

Research article

Dissemination of scientific information through open access by research scientists in a developing country

Philip Kwaku Kankam^{a,*}, Lawrencia Donkor Acheampong^b, DeGraft Johnson Dei^a^a Department of Information Studies, University of Ghana, Ghana^b Crops Research Institute, CSIR, Ghana

ARTICLE INFO

Keywords:

Article processing charges
Dissemination
Diffusion of innovation theory
Open access
Predatory

ABSTRACT

This study investigated the perceptions and factors that researchers had about Open Access (OA) publishing, specifically how it affected their decision to publish or not. The Diffusion of Innovation Theory by Rogers served as the study's main guide, and 15 research scientists from Ghana's Council of Scientific and Industrial Research's Crop Research Institute provided qualitative data for the study through semi-structured interviews and the interpretivist research paradigm. Convenience sampling was used to choose the participants, and thematic analysis was used to analyse and present the research results in themes. The study's conclusions showed that all of the participants benefited from OA and that they were all aware of its application for disseminating scientific information. High Article Processing Charges (APC) and credibility issues were also mentioned in the study as significant obstacles to using OA for the dissemination of scientific information. The study suggests that in order for scientists to use Open Access (OA) for the sharing of scientific information, they must be given the means to distinguish trustworthy journals from predatory ones.

1. Introduction

Open access (OA) represents a shift away from the conventional practice of paying for access to scholarly works and toward free information for all [1]. This has gained attention since disseminating the findings and ideas of scientific study is an important component [2]. Academic journals produce public records of knowledge that alter the landscape of disciplines and hence play a significant role in the diffusion of intellectual knowledge [3]. Since OA was developed in specialized fields by start-up programs to encourage the open dissemination of information on the internet, this has been amply shown in OA models [4]. Also, it received widespread attention due to the conviction that publicly sponsored research must be available to the general public. Open Access publishing is asserted to be a magic bullet for democratizing and widely disseminating scientific knowledge [5]. Because of open access publishing, prominent journals are now looking into new choices for paper publication and beginning to experiment with new business models to identify methods to improve OA model [6,7].

Open Access publishing has gained significant influence in the academic world due to its compelling freedom of access to research papers and its impact on how research information is disseminated [1]. Open access promotes limitless availability and access to research content in opposition to the conventional subscription-based model that restricts access to research findings [8]. The decision has significant repercussions on scholars, organizations, publishers, and the academic conversation at large, particularly with regard to

* Corresponding author.

E-mail addresses: pkkankam@ug.edu.gh (P.K. Kankam), l.donkor@cropresearch.org (L.D. Acheampong), [djdei@ug.edu.gh](mailto:djde@ug.edu.gh) (D.J. Dei).

problems of justice, sustainability, and quality [7,9–11].

Particularly, OA is based on the idea that all people should be able to access scholarly knowledge without payment or restriction [12,13]. It works to ensure that knowledge such as study articles, data, and other scholarly information can be accessed by researchers, students, policymakers, and others without any restrictions based on cost or legality. Open access greatly increases the likelihood that the speed of discovery, cooperation, and improvement of research impact will have an international impact [6,14].

The development of new technologies that made it easier for information to be disseminated on the internet effectively and efficiently is favