of equal quality to articles in paywalled journals. However, 17% thought they were of lower quality and none believed that they were better.

Responses to another question on their awareness of predatory journals indicate that UAE librarians were generally familiar with the concept "predatory journal", as over 50% (52%) were familiar with it, about a quarter (24%) were aware of mechanisms to recognize them, and a similar percentage were even educating users on how to detect them. Only a small fraction (7%) was not aware of the concept.

Librarians guide users towards appropriate resources within their collections and beyond. In the absence of a required resource, librarians have a myriad of choices ranging from inter-library loan to finding

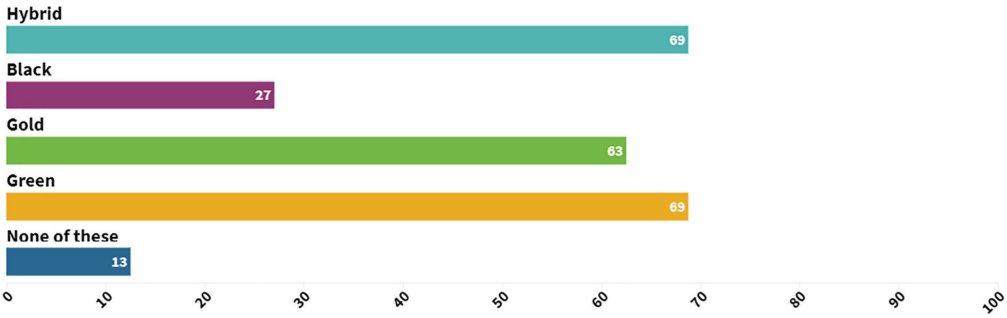


Fig. 1. Awareness of OA routes (n = 48).

alternative resources. This question (Fig. 2) measured the librarians' choice between traditional resources and OA.

Their responses indicated that only 19% elected to use OA self-archived versions of articles. About two thirds said that they would select inter-library loan and a further 6% choose to recommend similar paywalled articles.

Institutional repositories

Responses to a question on the existence of an institutional repository in their institution showed that almost half of the respondents (46%) have an institutional repository.

Institutional repositories infrastructure can be managed either internally by one or more units within the institution or through external sub-contractors.

Responses to the question on who manages the IR reveal that university libraries were mostly in charge with nearly half of the relevant responses indicating that IRs were run by librarians (46%). This was followed by the information technology units. Only 6% reported having outsourced the IR maintenance. 33% of relevant respondents did not know who was in charge of their IR's management (Fig. 3).

Awareness of and use of academic social networks and OA finding tools

When asked about awareness of OA finding tools such as Unpaywall, Kopernio and OA Button, about two thirds of librarians indicated being aware of them and using them frequently. A little over a quarter (27%) reported having heard of them but having never used them. Nearly a third (35%) were not aware of these tools.

In response to another question measuring librarians' use of the controversial piracy-based social networks such as SciHub, the majority (44%) reported using those services occasionally. Another (21%) used them often. A further 19% used them rarely. Only 17% stated never having used them.

Instruction on and harnessing of OA resources

Advancing the OA agenda involves a range of activities spanning from user education to financial support. The following question examines the UAE libraries' mandate in relation to OA.

A little over two thirds of librarians (69%) reported educating researchers about OA. 43% see use of OA to promote the work of their researchers as part of the library mandate. This was followed by 40% stating help to researchers to self-archive their work as their mandate. 36% listed educating research on OA policies and funding as one of their tasks. 24% and 17% stated making sure researchers comply with funders' OA policies and helping researchers with funding of OA publication as their library's mandate, respectively. Only about a quarter (26%) proclaimed that none of the tasks listed above were part of their library's mandate (Fig. 4).

In response to another question on whether they offer instruction on scholarly communication including OA, about three quarters of librarians (74%) stated that they do.

Fig. 5 shows the education methods used by UAE librarians to educate users about OA. In popularity order, these methods include posting information about OA on the library website (54%), one-to-one instruction (54%), seminars or workshops (41%), lectures for students (28%), webinars 13%, Conferences (7%), social media (7%), and publication of handbooks (7%).

UAE librarians' responses to a question on the top ten most important OA literacy skills of their users indicated that these skills fall both under skills of user-as-reader and user-as-author (Fig. 6).

Evaluating OA journals was seen as the most important skill. The second most important skill was understanding OA citation advantage. These were followed by finding OA information, copyright and licensing, identification of questionable publishers, etc. Interoperability

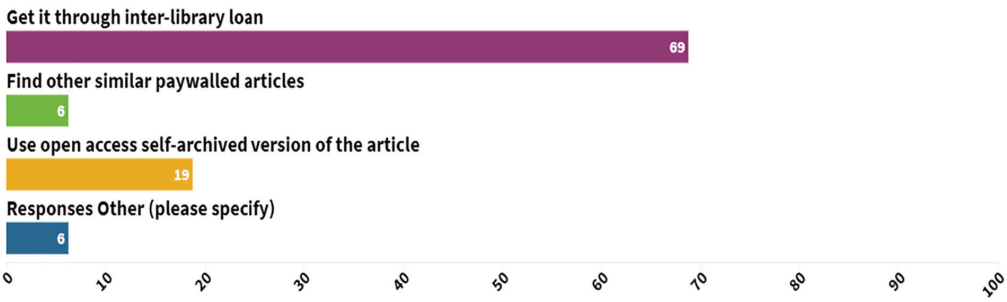


Fig. 2. Alternatives used in the absence of a subscription-based article (n = 48).

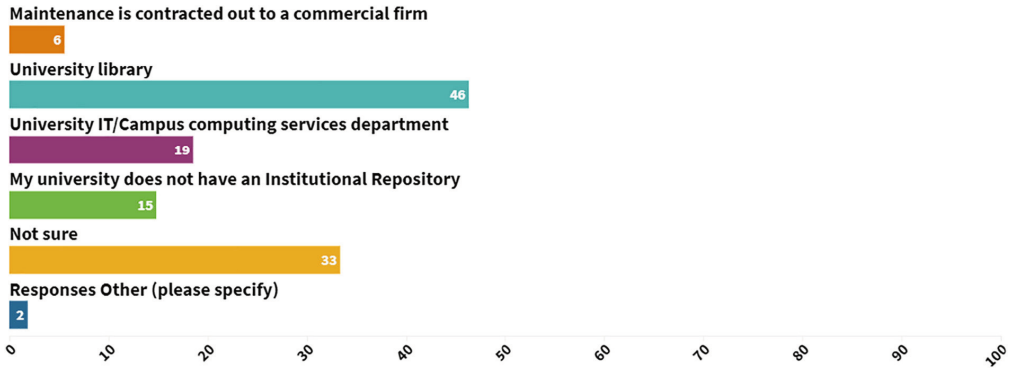


Fig. 3. Unit managing the institutional repository (n = 54).

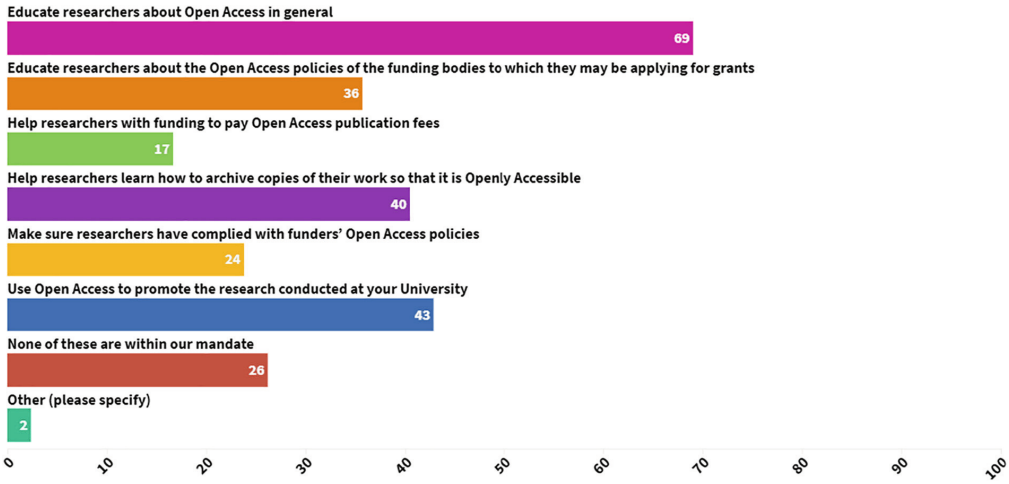


Fig. 4. In your view, which of the following are part of your library's mandate? (Please choose *all* that apply) (n = 42).

of repositories, new formats in electronic environments, unique identifiers of authors in OA papers, and open data did not make it to the top ten skills.

When asked about the integration of OA resources in their instruction material, 62% of librarians said that they make their users aware of OA resources and an additional 10% responded that they even encourage researchers to self-archive or opt for Gold OA publishing. 31% were not integrating OA resources in their instruction material.

Fig. 7 shows that the majority of librarians (67%) consider convincing users of the quality of OA resources as the biggest challenge facing information literacy specialists. A further 45% viewed the difficulty of distinguishing between good and predatory journals as a challenge. An equal percentage (29%) perceived fear of copyright infringement, faculty's preference of subscription resources, and integration of OA resources in IL instruction as issues they have to address with the advent of OA. Having to learn new information searching tools and methods represented a challenge for about a quarter (26%).

Librarians' responses on activities their libraries performed in support of OA reflect their perception of OA resources (Fig. 8). Nearly two thirds were actively supporting OA through one or a combination of tangible activities. Over half (52%) were using OA platforms to identify potential OA resources to supplement their subscription resources. A further 45% were visibly identifying resources in their catalogs and discovery platforms as OA. About a quarter more (24%) were featuring information on OA in their library homepage or one level below the homepage. Surprisingly, 21% stated even hosting OA journals. A low but nonetheless noteworthy number of the libraries (12%) stated being members of one or more OA organizations such as PLoS, Hindawi and BioMed central.

Discussion

Awareness and perception of OA and predatory journals

The color coding for different OA routes has been constantly evolving adding to the complexity of the OA model. Part of this study focuses on the most common and core OA routes with "Black OA" added as a challenging option. The UAE librarians' responses indicate that they are highly aware of the different OA routes despite many of them not being involved in OA activities. The low unfamiliarity with Black OA is not quite surprising, as the term "Black OA", coined by Björk (2017) with nuances to pirates' flags and black market, is not quite popular yet. This high awareness sets them in a position to lead OA outreach and awareness initiatives within their institutions.

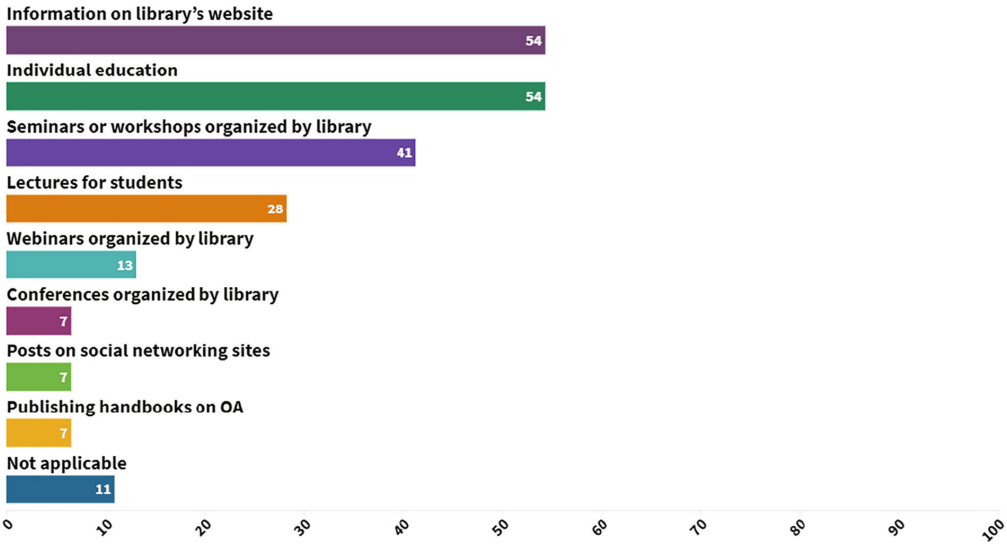


Fig. 5. Education methods used when educating users about OA (n = 46).

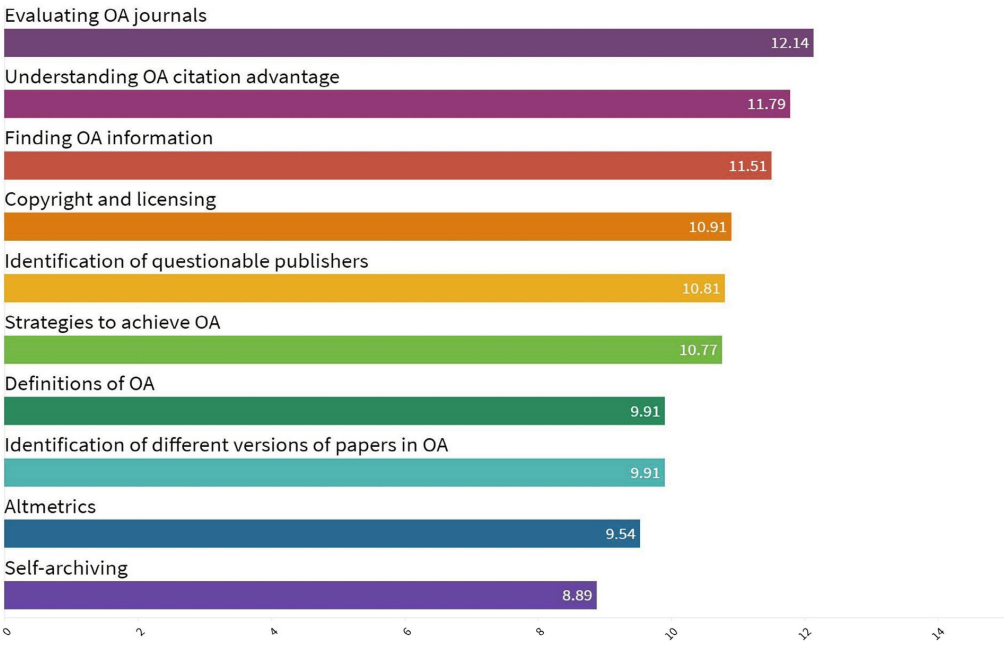


Fig. 6. The 10 most interesting OA skills for library users (n = 39).

The UAE librarians' perception of OA versus paywalled articles with 83% viewing them of equal quality and only 17% thinking they are of lower quality diverges from findings of Peekhaus & Proferes (2016, p. 24) who stated that about half (53%) of LIS faculty viewed the quality of OA and paywalled articles as equal, about a quarter thought that OA articles are of lower quality, and over 8% believed OA articles were of better quality than paywalled ones. This mostly positive perception of OA articles could be attributed to increased awareness of predatory journals and familiarity with tools to recognize them.

Indeed, UAE librarians demonstrated that they are generally familiar with the concept "predatory journal" (52%), aware of mechanisms to recognize them (24%), and educating users on how to detect them (24%) surpassing some of their counterparts in other countries. For example, Hebrang Grgić and Guskić (2019) found that only a little over 50% of Croatian librarians are aware or totally aware of the term and that nearly a quarter are not aware of it.

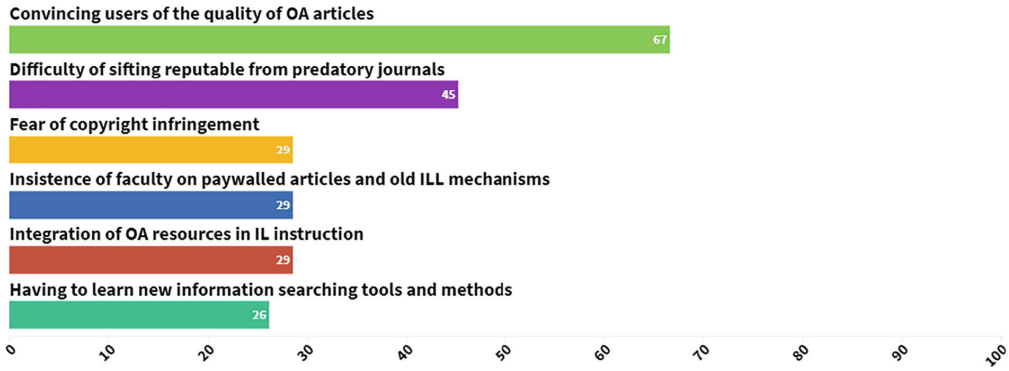


Fig. 7. Challenges brought about by Open Access for information literacy specialists (n = 42).

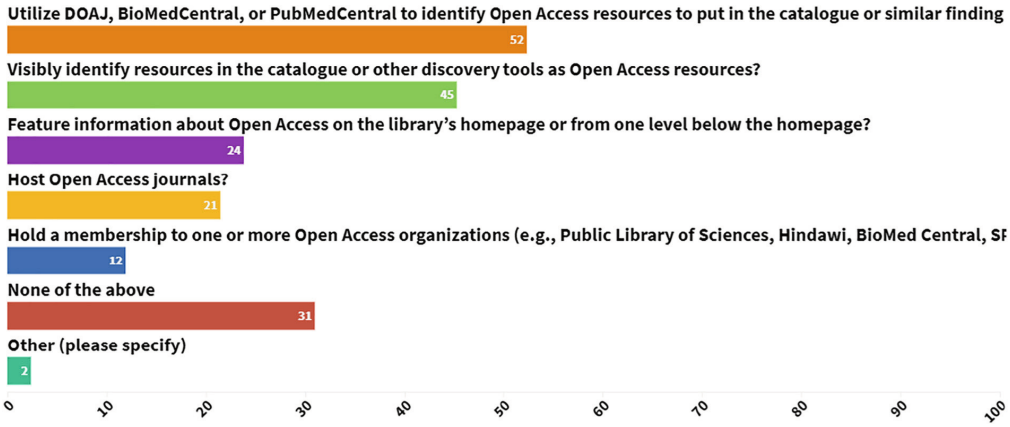


Fig. 8. Activities performed in support of OA (n = 42).

Despite their high awareness and perception of OA and in concurrence with Palmer et al. (2009), UAE librarians demonstrate conservative behavior with their continuous preference for, support and endorsement of traditional subscription-based resources over OA self-archived versions of articles. This could be attributed to the researchers' preferences and insistence on paywalled articles often published by major publishers in "prestigious journals", in pursuit of high impact and status.

Institutional repositories management

Consistent with previous findings (Boufarss & Laakso, 2020), the percentage of UAE institutions with an institutional repository (46%) is low and subpar the 80% reported among European universities (Morais & Borrell-Damián, 2019) and over 90% among Canadian institutions over a decade ago (Greyson et al., 2009). However, and considering that some respondents work for schools, it signals a big improvement from only four DOAR-registered repositories reported by Carlson (2015). This indicates an acceleration in OA initiatives and IR infrastructure adoption and implementation.

UAE libraries are leading the way in IR management ahead of IT units and external contractors. This is in line with findings of Boufarss and Laakso (2020) and in agreement with Schmolling's (2015, p.4) statement that libraries are seen "as repository organizers and disseminators" and that even disciplinary repositories established by researchers themselves "are in some cases maintained by university libraries". This result confirms the librarians' often acclaimed skillset to maintain and run repositories (Bell et al., 2005; Chan et al., 2005; Gibbons, 2004; Rockman et al., 2005). Furthermore, the involvement of IT departments and commercial IT firms reflects Degkwitz's (2013, p.89) belief that new collaborative services by these different stakeholders are needed to "achieve 'open science' and to improve scholarly communication."

Awareness of and use of academic social networks and OA finding tools

UAE librarians demonstrate a high level of awareness of OA finding tools. As Schultz et al. (2019) state, "the emergence of OA finding tools offers much potential for increasing the visibility of OA versions of scholarship", awareness and use of these OA finding tools is sought as an asset for librarians and a demonstration of their support of OA.

The copyright infringement nature of SciHub and to some extent of copyrighted content hosted by academic social networks, on the other hand, has been extensively debated (Björk, 2017; Jamali, 2017; Laakso et al., 2017; Laakso & Polonioli, 2018; Lovett et al., 2017). The possibility that over 80% of UAE librarians have used them with varying degrees confirms Harle's (2016) warning that embracing these piracy-based platforms is a natural outcome in light of current high access costs.

Instruction on and harnessing of OA resources

The high percentage of UAE Librarians (74%) performing a combination of activities in support of OA indicates that the library's mandate is being transformed by OA. The remaining quarter (26%) who did not list any tasks as part of their library's mandate puts these results at odds with the findings of Greyson et al. (2009), since none of their respondents choose "none of these are within our mandate". This could be attributed to our sample including respondents from all types of libraries and to the presence of a national OA agenda in Canada. The low number of UAE librarians offering scholarly communication and OA instruction in response to a related question may also be attributed to the presence of school librarians in the sample.

UAE librarians adopt various methods to educate users about OA. Their choices are consistent with Croatian libraries (Hebrang Grgić, 2016), which primarily adopted individual education, information on the library's website, and seminars and workshops as their top three main methods. However, they diverge slightly from results reported by their Canadian counterparts (Greyson et al., 2009), who listed their top three tools as: printed materials, lectures and seminars, and webpages about OA. With about two thirds integrating OA resources in their instruction material, UAE librarians are nonetheless helping advance the OA movement not only by connecting users with these resources but also by encouraging adoption of OA publishing models.

As the increasing popularity of OA has changed the information landscape and publishing market dynamics, librarians are faced with new challenges brought about by this new reality. Results of this study indicate that there has been a shift in the librarians' roles from a traditional passive gatekeeper function of making information accessible to a more proactive forward-thinking role of a gate-opener by bolstering the uptake of OA as a viable publishing model. Addressing issues such as reassuring users of the quality of OA articles, pinpointing predatory journals, managing copyright, and learning new searching methods are extensions of their role as gatekeepers. However, our results indicate that by performing other activities in support of OA, like crawling OA platforms to populate inhouse systems with OA resources, visibly identifying resources in discovery platforms as OA, featuring information on OA in their websites, hosting OA journals, or joining OA organizations, UAE librarians are no longer by-standers in the OA debate but are actively building cross-bridges to greater OA acceptability in a way that befits their new gate-opening role. This role could be enhanced further from within the UAE HEIs at the grassroots level by boosting collaborations with research management offices and grants administrators in ways that will affect change of OA policies.

Limitations

As with any survey, the responses of UAE librarians are self-reported, and the authors assume their accuracy without the possibility for verification. The small sample size limited the possibility of cross-tabulation and did not allow for a deeper analysis of the different variables. Similarly, the convenience nature of sampling used here limits the generalizability of the results and warrants a need for further studies based on probability sampling strategies. Furthermore, further research comparing the role of librarians with that of other players in advancing the OA agenda may provide better insight into their efforts. Nonetheless, this study provides the first glimpse into the gate-opener role of librarians especially in a region where OA debate has been pushed to the backburner and there seems to be no government or funder pressure to shift to OA publishing. This unfortunate situation is easily exposed by a quick search for OA related colloquium, events and ROARMAP registered mandates, OA related research output, and national level OA policies.

Conclusion

The dynamics of scholarly communication have been constantly changing. The advent of OA is one of the key signposts of this shift as it altered the relationship between different stakeholders. Some of the major scholarly communication players got bypassed as the stakeholders' relationship paradigm changed. Librarians' roles have, particularly, been revisited. OA provided an opportunity for them to act as gate openers instead of their traditional role as gatekeepers.

Our results indicate that libraries and librarians are finding ways to re-intermediate themselves in a scholarly landscape that has been transformed by both the advent of OA and the ways in which OA has later expanded to new practices. Librarians support the movement by providing appropriate infrastructure through setting up and managing institutional repositories. In addition, they educate users on and raise awareness of scholarly communication and OA. In parallel to providing access to traditional resources, they started marketing, sharing and highlighting OA resources in their websites and catalogs. From centuries of gatekeeping, they have also in the UAE, like their counterparts in other parts of the world, become the central gate-openers on the side of those who produce new knowledge. This shift in roles is particularly important in a region like the UAE, where, unlike in Europe, Americas and China, overarching science policy, local OA policies and mandates are sporadic. It could be even argued that the geographical, economic, and social context of this study makes it unique and helps draw a general picture of open access globally. This study is also different in that it diverges from the common trend of perceptions and beliefs and instead focuses on the librarians' gate-opener role and their help in tipping the scale towards increased OA adoption.

CRediT authorship contribution statement

We hereby confirm that all persons listed as authors meet authorship criteria. The roles of the authors are as follows: **Mohamed Boufarss**: Conceptualization, Methodology, Data collection, Visualization, Writing- data analysis, Writing-original draft, Writing-reviewing and editing, Research contextualization. **J. Tuomas Harviainen**: Supervision, Writing - data analysis, Writing-reviewing and editing, Research contextualization.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.acalib.2021.102425.

References

Alami, A., Bhatti, J., & Dumalaon, J. (2014). Employment in the Gulf: Not always what it seems. Retrieved 15 June 2021, from https://www.al-fanarmedia.org/2014/01/employment-in-the-gulf-not-always-what-it-seems/.

Ali, S. (2011). Going and coming and going again: Second-generation migrants in Dubai. *Mobilities, 6*(4), 553–568. https://doi.org/10.1080/17450101.2011.603947

Austin, A., Chapman, D., Farah, S., Wilson, E., & Ridge, N. (2014). Expatriate academic staff in the United Arab Emirates: The nature of their work experiences in higher education institutions. *Higher Education, 68*(4), 541–557. Retrieved June 26, 2021, from http://www.jstor.org/stable/43648737.

Bailey, C. W. (2007). Open access and libraries. *Collection Management, 32*(3–4), 351–383. https://doi.org/10.1300/J105v32n03_07

Ball, D. (2012). Cutting out the middle man?: Disintermediation and the academic library. In *, Vol. 14. LINK: Connecting commonwealth librarians* (pp. 2–3). Retrieved from http://eprints.rclis.org/17577/1/LINK_Issue_14.pdf.

Beasley, G. (2016). Article processing charges: A new route to open access? *Information Services & Use, 36*(3/4), 163–170. https://doi.org/10.3233/ISU-160815

Bel-Air, F. D. (2018). Demography, migration, and the labour market in the UAE. In *Gulf labour markets and migration*. GLMM-EN-No.1/2018. Retrieved from https://cadmus.eui.eu/bitstream/handle/1814/36375/GLMM_ExpNote_07_2015.pdf.

Bell, S. (2009). From gatekeepers to gate-openers. *American Libraries, 40*(8/9), 50–53. Retrieved from http://www.jstor.org/stable/25650380.

Bell, S., Foster, N. F., & Gibbons, S. (2005). Reference librarians and the success of institutional repositories. *Reference Services Interview, 33*(3), 283–290.

Björk, B. C. (2017). Gold, green, and black open access. *Learned Publishing, 30*(2), 173–175. https://doi.org/10.1002/leap.1096

Björk, B. C., & Solomon, D. (2014a). Developing an effective market for open access article processing charges. Retrieved from https://wellcome.ac.uk/sites/default/files/developing-effective-market-for-open-access-article-processing-charges-mar14.pdf.

Björk, B. C., & Solomon, D. (2014b). How research funders can finance APCs in full OA and hybrid journals. *Learned Publishing*. https://doi.org/10.1087/20140203

Boufarss, M., & Laakso, M. (2020). Open Sesame? Open access priorities, incentives, and policies among higher education institutions in the United Arab Emirates. *Scientometrics, 124*, 1553–1577. https://doi.org/10.1007/s11192-020-03529-y

Carlson, S. (2015). An assessment of institutional repositories in the Arab world. *D-Lib Magazine, 21*(5/6). https://doi.org/10.1045/may2015-carlson

Chan, D., Kwok, C., & Yip, K. (2005). Changing roles of reference librarians: The case of the HKUST institutional repository. *Reference Services Review, 33*(3), 268–282.

Cryer, E., & Collins, M. (2011). Incorporating open access into libraries. *Serials Review, 37*(2), 103–107. https://doi.org/10.1016/j.serrev.2011.03.002

Degkwitz, A. (2013). What will future publications be like? In H.-C. Hobohm (Ed.), *Informationswissenschaft zwischen virtueller Infrastruktur und materiellen Lebenswelten. 13. Internationales Symposium für Informationswissenschaft (ISI), Potsdam, 19.-21-3-2013* (pp. 81–92). Glückstadt: Hülsbusch. Retrieved from https://opus4.kobv.de/opus4-fhpotsdam/frontdoor/index/index/docId/399.

Esposito, J. (2011). Disintermediation and its discontents: Publishers, libraries, and the value chain. Retrieved from: https://scholarlykitchen.sspnet.org/2011/04/18/disintermediation-and-its-discontents-publishers-libraries-and-the-value-chain/.

Fargo McKinnon, L., & S. Helge, K. (2014). Copyright, open access and library instruction. *Library Hi Tech News, 31*(10), 13–16. https://doi.org/10.1108/LHTN-07-2014-0064

Gibbons, S. (2004). Establishing an institutional repository. *Library Technology Reports, 40*(4), 1–68.

Greyson, D., Vézina, K., Morrison, H., Taylor, D., & Black, C. (2009). University supports for open access: A Canadian national survey. *Canadian Journal of Higher Education Revue Canadienne d'enseignement Supérieur, 39*(3), 1–32. Retrieved from https://journals.sfu.ca/cjhe/index.php/cjhe/article/download/472/499/.

Harle, J. (2016). High prices to access scholarly research could drive developing country researchers to use pirate sites like SciHub. In *LSE: Impact blog*.

Hebrang Grgić, I. (2016). Information literacy and open access in Croatian academic libraries. *Library Review, 65*(4), 255–266. https://doi.org/10.1108/LR-01-2016-0009

Hebrang Grgić, I., & Guskić, M. (2019). Croatian scientists' awareness of predatory journals. *International Journal for Educational Integrity, 15*, Article 3. https://doi.org/10.1007/s40979-019-0041-5

Hjørland, B. (2013). User-based and cognitive approaches to knowledge organization: A theoretical analysis of the research literature. *Knowledge Organization, 40*(1), 11–27. https://doi.org/10.5771/0943-7444-2013-1-11

Ifijeh, G. (2017). Emergence of predatory publishing in library and information science: Issues and implications for scholarship among academic librarians in Nigeria. *Bilgi Dunyasi, 18*(1), 149–161. https://doi.org/10.15612/bd.2017.572

Ilva, J. (2018). Looking for commitment: Finnish open access journals, infrastructure and funding. *Insights - The UKSG Journal, 31*. https://doi.org/10.1629/uksg.414

Jamali, H. R. (2017). Copyright compliance and infringement in ResearchGate full-text journal articles. *Scientometrics, 112*(1), 241–254. https://doi.org/10.1007/s11192-017-2291-4

King, D. W., & Alvarado-Albertorio, F. M. (2008). Pricing and other means of charging for scholarly journals: A literature review and commentary. *Learned Publishing, 21*(4), 248–272. https://doi.org/10.1087/095315108X356680

Koltay, T. (2017). The bright side of information: Ways of mitigating information overload. *Journal of Documentation, 73*(4), 767–775. https://doi.org/10.1108/JD-09-2016-0107

Laakso, M., Lindman, J., Shen, C., Nyman, L., & Björk, B. C. (2017). Research output availability on academic social networks: Implications for stakeholders in academic publishing. *Electronic Markets*. https://doi.org/10.1007/s12525-016-0242-1

Laakso, M., & Polonioli, A. (2018). Open access in ethics research: An analysis of open access availability and author self-archiving behaviour in light of journal copyright restrictions. *Scientometrics, 116*(1), 291–317. https://doi.org/10.1007/s11192-018-2751-5

Lewis, D. W. (2017). The 2.5% commitment. In *Copyright, fair use, scholarly communication, etc* (p. 83). https://digitalcommons.unl.edu/scholcom/83.

Lovett, J. A., Rathemacher, A. J., Boukari, D., & Lang, C. (2017). Institutional repositories and academic social networks: Competition or complement? A study of open access policy compliance vs. ResearchGate participation. *Journal of Librarianship and Scholarly Communication, 5*(1), Article eP2183. https://doi.org/10.7710/2162-3309.2183

Mercer, H. (2011). Almost halfway there: An analysis of the open access behaviors of academic librarians. *College and Research Libraries, 72*(5), 443–453. https://doi.org/10.5860/crl-167

Middle East Centre. (2015). *Challenges to citizenship in the Middle East and North Africa region. Collected papers* (Vol. 2). London: London School of Economics and Political Science. Retrieved from http://eprints.lse.ac.uk/61773/1/Challenges%20to%20citizenship%20in%20the%20Middle%20East%20and%20North%20Africa%20region.pdf.

Ministry of Economy (UAE). (2019). Annual Economic Report 2019. Retrieved from https://www.economy.gov.ae/EconomicalReportsEn/MOE_Annual%20Economic%20Report_2019_.pdf.

Morais, R., & Borrell-Damián, L. (2019). Open access: 2017–2018 EUA survey results. Retrieved from https://www.eua.eu/downloads/publications/2017-2018%20open%20access%20survey%20results.pdf.

Mullen, L. (2010). *Open access and its practical impact on the work of academic librarians: Collection development, public services, and the library and information science literature*. Oxford, England: Chandos Publishing.

Ojennus, P. (2020). Modelling advances in gatekeeping theory for academic libraries. *Journal of Documentation, 76*(2), 389–408. https://doi.org/10.1108/JD-03-2019-0051

Palmer, K., Dill, E., & Christie, C. (2009). Where there's a will there's a way? Survey of academic librarian attitudes about open access. *College & Research Libraries, 70*(4), 315–335. https://doi.org/10.5860/0700315

Peekhaus, W., & Proferes, N. (2016). An examination of North American Library and Information Studies faculty perceptions of and experience with open-access scholarly publishing. *Library and Information Science Research, 38*(1), 18–29. https://doi.org/10.1016/j.lisr.2016.01.003

Rockman, I., Phillips, H., Carr, R., & Teal, J. (2005). Leading roles for reference librarians in institutional repositories: One library's experience. *Reference Services Review, 33*(3), 301–311. https://doi.org/10.1108/00907320510611339

Schiermeier, Q. (2018). China backs bold plan to tear down journal paywalls. *Nature, 564*(7735), 171–172. https://doi.org/10.1038/d41586-018-07659-5

Schmolling, R. (2015). Agents of the publishing chain: From libraries as academic publishers to libraries as publishers in eScience and Digital Humanities. In *WLIC 2015*. Cape Town, SA: IFLA. Retrieved from http://library.ifla.org/1164/.

Schultz, T. A., Azadbakht, E., Bull, J., Bucy, R., & Floyd, J. (2019). Assessing the effectiveness of open access finding tools. *Information Technology and Libraries, 38*(3), 82–90. https://doi.org/10.6017/ital.v38i3.11109

Scott, R. E. (2017). Open access implications for information literacy services. In K. Smith (Ed.), *Open access and the future of scholarly communication*. Lanham: Rowman & Littlefield.

Shah, T. A., & Gul, S. (2013). Philosophy of escapism in the open access world: Studying author pay model. *Library Review*. https://doi.org/10.1108/lr-09-2012-0104

Tara, B. (2014). The disintermediated librarian and a reintermediated future. *The Australian Library Journal, 63*(3), 191–205. https://doi.org/10.1080/00049670.2014.932681

Tenopir, C., Dalton, E., Christian, L., Jones, M., McCabe, M., Smith, M., & Fish, A. (2017). Imagining a gold open access future: Attitudes, behaviors, and funding scenarios among authors of academic scholarship. *College & Research Libraries, 78*(6). https://doi.org/10.5860/crl.78.6.824

Travica, B. (1999). Organizational aspects of the virtual library: A survey of academic libraries. *Library and Information Science Research, 21*(2), 173–203. https://doi.org/10.1016/S0740-8188(99)00006-7

UAE PMO. (2019). Share of the UAE nationals in the workforce. Retrieved from https://www.vision2021.ae/en/national-agenda-2021/list/card/share-of-uae-nationals-in-the-workforce.

Ward, M., & Lavoie, J. (2016). A library-publisher partnership for open access: Building an innovative relationship between scholarly publishers and academic libraries. *LIBER Quarterly, 25*(4), 189–204. https://doi.org/10.18352/lq.10139

World Bank. (2020). World development indicators 2020. Retrieved from https://databank.worldbank.org/source/world-development-indicators.

PUBLICATION IV

Open access and international co-authorship: a longitudinal study of the United Arab Emirates research output

Mohamed Boufarss and Mikael Laakso

Quantitative Science Studies, 4(2), 372-393
https://doi.org/10.1162/qss_a_00256

QSS

an open access journal

Check for updates

Citation: Boufarss, M., & Laakso, M. (2023). Open access and international coauthorship: A longitudinal study of the United Arab Emirates research output. *Quantitative Science Studies*, *4*(2), 372–393. https://doi.org/10.1162/qss_a_00256

DOI: https://doi.org/10.1162/qss_a_00256

Peer Review: https://www.webofscience.com/api/gateway/wos/peer-review/10.1162/qss_a_00256

Received: 6 November 2022
Accepted: 27 March 2023

Corresponding Author:
Mohamed Boufarss
mohamed.boufarss@tuni.fi

Handling Editor:
Ludo Waltman

RESEARCH ARTICLE

Open access and international coauthorship: A longitudinal study of the United Arab Emirates research output

Mohamed Boufarss[1] and **Mikael Laakso**[2]

[1]Faculty of Information Technology and Communication Sciences, Tampere University, Tampere, Finland
[2]Department of Management and Organisation, Hanken School of Economics, Helsinki, Finland

Keywords: coauthorship, international collaboration, open access, scientometrics, Scopus, UAE

ABSTRACT

We investigate the interplay between open access (OA), coauthorship, and international research collaboration. Although previous research has dealt with these factors separately, there is a knowledge gap in how these interact within a single data set. The data includes all Scopus-indexed journal articles published over 11 years (2009–2019) where at least one of the authors has an affiliation to a United Arab Emirates institution (30,400 articles in total). To assess the OA status of articles, we utilized Unpaywall data for articles with a digital object identifier, and manual web searches for articles without. There was consistently strong growth in publication volume counts as well as shares of OA articles across the years. The analysis provides statistically significant results supporting a positive relationship between a higher number of coauthors (in particular international) and the OA status of articles. Further research is needed to investigate potentially explaining factors for the relationship between coauthorship and increased OA rate, such as implementation of national science policy initiatives, varying availability of funding for OA publishing in different countries, patterns in adoption of various OA types in different coauthorship constellations, and potentially unique discipline-specific patterns as they relate to coauthorship and OA rate.

1. INTRODUCTION

Open access (OA) publishing in journals is growing globally, both as entire journals and on the article level, in particular through hybrid OA transformative agreements (Crawford, 2021; Jahn, Matthias, & Laakso, 2022). Repository self-archiving by authors is also a major enabler of OA to content that would otherwise only be accessible behind a paywall (Thibault, MacPherson et al., 2018). Science policy and practices for OA publishing have evolved unevenly from an international perspective, where many European countries have in recent years been advancing rapidly compared to the rest of the world. Research funders and higher education institutions (HEIs) in Europe are increasingly requiring that the publications produced by funded or affiliated researchers are made available OA immediately (cOalition S, 2018; ROARMAP, n.d.). Although OA policies and practices are locally anchored to specific organizations and funding instruments, research is often conducted through international collaboration. Institutional requirements and possibilities for OA availability can thus also affect coauthors, even though their own circumstances do not require or enable OA to publications. Knowledge about how this phenomenon, coauthorship-induced OA, exists and has developed over time is lacking.

One key aspect that has contributed to the slow progress of knowledge development related to more intricate aspects of OA, such as the phenomenon of coauthorship-induced OA described in the previous paragraph, is the dearth of comprehensive basic data. Even though OA publishing has been growing strongly for over 20 years, a comprehensive central database for searching and retrieval of OA resources has still not been realized (Azadbakht & Schultz, 2020). The freely accessible Unpaywall database is currently the most comprehensive resource, but it is built around the fundamental principle that included articles have a digital object identifier (DOI) which is not something that all journals use. In a study on DOIs in the Web of Science (WoS) Core Collection and Scopus from 2005 to 2014, Gorraiz, Melero-Fuentes et al. (2016) observed that while 90% of all citable items in the Sciences and the Social Sciences in 2014 had a DOI, the percentage is about 50% in the Arts & Humanities. As this concerns journals within these indexes, the lack of DOIs for journals outside them can be assumed to be higher. Although the problem of lacking comprehensive data, or what Nguyen, Luczak-Roesch et al. (2022) refer to as "fitness for use," is something that also concerns data availability in scholarly journal publishing overall, with the selection of what data source one uses strongly shaping what the landscape looks like (Basson, Simard et al., 2022), for research on OA, this problem is heightened due to often having to rely on multiple layers of incomplete data to gain an overview of the situation. To counter these shortcomings, Xu, Yue et al. (2017) conclude that a multisource data fusion (MSDF) is "necessary and meaningful" in scientometrics. Overall, there is a need for more research on OA that also includes parts of the publication landscape that are omitted if only readily available data is used.

Considerable existing research is devoted to descriptive article-level growth analysis of OA utilizing Scopus and WoS, but less attention has been paid to the connection between openness and coauthorship, international collaboration, and journal host country. Using manual data enrichment, this study provides new insight into these phenomena with United Arab Emirates (UAE) research output providing the base data. The objective is to provide a granular analysis of research article output in the country, level of openness, and connection to international coauthorship.

The specific research questions that we seek answers to through the use of longitudinal data concerning journal article output which involves at least one UAE-affiliated author are

1. **What are the key OA characteristics of journal articles from UAE-affiliated authors?**
    (a) What are the shares of different OA types?
    (b) What are the disciplinary differences in OA shares?
    (c) Does the journal host country have a connection to OA availability?
    (d) What are the most popular repositories for self-archiving?
2. **How do different aspects of coauthorship interplay with OA shares of UAE-affiliated research output?**
    (a) How is coauthorship distributed globally?
    (b) Does the number of coauthors have a connection to OA availability?
    (c) Does the geographic region of coauthors have a connection to OA availability?

The UAE makes for an interesting case for the study of both research output and OA growth for a number of reasons. First, the UAE is a very young country, established only in 1971 and with its oldest university established in 1976. Although it does not have an old research

tradition or a well-established science policy, it has made giant strides in transforming its research landscape. Al Marzouqi, Alameddine et al. (2019) revealed that UAE research productivity has seen a 16-fold increase between 1998 and 2017 and the UAE Commission for Academic Accreditation (2022) currently lists 74 active higher education institutions. Second, the UAE research workforce is composed of a high share of expatriates and thus is transient by nature but they may also bring along their collaboration networks and thus boost the UAE's coauthored publications output. Finally, we could not identify any mention of sources of article processing charges (APC) funding within the UAE across all resources analyzing extramural and intramural funding in the country. This is in stark contrast with countries that have a high OA uptake and highlights the unique characteristics of the UAE research environment.

Alsharari (2018) states the preoccupation of UAE universities with gaining recognition through international accreditation. He further adds that "Local and global rankings are assuming greater importance ...." Research performance plays a major role in most university rankings and often relies on outputs in international journals, preferably high-ranked ones. It is this preoccupation with rankings (among other data quality aspects that are discussed in the methods section) that supports our choice of Scopus as a source of data, as it is a main resource of research output data for university rankings such as Quacquarelli Symonds (QS) and Times Higher Education (THE). What is relatively unexplored is how the growth in OA journal articles of UAE-affiliated authors has developed over recent years and how that might be connected to changes in international coauthorship among these authors. By designing a study around this topic, we aim to improve the current level of knowledge regarding the influence of coauthorship on the OA status of articles. We also aim to expose the level of compromise that reliance on readily available OA data implies when investigating phenomena such as this.

2. LITERATURE REVIEW

2.1. Challenges to OA Analysis and Retrieval

The road to comprehensive study of OA is strewn with methodological options and associated tradeoffs that need to be considered. First, current data sources often fail to provide comprehensive coverage data on different types of OA, leading researchers to resorting manual data collection, which has implications for how studies are skewed towards certain languages, countries, and disciplines. Second, discovery and retrieval of OA sources is shackled by the inconsistency of the different existing OA finding tools.

Despite being the most mature branch of open science so far, the measurement of OA share for journal articles is a complex task given the many variants of OA and the multiplicity of approaches, as well as the data sets used. Taubert, Hobert et al. (2019) illustrate this point with a listing of about 11 different OA types synthesized from existing OA research. Most bibliographic indexes do not capture data on all these OA variants, which can overlap with each other as multiple copies of publications are available through different channels over time, thus introducing a methodological challenge for bibliometric analysis. As most bibliographic databases are designed primarily for content retrieval purposes, bibliometric analysis of metadata can be just a secondary purpose (Hood & Wilson, 2003). Researchers often resort to extensive manual data collection to rectify gaps in the data (see e.g., Boufarss, 2020). Another issue with bibliometric analysis of international scope, be it including OA dimensions or not, is related to the biases in the two most commonly used data sources, namely WoS and Scopus. These two services contain biases in coverage related to disciplines, countries, and languages (Khanna, Ball et al., 2022; Mongeon & Paul-Hus, 2016). The bias towards English language

publications also reported by Björk (2019) makes comprehensive bibliometric studies of non-English-speaking countries like the UAE skewed, as part of their research output is often underrepresented. In a recent comprehensive analysis of the leading sources of citation data, Martín-Martín, Thelwall et al. (2021) reveal that sources suffer from either of the two main limitations: limited coverage in the case of Scopus or WoS; and limited search functionalities in the case of Google Scholar, Microsoft Academic, Dimensions, and OpenCitations COCI. With this in mind, Scopus has the upper hand because of greater coverage than WoS and more metadata fields, enabling deeper analysis (Thelwall & Maflahi, 2022). This last argument is supported by Guerrero-Bote, Chinchilla-Rodríguez et al. (2021), who concluded that there is greater coverage at the level of countries and institutions in Scopus than in Dimensions even though the latter has overall greater data coverage than the former. However, as of writing, there are no competing, more inclusive services than Scopus and WoS that would offer the same level of curation for journal and article-level metadata concerning active peer-reviewed journals that fulfill some common baseline criteria, which means that they can still be very useful for various research purposes as long as the limitations and biases are acknowledged.

At a time when OA uptake is trending upward (Archambault, Amyot et al., 2014; Piwowar, Priem et al., 2018; Piwowar, Priem, & Orr, 2019), discovery and retrieval of OA resources has been an issue that many service providers have worked on improving (Azadbakht & Schultz, 2020; Dhakal, 2019; Willi Hooper, 2017). The heralded general objective of the OA movement to provide access to scholarship to anyone with internet access is not achieved if people cannot find OA versions of articles easily (Schultz, Azadbakht et al., 2019). OA discovery tools such as Unpaywall, Kopernio, OA button, and Lazy Scholar have tried to resolve this challenge, as demonstrated by Azadbakht and Schultz (2020), Duffin (2020), Else (2018), and Schultz et al. (2019). Willi Hooper (2017) reviewed Unpaywall as an OA finding tool, finding it advantageous compared with Google Scholar, which has accuracy issues and linking to Academic Social Networks (ASNs), which can have copyright compliance issues. This finding is shared by Dhakal (2019), who stressed Unpaywall's focus on legally available OA articles. Other merits of Unpaywall have also been emphasized by Dhakal (2019), such as the provided Simple Query Tool, the REST API, and the full database snapshot, which all facilitate establishing OA status for larger amounts of articles as long as a DOI can be provided for each.

Whether it is the unequivocal focus of OA studies on journal literature, absence of comprehensive data sources that cater for the different OA models and are unbiased, or unreliable discovery and retrieval tools, the challenges to OA studies abound.

2.2. Research Collaboration and OA

The research landscape has witnessed a surge in collaboration in recent years, driven by the global proliferation of networked devices and associated web services, policies encouraging research partnerships, and beliefs that this leads to increased scholarly productivity (Abramo, D'Angelo, & Di Costa, 2009), increased citations (Eysenbach, 2006; Hajjem & Harnad, 2007), increased research visibility (Glänzel & Schubert, 2004), increased knowledge sharing and transfer, creativity, and intellectual companionship (Katz & Martin, 1997), and increased academic performance (Aziz & Rozing, 2013). This has also been influenced by the globalization of science becoming a necessity for addressing major societal challenges (Macháček, 2023). An example of support for research collaboration at the policymaker level is the European research funders' network ERA-NET and the European Joint Programming Initiatives (JPI). The correlation between collaboration and upsurge in publication quality and output is supported by Chung, Cox, and Kim (2009). This opinion is shared by Adams, Jamal et al. (2021) in

the Middle East, North Africa, and Turkey (MENAT) context, as they believe that the upsurge in publications is largely due to international collaboration.

While coauthorship is the most common indicator of research collaboration (Nguyen et al., 2022), drawing broad conclusions regarding the intensity and quality of research collaboration purely based on bibliometric data should be done with caution. Katz and Martin (1997) believe that "co-authorship is no more than a partial indicator of collaboration" as inter-institutional and international collaboration does not have to be a collaboration between individuals. A case in point is when a researcher lists two affiliations, indicating an overarching institutional collaboration. In fact, a "collision of collaboration and authorship" (Birnholtz, 2006) can even happen when collaboration breeds mass authorship or hyperauthorship, with some articles in physics, for example, listing thousands of coauthors (Kahn, 2018). Equally problematic is what Moustafa (2020) refers to as "octopus affiliations," referring to authors listing multiple affiliations. This could be in exchange for financial reward by institutions seeking to enhance their ranking or authors' desire to boost their reputation by associating themselves with prestigious institutions. These practices have deep implications for attribution and credit, ownership, and reputation. Glänzel and Schubert (2004) provide a detailed fundamental overview of coauthorship. They note that almost 20 years ago, one could already observe an overall trend in terms of decrease in single-author publications. This was counterbalanced by intensifying collaboration in all disciplines. In a study of coauthorship in different disciplines from 1900 to 2020, Thelwall and Maflahi (2022) reported a steady increase in the mean number of authors per article. Even though Glänzel and Schubert (2004) noted that this increase was a "global law" with all countries, regardless of the size of their publication output, having witnessed this growth, they observed that medium-sized or small countries had higher international copublications than large countries.

Benefits of coauthorship transcend the impact it can have on an individual author's or institution's scientific profile. Wagner, Whetsell et al. (2018) state that "the more internationally engaged a nation is in terms of co-authorships and researcher mobility, the higher the impact of scientific work." If this statement is accurate and with a high incoming mobility as demonstrated by El-Ouahi, Robinson-García, and Costas (2021) and with internationally coauthored publications of nearly 70% in 2015 (Moed, 2016), the UAE should record high scientific work impact. In fact, Al Marzouqi et al. (2019) reported an improvement in the percentage of articles from the UAE that were published in the top 10th percentile (by CiteScore) ranked journals and that this metric was higher than the average for Gulf Cooperation Council and Arab League countries.

Very little research has been published on the relationship between the number of authors and level of articles' openness. Though old and exploring a different aspect of OA, Eysenbach's (2006) research found OA articles to have a "higher number of authors." This could be attributed to two factors, namely higher self-archiving probability with more authors and increased potential of APC funding by one of the author's affiliations. Hajjem and Harnad (2007), in a study from around the same time frame, found that the number of authors among other factors "contributes an independent, statistically significant increment to the citation counts."

Another challenge brought about by coauthorship is who bears the cost of publishing OA. In their study on OA costs, taking into account author roles and the number of authors in Germany, Bruns, Rimmert, and Taubert (2020) identified five payment models for APC payments: First author model, Reprint author model, Institutions contribute equally, Institutions contribute, weighted by the number of authors, and Institutions contribute, weighted by

author-institution-combination. They conclude that these models result in different financial contributions and thus some are preferred by some institutions over others. Morillo (2020) looked more closely at the relationships between OA (based on Unpaywall data), funding types (national, international, EU funded), collaboration (national, international coauthorship), and citations for WoS articles published in 2017 in the disciplines of Immunology and Economics. One clear difference from the start was that the overall level of OA among the articles differed substantially between the two disciplines: 50% for Immunology and less than 15% for Economics. Although the studied factors are intertwined and influence each other in different ways, the authors could conclude that the probability of an article being OA was significantly higher in Immunology when the study was EU funded, included international collaboration, and with a positive connection to accrued citations. The factors were positive towards the probability of an article being OA independently but particularly so when multiple of them were present for the same article. The trend was also similar for the same factors for Economics articles, but the overall strength was weaker due to the substantially lower OA update overall.

Based on research on the initial years of transformative agreements in Germany, Haucap, Moshgbar, and Schmal (2021) found a significant change in publication patterns among authors, where they more frequently select journals that are part of such agreements than journals that are outside of their coverage. Similar results were also recently found by Wenaas (2022) for articles from authors affiliated with Norwegian institutions. What does this mean for studies that relate to coauthorship and openness? OA grows by two mechanisms: directly as a consequence of outlets making articles open that would otherwise have been closed, and by stimulating authors to select journals that enable OA at no extra cost.

2.3. The UAE Landscape

Article output from Arab countries was slow in catching up but is quickly compensating for this latency as part of a global trend ending the dominance of the transatlantic research axis, which had a share of 75–80% of all academic research output (Adams et al., 2021). Adams et al. (2021) further state that the number of papers output from the MENAT region saw a 20-fold growth between 1981 and 2019. This translates into a move from 2% to 8% of global share. They also share the findings of Cavacini (2016) that research output from the region is dominated by Israel, Iran, Turkey, Saudi Arabia, and Egypt, which means that other countries, including the UAE, still play a marginal role in scientific production. In 2019, the UAE contributed only 15% of the Gulf Cooperation Council research productivity against 63% for Saudi Arabia (Ajayan, Balasubramanian, & Ramachandran, 2022).

The UAE research landscape presents some unique characteristics, including, but not limited to, the country being only around 50 years old, a high transient research community with temporary residency status (the oldest university being only around 46 years old), and a nonhomogeneous multilingual population. All these factors have a direct impact on research output. However, the situation is set to change in the UAE as the national science policy is being geared towards increased scientific output (Boufarss & Laakso, 2020). This direction started with the launch of UAE Vision 2021, followed by the release of the UAE Innovation Strategy, the National Strategy for Higher Education 2030, the announcement of the National Advanced Sciences Agenda 2031, the Research and Development (R&D) Governance Policy, and finally by the recently launched Golden Visa scheme, aiming to attract and retain outstanding researchers. Furthermore, initiatives that aim to provide funding for research were launched recently and include, among many others, the Mohammed bin Rashid Al Maktoum Knowledge Foundation, the National Research Foundation, the Abu Dhabi Research and

Development Authority, the Advanced Technology Research Council, and the Abu Dhabi Ghadan 21 Research and Development funds. The Research and Development Governance Policy lists among its aims to "foster an agile, robust national ecosystem for research and development in the UAE" and "set standards to improve research, elevate the performance of the national R&D activities." These policies and initiatives are likely to have had a visible impact on scientific research output. A Clarivate Analytics (2019) report estimated that UAE research articles indexed in the WoS Core Collection increased by 450% between 2008 and 2018. The same Clarivate report states that the UAE is part of the OA growth trend, with a gradual increase in the percentage of OA articles published in recent years.

3. METHODOLOGY AND DATA

Some of the most recent and comprehensive studies on national-level OA dimensions have been based on nationally collected and curated Current Research Information System (CRIS) data, which, when a country has such available, still provide breadth at the expense of standardized detail when it comes to, for example, affiliation metadata for all involved coauthors and OA type categorization (Pölönen, Laakso et al., 2020; Wenaas, 2022). In the absence of comprehensive local or regional indexes of journal articles with the required author-affiliation metadata for each article, we utilized Scopus as a source of data. Boufarss (2020) states that "regional indexes such as ARCIF and Arab Impact Factor are limited in their coverage of locally published journals." In fact, these two products are Journal Impact Factor indexes. Similarly, according to Ouahi (2021), the share of UAE journals in Clarivate's Arabic Citation Index is a mere 2%. This index is also highly biased with nearly 79% of records in Arts & Humanities, and Social Sciences categories and nearly 93% in Arabic language (Ouahi, 2021). The choice of Scopus is also supported by the perceived focus among UAE institutions on publications indexed mainly in Scopus and WoS services, as Boufarss and Laakso (2020) found that the greatest majority of HEIs consider their researchers' publishing in Scopus and WoS essential and a high priority.

The key steps of the data collection methodology are presented in Figure 1. We initially extracted a list of articles published during a period of 11 years (2009 to 2019) and authored by researchers affiliated with UAE institutions from Scopus and imported the data into Microsoft Excel. Scopus data were extracted using Scival in February 2020 and data for the year 2019 were appended in October 2021. A query for publications limited by country to the "United Arab Emirates" was performed. For the sake of focus on primarily peer-reviewed

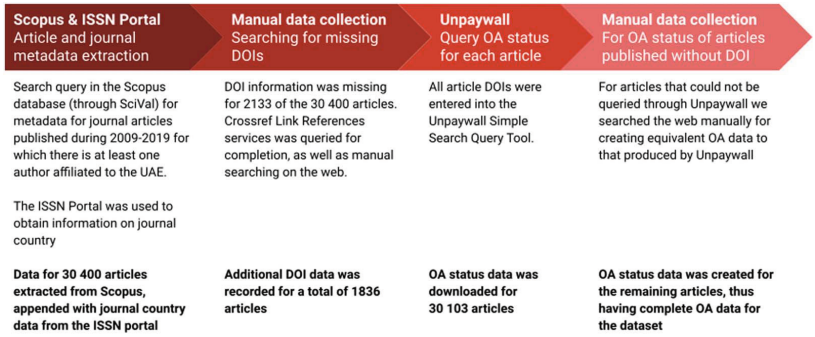


Figure 1. Data collection methodology.

content, and comparability with other studies such as Piwowar et al. (2019), the query was further limited to articles, articles in the press, business articles, and data papers. Our choice of this time frame initially emanated from a desire to analyze a decade of data, but was later expanded to 11 years. Our choice of 2009 was motivated by data in Ajayan et al. (2022) and Al Marzouqi et al. (2019) which indicated a big jump in UAE research articles output in that year, and also by the general momentum for OA journal publishing globally that was more seriously building up involving several OA types around that time frame (Piwowar et al., 2018). Articles published in 2020 were excluded, as metrics were still at risk of being "incomplete" for that year at the time of data collection, particularly regarding self-archived materials, which are often under an embargo before they can be distributed on the web. Conference proceedings, books, and book chapters were excluded in an endeavor to have a consistent data set that could be analyzed for journal OA status. To enable the analysis of journal choice and possible relationship concerning language and geographical bias, we also enriched the data with the journal country using the ISSN Portal.

For the records without a DOI (2,133 articles), we matched these to DOIs in Crossref Metadata using their Link References feature or manually researched and appended a DOI whenever found through manual checking through journal websites. A DOI could not be found for the remaining 297 articles. All records with a DOI were batch run through the Unpaywall Simple Query Tool and the resulting data were appended to those records. For the remaining articles that were published without DOIs, we manually collected OA status information for them, following the basic principles of classification that Unpaywall also uses to have a uniform data set. To remain in line with Unpaywall data harvesting principles, OA resources in services such as ResearchGate and Academia.edu were excluded.

The data were then enriched with a coauthor affiliation region based on Scopus affiliation country data. The affiliation countries were grouped into six regions, namely Africa, Asia, Australasia, Europe, North America, and South America. It bears noting that one author might be affiliated to more than one institution or country through one article. From the perspective of this study this has been seen as an expression of international collaboration and aligned with the aims of the study and can be included as such rather than something that had to be fractionalized or cleaned out from the data. To give some scope for this data property, we calculated that 7,724 articles (25%) included more affiliations than the count of total authors in the metadata. Journal topic clusters were grouped into the five main Scopus subject areas (Multidisciplinary, Life Sciences, Health Sciences, Physical Sciences, and Social Sciences and Humanities) by mapping the All Science Journal Classification Codes (ASJC) field against the Scopus subject areas.

For the sake of clarity and disambiguation, the following basic definitions from Piwowar et al. (2018) are used for the classification of OA type:

- Gold OA: articles published in an OA journal where all articles are open directly on the journal website.
- Green OA: articles published in a subscription journal, but self-archived in, for example, an institutional or disciplinary OA archive. These articles vary in what version they are, ranging from publisher versions to article manuscripts prior to peer review.
- Hybrid OA: articles published in a toll-access journal but are immediately made open under an open license, often in exchange for payment of an APC.
- Bronze OA: articles provided and made available to read from the publishers' website but without a license, thus limiting their reuse rights to reading.
- Closed: an OA version of the article has not been found, also referred to as non-OA.

The Unpaywall data used in this study contain one OA type recorded per publication, and in cases where there were multiple versions available preference was given to recording the gold OA option. As such, the green OA share can be lower than actual availability because many articles available through that mechanism might also be available as a gold OA type.

For statistical analysis, we utilized IBM SPSS 28.0. Dichotomous variables and presence of article attributes (article OA status, journal discipline categories, journal world region, article affiliation world region group) were dummy coded as 0 or 1 to enable analysis. For analysis involving absolute author counts or author affiliation distribution, outliers were excluded from the analysis to make the analysis more representative of the majority of articles in the population. Articles with author counts outside of one standard deviation of the arithmetic mean of authors (14.76) were excluded in this case, which meant that articles with an excess of 159 authors were not considered (183 articles in total). Where this exclusion applies is mentioned in the results section; otherwise in all other cases, all articles are included in the analysis.

4. RESULTS AND DISCUSSION

This part of the study presents and discusses the results of the analysis conducted on the dataset described in the methods and data section.

4.1. What Are the Key OA Characteristics of Journal Articles from UAE-Affiliated Authors?

4.1.1. What are the shares of different OA types?

Figure 2 and Table 1 show that scientific article output of the UAE has been strong in the past 11 years, especially since 2014, coinciding with the UAE's Innovation Strategy, which aims to "promote research and development across universities" (UAE PMO, 2015). The percentage of OA articles for the period from 2009 to 2019 amounts to nearly 41%, growing from only 28% in 2009 to 50% in 2019. Furthermore, year-on-year analysis of OA percentage during the same period reveals an average 2.2% increase in OA annually. These figures are surprising in a country with no national-level OA policies, mandates, or clear guidelines (Boufarss &

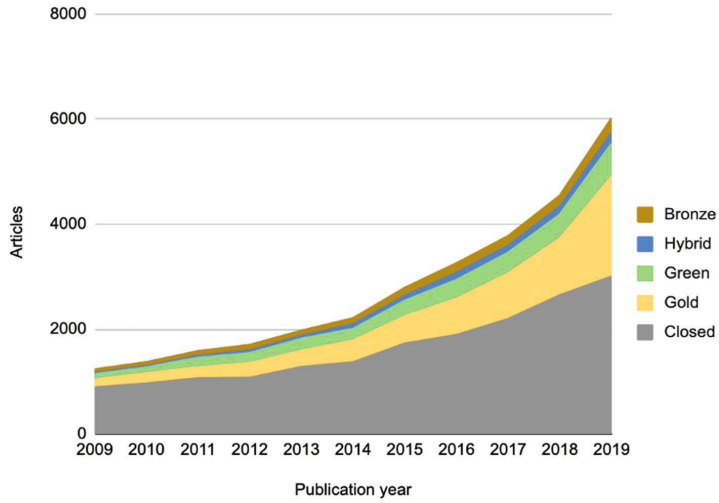


Figure 2. OA status and type by publication year.

Table 1. OA type and status by publication year

OA Type	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Closed	886	960	1,060	1,067	1,270	1,360	1,717	1,881	2,193	2,641	2,990	18,015
Gold	156	199	214	286	322	420	524	696	868	1,083	1,916	6,684
Green	102	123	179	185	220	220	294	355	390	452	619	3,139
Bronze	53	65	76	93	84	105	140	171	173	193	256	1,409
Hybrid	37	23	51	64	69	100	109	148	147	172	233	1,153
Total OA	348	410	520	628	695	845	1,067	1,370	1,578	1,900	3,024	12,385
Total	**1,231**	**1,367**	**1,576**	**1,695**	**1,965**	**2,205**	**2,784**	**3,251**	**3,771**	**4,541**	**6,014**	**30,400**
% OA	**28**	**30**	**33**	**37**	**35**	**38**	**38**	**42**	**42**	**42**	**50**	**41**

Laakso, 2020). In fact, the UAE OA rate for 2019 is much higher than Piwowar et al.'s (2019) findings that showed the world share of OA standing at about 31%. Similarly, these are well ahead of the 24% OA for papers published between 2015 and 2019 in the Arab countries and indexed in the Arabic Citation Index (ARCI) as reported by Ouahi (2021). However, they remain subpar with the OA shares achieved by Finland (73%), the United Kingdom (70%), Sweden (66%), and France (65%) in 2019 (Curtin University, 2022).

Figure 2 also shows that 54% (6,684) of all OA articles are provided as gold OA directly through journals. This is followed by green OA with 3,139 (25%). Bronze OA and hybrid OA account for 11% (1409) and 9% (1,153) of OA articles respectively. This trend corroborates the conclusions of Piwowar et al. (2019) that gold OA spearheads the OA movement. When interpreting these numbers, it is important to reiterate that the Unpaywall data used here only provides one OA type recorded per publication, and in cases where there are multiple versions available preference is given to recording the gold OA option. As such, the green OA share is lower than actual availability because many articles available through that mechanism are also available as a gold OA type. In any case, it can be argued that this will not have much effect on the decreasing trend of green OA, which could be attributed to an increasing number of authors who publish gold OA articles not choosing to self-archive these already open articles.

4.1.2. What are the disciplinary differences in OA shares?

As Table 2 presents, articles involving UAE-affiliated authors were dominated by Physical Sciences, which accounts for 47% of all articles. This is probably driven by the research and development of the oil and gas industry. However, the highest percentage of OA was achieved by journals in multidisciplinary fields at 90% (e.g., including megajournals such as *PLOS ONE* and *Scientific Reports*). Health Sciences and Life Sciences achieved the next highest OA percentages, with 55% and 51% respectively. It also bears remembering in this context that the study only includes journal articles and does not include, for example, conference papers that might follow different dynamics regarding OA shares and have seen different changes over the 11-year observation period.

To more robustly explore whether the degree of OA status differed to a statistically significant degree between discipline categories of the publishing journal, we performed a Pearson chi-square association test. The relationship between these variables (article OA status and

Table 2. OA by Scopus subject area

Scopus subject area	OA	Closed	Total	% OA
Health Sciences	2,880	2,349	5,225	55
Life Sciences	2,241	2,186	4,419	51
Physical Sciences	4,791	9,525	14,314	33
SS&H	1,819	3,885	5,695	32
Multidisciplinary	654	70	721	90

Scopus Subject Area) was found to be significant, $\chi^2(4, 34{,}000) = [1{,}860.574, p < .000]$. Table 3 breaks down the actual counts in the data set compared with the expected counts based on the analysis: Physical Sciences and Social Sciences and Humanities had lower than expected shares of articles available OA, while Life Sciences, Health Sciences and Multidisciplinary had a higher than expected share of OA articles.

4.1.3. Does the journal host country have a connection to OA availability?

As the results in Table 4 demonstrate, authors continue heading north, with the majority of articles published in journals from Europe and North America. Journals published in Europe alone account for about 56% of all articles published by UAE authors. North American journals published another 29% of the articles. This could be attributed to the big publishers being based in these countries (Mongeon & Paul-Hus, 2016) and to the authors' pursuit of high impact and prestige or to the increasing globalization of research communication trend (Macháček, 2023). MENAT journals account for only 926 (3%) publications, of which 724 (78%) are OA and 202 (22%) are paywalled.

South American journals lead in the OA percentage of articles, with 84% of all articles being OA. This is followed by MENAT (78%), International organization (75%), Australasian (67%), Asian (66%), and African (64%) journals. European and North American journals are both at the bottom of the list with 36% and 37%. "International organization," in this context, represents journals published by an international organization and listed as such by the ISSN International Centre because those organizations do not have a national ISSN center.

We conducted a Pearson chi-square association test to establish whether the distribution of article OA status differs across journal host country categories. The relationship between these variables (article OA status and journal host country) was found to be significant, $\chi^2(6, 34{,}000) = [1{,}461.186, p < .000]$. The results of the analysis showed that articles published by journals in

Table 3. Output of Pearson chi-square association test for OA status differences for articles published in journals within different Scopus subject areas

			Physical Sciences	Life Sciences	Health Sciences	Social Sciences and Humanities	Multidisciplinary
Article OA status	No	Count	9,525	2,186	2,349	3,885	70
		Expected count	8,484	2,623	3,099	3,380	429
	Yes	Count	4,791	2,241	2,880	1,819	654
		Expected count	5,832	1,804	2,130	2,324	295

Table 4. Journal region and OA shares

	OA	Closed	% OA	Total
Asia	2,094	1,083	65.9	3,177
Europe	6,217	10,971	36.2	17,188
North America	3,300	5,638	36.9	8,938
Australasia	264	130	67.0	394
Africa	173	99	63.6	272
South America	124	24	83.8	148
International	213	70	75.3	283

the journal host country categories of Africa, Asia, Australasia, South America and International had higher than the expected distribution of articles available OA, while Europe and North America were lower than expected. Table 5 presents the output of the analysis.

4.1.4. What are the most popular repositories for self-archiving?

Performing document version and web location analysis for any other type than green OA would not be meaningful, as the copies should in those cases always be available from the publisher's website in their final peer-reviewed and copyedited form, but for green OA, access can be provided through various document versions and can come from different types of web services around the world. With data being based on how Unpaywall has harvested different article versions, Table 6 shows that the submitted version of the manuscript accounts for almost half of all self-archived articles. Combined with the accepted version rate, this reaches around two-thirds of self-archived articles. This result of around a third of self-archived copies being the published version is surprising, as, in general, journal publishers do not allow posting of the published version (Laakso, 2014) unless the article has been published in an OA journal with a Creative Commons license so that open distribution is explicitly permitted.

Studies have reported a limited number of institutional repositories (IRs) in the UAE (Boufarss, 2011; Boufarss & Laakso, 2020), and this study provides further evidence that the actual use of the existing repositories is also low when looked through the observation of this data set. Although IRs were the most common location of self-archived/green OA articles as demonstrated in Table 7, the vast majority of were at institutions outside the UAE, as OA copies located at UAE-based academic IR amounted to a mere 36 articles of the 1,077 found at such locations. IRs were followed by subject-based repositories, namely arXiv and PMC, in

Table 5. Output of Pearson chi-square association test for OA status differences for articles published in journals from different continents

			Africa	Asia	Australasia	Europe	International	North America	South America
Article OA status	No	Count	99	1,083	130	10,971	70	5,638	24
		Expected count	161	1,883	234	10,186	168	5,297	88
	Yes	Count	173	2,094	264	6,217	213	3,300	124
		Expected count	111	1,294	161	7002	115	3,641	60

Table 6. Green OA self-archived versions

Version	# of articles
Published	859
Accepted	729
Submitted	1,549

frequency of use for self-archiving articles. These findings are quite surprising in contrast with the findings of Boufarss and Laakso (2020) that the majority of UAE HEIs mandate or encourage self-archiving in an IR, something which does not happen at least in the UAE-operated IRs based on these results.

4.2. How Do Different Aspects of Coauthorship Interplay with OA Shares of UAE-Affiliated Research Output?

To start unraveling the relationships between the coauthorship, international collaboration, and OA status of articles a summarizing longitudinal analysis was made over how the average number of world regions covered by affiliations per article and the share of articles with at least one international affiliation have developed for articles with at least one UAE-affiliated author over the 11 years covered by the study. Table 8 presents the results of this analysis, showing consistent growth for both indicators over the years, the average number of world regions covered by the affiliations in the articles growing from 0.75 to 1.12 and the inclusion of at least one international affiliation from 59% to 72%.

4.2.1. How is coauthorship distributed globally?

To get a global summarizing perspective on coauthorship distribution we grouped the affiliation data into world regions rather than individual countries, with the UAE separated out as the only individual country in order to enable inspection of national-only coauthorships. Figure 3 indicates that about 19% of all coauthored UAE articles were with other UAE authors. However, UAE authors also have a diversified collaboration portfolio with coauthors from all continents, with around 80% of coauthored publications with authors from other countries surpassing the 70% reported by Moed (2016). With the exception of internal UAE coauthorship, the numbers shown on the map are nonexclusive per continent but rather capture all instances of at least one coauthor from that continent. The highest instances of collaboration were recorded with Asia (26%), North America (20%), and Europe (19%) respectively. Similar intercontinental collaboration trends have been reported by Kozma and Calero-Medina (2019)

Table 7. Top five sources of self-archived articles

Source	# of articles	Articles with UAE authors only
Academic institutional repositories	1,077	208
arXiv	463	92
Via Semantic Scholar lookup	449	160
Via Europe PMC lookup	348	92
PubMed Central (NIH)	184	56

Table 8. Longitudinal development of internationalization of authorship of articles with at least one UAE-affiliated author

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Average number of world regions covered by affiliations (articles with UAE-only affiliations counted as 0)	0.75	0.75	0.80	0.83	0.86	0.94	0.96	1.01	1.03	1.10	1.12
% of articles with at least one international affiliation	59%	57%	59%	62%	65%	68%	68%	70%	71%	73%	72%

among South African authors. This could be attributed to a range of factors, such as neocolonial ties and language impact, with English being the language of teaching and business in the UAE and workforce dynamics with immigrants from Asia being dominant (De Bel-Air, 2015) representing about half of the population. UAE university faculty by nationality statistics reported in Karabchuk, Shomotova, and Chmel (2022) indicate that about 89% of academics are expatriates in the year 2016/2017. A similar report by Bayanat.ae (s.d.) shows that only 12% of academics at Zayed University are UAE nationals. According to the same report, faculty hail from 62 different countries: 37% are from Asian countries, 25% are from the United States and Canada, and 22% are from European countries. These findings indicate that the UAE is part of the increasing international copublications trend reported by Glänzel and Schubert (2004).

4.2.2. Does the number of coauthors have a connection to OA availability?

To start with, we divided the articles into three groups based on the number of authors involved in each: one, two, or three or more. As Figure 4 shows, we found general prevalence for higher OA share for articles authored by more than three authors throughout the years covered. It can be seen also that there has been a constant increase in OA percentage across different coauthorship levels and over the 11 years captured. In addition to the fact that the number of coauthored publications has been significantly higher than single-author articles throughout the last 11 years, the output of publications with multiple authors has seen strong growth during the same period across both OA and closed articles. It can also be observed that

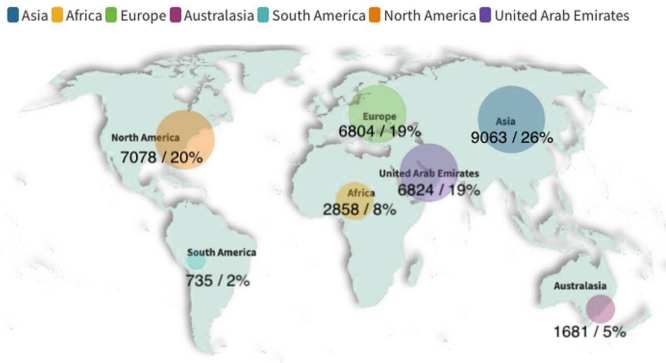


Figure 3. Coauthorship by continent.

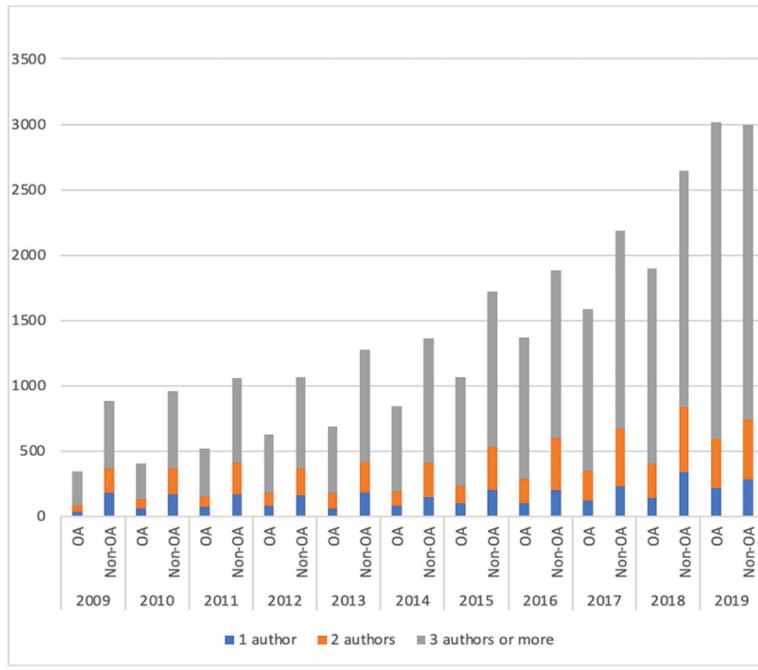


Figure 4. Single vs. multiauthor articles over time.

the OA rate is higher among multiauthor publications in recent years, with, for example, 52% OA for articles with three or more authors against 43% for single-author articles in 2019, 45% against 29% for the 2018, and 45% versus 34% in 2017.

Digging a bit deeper into this research question, a binominal logistic regression was performed to ascertain the effect of author count on the likelihood of an article being available OA. This analysis included two independent variables (count of authors per article) and year (publication year), and one independent variable for OA status (yes/no). We included the publication year in the model to account for the growth in general OA that can be seen over the observation years.

As described in Section 3, outliers were removed to improve analysis that involves absolute author counts. Author counts outside of one standard deviation of the arithmetic mean of authors (14.76) were excluded in this case, which meant that articles with an excess of 159 authors were not considered (183 articles in total).

The logistic regression model was statistically significant $\chi^2(2) = 1{,}431.995$, $p < .001$. The two predictor variables were both statistically significant: number of authors and publication year. An increase in authors as well as later publication years were associated with an increased likelihood of an article being available OA. The finding of more authors per paper being associated with higher likelihood of being OA is in line with the results of Morillo (2020) and Eysenbach (2006) for the disciplines they researched. The output of the analysis is presented in Table 9.

Table 9. Logistic regression predicting likelihood of open access status of published articles based on number of authors and publication year

							95% CI.for odds ratio	
	B	**S.E.**	**Wald**	**df**	***p***	**Odds ratio**	**Lower**	**Upper**
Number of authors	.094	.004	673.357	1	< .001	1.099	1.091	1.106
Publication year	.070	.004	293.676	1	< .001	1.072	1.064	1.081
Constant	−143.895	8.224	297.136	1	< .001	.000		

However, the degree to which the included variables could explain all the variation in the OA status for articles was relatively low. The model explained 6.3% (Nagelkerke R^2) of the variance in OA status and correctly classified 62.4% of cases. Sensitivity was 17.4% and specificity was 92.9%. Negative predictive value was 62.4% and positive predictive value 37.5%. As a follow-up we performed a Receiver Operating Characteristic (ROC) plotting of the discriminatory effects of the variables with the results of "Number of Authors" having an area of .593 and "Publication Year" having .566, which according to Hosmer, Lemeshow, and Sturdivant (2013) in general suggests poor discrimination that is not much better than a random classification.

So, although the test and its variables were significant, there are a lot of other factors also in play that should be explored in future studies.

Based on this finding we argue that one explaining factor is the increased likelihood of one author being covered by an OA mandate that either caters for OA APC expenses or ensures self-archival for published research on behalf of all authors of the article. As these mandates and funding possibilities have become more common over time, we think that also explains the relationship for more recent articles being more likely to be OA.

4.2.3. Does the geographic region of coauthors have a connection to OA availability?

Table 10 shows a comparison between OA rate and intercontinental collaboration. It shows that Europe is a key player in the top 10 collaboration combinations with the highest OA rate. For this analysis we included two categories for articles that contain no international affiliations (one for single-authored articles with a UAE affiliation, and one for articles with multiple authors where there are only UAE affiliations) as a point of comparison to all the other categories, which contain different combinations of international affiliations. The OA percentage among articles with only UAE affiliations the was 32% for single-authored and 38% for multiauthor articles, thus not falling far behind the average of 41% for all articles over the period of the study. The results seem to indicate that higher intercontinental collaboration is related to higher OA rate.

To further explore the relationship between different coauthor affiliation world regions and the OA status of articles we opted for a nonparametric Pearson chi-square test for association, here also using the modified data set that excluded the 183 articles with over 159 authors per article (N = 30,217). Because we are dealing with two dichotomous variables (OA status and presence of specific author affiliation continent), and the same articles can include several of the affiliation variables at any one time, a nonparametric test was decided as the most optimal way to explore this dimension of the data.

The result of the Pearson chi-square test of association found a statistically significant relationship between all affiliation categories and OA status outside of articles with an affiliation to Africa, where the results were not statistically significant. For articles with only national affiliations (only UAE affiliations) the share of articles with OA status was lower than expected. For articles that included affiliations to Europe, South America, Asia, Australasia, and North

Table 10. Coauthor affiliation continent and OA rate, showing combinations with over 50 articles only

Continent	# Articles	# OA	# Closed	% OA
Asia – Europe – North America – Australasia – Africa – South America	206	181	25	88
Asia – Europe – North America – Africa – South America	62	47	15	76
Asia – Europe – North America – Australasia	77	56	21	73
Europe – North America – Australasia	85	57	28	67
Asia – Europe – North America – Africa	65	43	22	66
Asia – Europe – Australasia	67	41	26	61
Asia – Europe – North America	385	229	156	59
Europe – North America	854	436	418	51
Europe – Australasia	164	81	83	49
Asia – North America – Africa	98	47	51	48
Asia – Europe – Africa	146	69	77	47
North America – Australasia	95	44	51	46
Asia – Europe	1,046	474	572	45
South America	92	41	51	45
Europe – Africa	312	138	174	44
Europe	3,366	1,436	1,930	43
Europe – South America	74	31	43	42
Asia – Africa	510	209	301	41
Asia	5,216	2,115	3,101	41
Asia – North America – Australasia	51	20	31	39
Asia – North America	1,163	456	7070	39
Asia – Australasia	224	83	141	37
Europe – North America – Africa	57	21	36	37
North America	3,803	1,342	2,461	35
Africa	1167	408	759	35
North America – Africa	268	90	178	33
Australasia	637	211	426	33
North America – South America	72	23	49	32
UAE only (Multi-author)	6,824	2,591	4,233	38
UAE only (Single-author)	3,313	1,057	2,256	32

Table 11. Pearson chi-square test of association between coauthor affiliation world regions and OA status of articles

	OA status distribution of articles with affiliation	Pearson chi-square value	Asymptotic significance (2-sided)	Cramer's V	Approximate significance
Asia affiliation	Higher than expected (expected 3,797, actual 4,061)	44.845	< .001	.039	< .001
Europe affiliation	Higher than expected (expected 2,848, actual 3,346)	190.854	< .001	.079	< .001
North America affiliation	Higher than expected (expected 2,979, actual count 3,058)	4.610	.032	.012	.032
Australasia affiliation	Higher than expected (expected 676, actual count 777)	26.656	< .001	.030	< .001
Africa affiliation	Higher than expected (expected 1,174, actual count 1,209)	1.896	.168	.007	.168
South America affiliation	Higher than expected (expected 336, actual count 252)	48.397	< .001	.040	< .001
Only UAE affiliation	Lower than expected (expected 3,563, actual count 3,316)	40.598	< .001	.037	< .001

America (listed in descending order of effect size between the variables) the actual count of OA articles exceeded the expected distribution. Because Cramer's V indication of the relative effect size ranges between 0 and 1, much like traditional correlation analysis, we can deduce that while the results are statistically significant the actual relative effect size is low, ranging between .037 and .079. The output of the analysis is provided in Table 11. These results support the notion that internationally coauthored articles in the data set are available OA to a higher degree, where the strongest effect was for articles which included a coauthor with an affiliation address in Europe.

5. CONCLUSIONS

For scientometric research, this study is able to contribute to integrative method development for supporting research on diverse data dimensions of bibliometric data sets on a national and longitudinal scale. Drawing together central methodological elements from OA research, coauthorship research, and research on national-level output, this study also provides novel research results related to how the national and international intertwine when it comes to the journal article publishing space. For this data set, we could establish that having more authors is related to a higher probability of an article being available OA, as well as more recent articles also more likely being available OA. The findings also show support for broad, multicontinent research being available OA to a higher degree than research only involving national authors. Though the explanatory power of the statistical model for identifying the most influential coauthor continent for relationship to an article being OA was weak overall, the highest effect

size was given to coauthors with a European affiliation. One explanation for this could be the push that many European HEIs and research funders have had during the last decade for making journal articles available OA, thus affecting coauthored research as well.

With regard to the national perspective and what the study contributes towards better understanding of the development of research in the UAE specifically, this study shows that UAE-affiliated journal research output saw strong increases in volume, international collaboration, and OA during the 11 years captured as part of this study. This has happened at the same time as the country took steps to establish a stronger science policy that emphasizes these aspects as central elements. How much of this change can be attributed to the impact of national science policy and how much to the global trends of growth, collaboration, and OA is hard to pin down and would require different data and methods to establish. However, distinguishable upsurges in the number of documents can be seen around the release times of the UAE Vision 2021 in 2010, the UAE Innovation Strategy in 2014, and the National Advanced Sciences Agenda 2031 in 2018. Worthy of mention in this context also are the UAE federal government open data guidelines and the transformative "read and publish" agreements with major publishers, such as Cambridge and the American Chemical Society, signed by the two major research-leading public universities, Khalifa University and United Arab Emirates University. It is still relatively rare to see these agreements outside European institutions and library consortia, where they have become quite common, and this is a substantially strong step from the direction of the UAE to facilitating immediate OA publication of research outputs.

As is expected from a country whose economy is primarily dependent on oil, our findings suggest that the highest number of articles were in the Physical Sciences. However, this subject area achieved the second lowest OA rate of 33% after Social Sciences and Humanities. Apart from the articles in multidisciplinary journals, which recorded a significant OA rate of 90%, Health Sciences and Life Sciences achieved shares of 55% and 51% respectively. In terms of green OA publications, IRs and subject-based repositories are the main host locations of green OA articles despite the mediocre number of repositories in the UAE. This would indicate a low level of use for such repositories in the UAE for self-archiving of journal article manuscripts; however, such repositories might be populated with other types of content.

We found that the UAE aligns with the global trend of coauthored articles being on the rise and that the share of OA among coauthored publications is higher. This suggests that either awareness of OA increases as the number of authors increases or the cost of publishing OA is shared, such that research projects with larger teams have access to more funds to pay APCs or are required to by funders, especially those with Plan S-aligned OA policies. We also found that the rate of OA is connected to the size of intercontinental collaboration, with European coauthors especially being part of the top 10 collaboration combinations with the highest OA rate, even though the highest collaborations were with Asia and North America. This European coauthorship-associated higher OA rate is likely to be attributed to the high subscription to Plan-S and Horizon Europe principles in Europe. Further investigations need to be carried out on the factors contributing to the connection between collaboration and OA rate.

The study also included an element where the continent of the journal publisher was included as a variable, with results showing that North American and European journals have recruited the majority of articles published by UAE-affiliated researchers during the observation period. However, South American journals have published the highest percentage of OA articles. What bears remembering is that these results in particular are likely influenced by the Western-skewness of the Scopus index in terms of journal inclusion (Khanna et al., 2022; Rodrigues & Abadal, 2014; Tennant, 2020).

OA overall has changed a lot since 2009, and this is one thing that we consider this study also captured quite well from our own perspective of looking at the world through the window of the UAE. However, it is not without limitations. Through this study we observed the complexity of dealing with a rich bibliometric data set augmented with both OA status information and authorship world region categories. One can only inspect so many variables at a time and everything cannot be included in one study. Future studies could zoom in even further: for example, only on the development of specific OA types with similar national data sets, and at the same time identifying particular research funders from article-level metadata, thus being able to also include financial considerations of various models and science policy strategies into the mix. Because of the widespread acceptance of Scopus indexing as a measure of acceptance of research among UAE HEIs, as well as the strict requirements for detailed author affiliation metadata, this study used a data set extracted from Scopus. However, it would be beneficial to do a similar study on a larger scale with articles in other indexes, local journals, and other languages. Further studies could also be expanded to compare the situation in the UAE with other countries, as well as identifying who has funded OA for coauthored publications.

ACKNOWLEDGMENTS

The authors thank Prof. J. Tuomas Harviainen for his insightful comments and feedback during the different stages of this paper. They also thank the editors and anonymous reviewers for suggestions that greatly improved the manuscript.

AUTHOR CONTRIBUTIONS

Mohamed Boufarss: Conceptualization, Data curation, Formal analysis, Methodology, Writing—original draft, Writing—review & editing. Mikael Laakso: Conceptualization, Formal analysis, Writing—review & editing.

COMPETING INTERESTS

The authors have no competing interests.

FUNDING INFORMATION

This research was not funded.

DATA AVAILABILITY

The complete data set is available in Zenodo (Boufarss & Laakso, 2023).

REFERENCES

Abramo, G., D'Angelo, C. A., & Di Costa, F. (2009). Research collaboration and productivity: Is there correlation? *Higher Education*, *57*, 155–171. https://doi.org/10.1007/s10734-008-9139-z

Adams, J., Jamal, E. O., David, P., & Martin, S. (2021). The changing research landscape of the Middle East, North Africa and Turkey. *Global Research Report*. ISI. https://clarivate.com/webofsciencegroup/wpcontent/uploads/sites/2/dlm_uploads/2021/04/WS647760757-ISIGRR-Changing-Research-Landscape-of-MENAT-DIGITAL.pdf (accessed October 19, 2021).

Ajayan, S., Balasubramanian, S., & Ramachandran, S. (2022). Benchmarking the research performance of United Arab Emirates with gulf cooperation council countries—A bibliometric study. *Frontiers in Education*, *7*, 792548. https://doi.org/10.3389/feduc.2022.792548

Al Marzouqi, A. H., Alameddine, M., Sharif, A., & Alsheikh-Ali, A. A. (2019). Research productivity in the United Arab Emirates: A 20-year bibliometric analysis. *Heliyon*, *5*(12), e02819. https://doi.org/10.1016/j.heliyon.2019.e02819, PubMed: 31872101

Alsharari, N. M. (2018). Internationalization of the higher education system: An interpretive analysis. *International Journal of Educational Management*, *32*(3), 359–381. https://doi.org/10.1108/IJEM-04-2017-0082

Archambault, É., Amyot, D., Deschamps, P., Nicol, A. F., Provencher, F., ... Roberge, G. (2014). *Proportion of open access*

papers published in peer-reviewed journals at the European and world levels—1996–2013. European Commission. https://science-metrix.com/sites/default/files/science-metrix/publications/d_1.8_sm_ec_dg-rtd_proportion_oa_1996-2013_v11p.pdf (accessed October 19, 2021).

Azadbakht, E., & Schultz, T. (2020). At the click of a button: Assessing the user experience of open access finding tools. *Information Technology and Libraries*, *39*(2), 1–13. https://doi.org/10.6017/ital.v39i2.12041

Aziz, N. A., & Rozing, M. P. (2013). Profit (*p*)-index: The degree to which authors profit from co-authors. *PLOS ONE*, *8*(4), e59814. https://doi.org/10.1371/journal.pone.0059814, PubMed: 23573211

Basson, I., Simard, M., Ouangré, Z. A., Sugimoto, C. R., & Larivière, V. (2022). The effect of data sources on the measurement of open access: A comparison of dimensions and the web of science. *PLOS ONE*, *17*(3), e0265545. https://doi.org/10.1371/journal.pone.0265545, PubMed: 35358227

Bayanat.ae. (s.d.). Number of faculty members according to the nationality. Retrieved January 28, 2023, from https://opendata.fcsc.gov.ae/@zayed-university/faculty-members-country-nationality.

Birnholtz, J. P. (2006). What does it mean to be an author? The intersection of credit, contribution, and collaboration in science. *Journal of the American Society for Information Science and Technology*, *57*(13), 1758–1770. https://doi.org/10.1002/asi.20380

Björk, B.-C. (2019), Open access journal publishing in the Nordic countries. *Learned Publishing*, *32*(3), 227–236. https://doi.org/10.1002/leap.1231

Boufarss, M. (2011). If we build it, will they come? A survey of attitudes toward institutional repositories among faculty at the Petroleum Institute. *International Journal of Library Science*, *3*(J11).

Boufarss, M. (2020). Charting the Open Access scholarly journals landscape in the UAE. *Scientometrics*, *122*, 1707–1725. https://doi.org/10.1007/s11192-020-03349-0

Boufarss, M., & Laakso, M. (2020). Open Sesame? Open access priorities, incentives, and policies among higher education institutions in the United Arab Emirates. *Scientometrics*, *124*, 1553–1577. https://doi.org/10.1007/s11192-020-03529-y

Boufarss, M., & Laakso, M. (2023). Open access and international co-authorship: A longitudinal study of the United Arab Emirates research output [Data set]. *Zenodo*. https://doi.org/10.5281/zenodo.7776055

Bruns, A., Rimmert, C., & Taubert, N. (2020). Who pays? Comparing cost sharing models for a Gold Open Access publication environment. *Journal of Library Administration*, *60*(8), 853–874. https://doi.org/10.1080/01930826.2020.1820275

Cavacini, A. (2016). Recent trends in Middle Eastern scientific production. *Scientometrics*, *109*, 423–432. https://doi.org/10.1007/s11192-016-1932-3

Chung, K. H., Cox, R. A. K., & Kim, K. A. (2009). On the relation between intellectual collaboration and intellectual output: Evidence from the finance academe. *Quarterly Review of Economics and Finance*, *49*(3), 893–916. https://doi.org/10.1016/j.qref.2008.08.001

Clarivate Analytics. (2019). *UAE's place in Web of Science research ecosystem report*. https://clarivate.com/webofsciencegroup/wp-content/uploads/sites/2/2019/09/WS371049217_ACVR_UAE_USLetter_CMYK_v8_DIGITAL_SMALL.pdf (accessed March 22, 2022).

cOAlition S. (2018) *Plan S: Making full and immediate Open Access a reality*. Strasbourg: cOAlition S. https://www.coalition-s.org (accessed April 28, 2022).

Crawford, W. (2021). *Gold Open Access 2015–2020: Articles in journals (GOA6)*. Livermore, CA: Cites & Insights Books. https://waltcrawford.name/goa6.pdf (accessed May 2, 2022).

Curtin University. (2022). *COKI open access dashboard*. https://openknowledge.community/dashboards/coki-open-access-dashboard/ (accessed March 10, 2022).

De Bel-Air, F. (2015). Demography, migration, and the labour market in the UAE. *Gulf Labour Markets*, No. 7, 2015. https://gulfmigration.grc.net/media/pubs/exno/GLMM_EN_2018_01.pdf (accessed April 15, 2022).

Dhakal, K. (2019). Unpaywall. *Journal of the Medical Library Association*, *107*(2), 286–288. https://doi.org/10.5195/jmla.2019.650

Duffin, K. I. (2020). Comparing open access search tools to improve interlibrary loan fulfillment efficiency. *Technical Services Quarterly*, *37*(4), 415–431. https://doi.org/10.1080/07317131.2020.1810442

El-Ouahi, J., Robinson-García, N., & Costas, R. (2021). Analyzing scientific mobility and collaboration in the Middle East and North Africa. *Quantitative Science Studies*, *2*(3), 1023–1047. https://doi.org/10.1162/qss_a_00149

Else, H. (2018). How Unpaywall is transforming open science. *Nature*, *560*(7718), 290–291. https://doi.org/10.1038/d41586-018-05968-3, PubMed: 30111793

Eysenbach, G. (2006). Citation advantage of open access articles. *PLOS Biology*, *4*(5), e157. https://doi.org/10.1371/journal.pbio.0040157, PubMed: 16683865

Gorraiz, J., Melero-Fuentes, D., Gumpenberger, C., & Valderrama-Zurián, J.-C. (2016). Availability of digital object identifiers (DOIs) in Web of Science and Scopus. *Journal of Informetrics*, *10*(1), 98–109. https://doi.org/10.1016/j.joi.2015.11.008

Glänzel, W., & Schubert, A. (2004). Analysing scientific networks through co-authorship. In H. F. Moed, W. Glänzel, & U. Schmoch (Eds.) *Handbook of quantitative science and technology research* (pp. 227–276). Dordrecht: Springer. https://doi.org/10.1007/1-4020-2755-9_12

Guerrero-Bote, V. P., Chinchilla-Rodríguez, Z., Mendoza, A., & de Moya-Anegón, F. (2021). Comparative analysis of the bibliographic data sources Dimensions and Scopus: An approach at the country and institutional levels. *Frontiers in Research Metrics and Analytics*, *5*, 593494. https://doi.org/10.3389/frma.2020.593494, PubMed: 33870055

Hajjem, C., & Harnad, S. (2007). Citation advantage for OA self-archiving is independent of journal impact factor, article age, and number of co-authors. *arXiv* preprint. https://arxiv.org/abs/cs/0701136

Hood, W. W., & Wilson, C. S. (2003). Informetric studies using databases: Opportunities and challenges. *Scientometrics*, *58*, 587–608. https://doi.org/10.1023/B:SCIE.0000006882.47115.c6

Haucap, J., Moshgbar, N., & Schmal, W. B. (2021). The impact of the German 'DEAL' on competition in the academic publishing market. *Managerial and Decision Economics*, *42*(8), 2027–2049. https://doi.org/10.1002/mde.3493

Hosmer, D. W., Jr., Lemeshow, S., & Sturdivant, R. X. (2013). *Applied logistic regression* (3rd ed.). Hoboken, NJ: Wiley. https://doi.org/10.1002/9781118548387

Jahn, N., Matthias, L., & Laakso, M. (2022). Toward transparency of hybrid open access through publisher provided metadata: An article-level study of Elsevier. *Journal of the American Society for Information Science and Technology*, *73*(1), 104–118. https://doi.org/10.1002/asi.24549

Kahn, M. (2018). Co-authorship as a proxy for collaboration: A cautionary tale. *Science and Public Policy*, *45*(1), 117–123. https://doi.org/10.1093/scipol/scx052

Karabchuk, T., Shomotova, A., & Chmel, K. (2022). Paradox of research productivity of higher education institutions in Arab Gulf countries: The case of the UAE. *Higher Education Quarterly*, *76*(4), 759–785. https://doi.org/10.1111/hequ.12347

Katz, J. S., & Martin, B. R. (1997). What is research collaboration? *Research Policy*, *26*(1), 1–18. https://doi.org/10.1016/S0048-7333(96)00917-1

Khanna, S., Ball, J., Alperin, J. P., & Willinsky, J. (2022). Recalibrating the scope of scholarly publishing: A modest step in a vast decolonization process. *Quantitative Science Studies*, *3*(4), 912–930. https://doi.org/10.1162/qss_a_00228

Kozma, C., & Calero-Medina, C. (2019). The role of South African researchers in intercontinental collaboration. *Scientometrics*, *121*, 1293–1321. https://doi.org/10.1007/s11192-019-03230-9

Laakso, M. (2014). Green open access policies of scholarly journal publishers: A study of what, when, and where self-archiving is allowed. *Scientometrics*, *99*, 475–494. https://doi.org/10.1007/s11192-013-1205-3

Macháček, V. (2023). Globalization of scientific communication: Evidence from authors in academic journals by country of origin. *Research Evaluation*, *32*(1), 157–169. https://doi.org/10.1093/reseval/rvac033

Martín-Martín, A., Thelwall, M., Orduna-Malea, E., & López-Cózar, E. D. (2021). Google Scholar, Microsoft Academic, Scopus, Dimensions, Web of Science, and OpenCitations' COCI: A multidisciplinary comparison of coverage via citations. *Scientometrics*, *126*(1), 871–906. https://doi.org/10.1007/s11192-020-03690-4, PubMed: 32981987

Moed, H. F. (2016). Iran's scientific dominance and the emergence of South-East Asian countries as scientific collaborators in the Persian Gulf Region. *Scientometrics*, *108*(1), 305–314. https://doi.org/10.1007/s11192-016-1946-x

Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of Web of Science and Scopus: A comparative analysis. *Scientometrics*, *106*, 213–228. https://doi.org/10.1007/s11192-015-1765-5

Morillo, F. (2020). Is open access publication useful for all research fields? Presence of funding, collaboration and impact. *Scientometrics*, *125*, 689–716. https://doi.org/10.1007/s11192-020-03652-w

Moustafa, K. (2020). Octopus affiliations. *Scientometrics*, *124*(3), 2733–2735. https://doi.org/10.1007/s11192-020-03600-8

Nguyen, B. X., Luczak-Roesch, M., Dinneen, J. D., & Larivière, V. (2022). Assessing the quality of bibliographic data sources for measuring international research collaboration. *Quantitative Science Studies*, *3*(3), 529–559. https://doi.org/10.1162/qss_a_00211

Ouahi, J. E. (2021). Early insights into the Arabic citation index. *arXiv* preprint. https://arxiv.org/abs/2101.12177

Piwowar, H., Priem, J., Larivière, V., Alperin, J. P., Matthias, L., ... Haustein, S. (2018). The state of OA: A large-scale analysis of the prevalence and impact of Open Access articles. *PeerJ*, *6*, e4375. https://doi.org/10.7717/peerj.4375, PubMed: 29456894

Piwowar, H., Priem, J., & Orr, R. (2019). The future of OA: A large-scale analysis projecting Open Access publication and readership. *bioRxiv*. https://doi.org/10.1101/795310

Pölönen, J., Laakso, M., Guns, R., Kulczycki, E., & Sivertsen, G. (2020). Open access at the national level: A comprehensive analysis of publications by Finnish researchers. *Quantitative Science Studies*, *1*(4), 1396–1428. https://doi.org/10.1162/qss_a_00084

ROARMAP. (n.d.). *ROARMAP: Registry of open access repository of mandates and policies*. https://roarmap.eprints.org/ (accessed October 19, 2021).

Rodrigues, R. S., & Abadal, E. (2014). Ibero-American journals in Scopus and Web of Science. *Learned Publishing*, *27*(1), 56–62. https://doi.org/10.1087/20140109

Schultz, T. A., Azadbakht, E., Bull, J., Bucy, R., & Floyd, J. (2019). Assessing the Effectiveness of open access finding tools. *Information Technology and Libraries*, *38*(3), 82–90. https://doi.org/10.6017/ital.v38i3.11009

Taubert, N., Hobert, A., Fraser, N., Jahn, N., & Iravani, E. (2019). Open Access: Towards a non-normative and systematic understanding. *arXiv*, arXiv:1910.11568. https://doi.org/10.48550/arXiv.1910.11568

Tennant, J. (2020). Web of Science and Scopus are not global databases of knowledge. *European Science Editing*, *46*, e51987. https://doi.org/10.3897/ese.2020.e51987

Thelwall, M., & Maflahi, N. (2022). Research coauthorship 1900–2020: Continuous, universal, and ongoing expansion. *Quantitative Science Studies*, *3*(2), 331–344. https://doi.org/10.1162/qss_a_00188

Thibault, R. T., MacPherson, A., Harnad, S., & Raz, A. (2018). *The rent's too high: Self-archive for fair online publication costs*. https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1090&context=scholcom (accessed August 24, 2022).

UAE Commission for Academic Accreditation. (2022). *Higher education institutions*. https://www.caa.ae/Pages/Institutes/All.aspx (accessed August 24, 2022).

UAE PMO. (2015). *UAE national innovation strategy*. https://www.moei.gov.ae/assets/download/1d2d6460/National%20Innovation%20Strategy.pdf.aspx (accessed August 24, 2022).

Wagner, C. S., Whetsell, T., Baas, J., & Jonkers, K. (2018). Openness and impact of leading scientific countries. *Frontiers in Research Metrics and Analytics*, *3*, 10. https://doi.org/10.3389/frma.2018.00010

Wenaas, L. (2022). Choices of immediate open access and the relationship to journal ranking and publish-and-read deals. *Frontiers in Research Metrics and Analytics*, *7*, 943932. https://doi.org/10.3389/frma.2022.943932, PubMed: 36339745

Willi Hooper, M. D. (2017). Product review: Unpaywall [Chrome & Firefox browser extension]. *Journal of Librarianship & Scholarly Communication*, *5*(1), 1–3. https://doi.org/10.7710/2162-3309.2190

Xu, H. Y., Yue, Z. H., Wang, C., Dong, K., Pang, H. S., & Han, Z. (2017). Multi-source data fusion study in scientometrics. *Scientometrics*, *111*, 773–792. https://doi.org/10.1007/s11192-017-2290-5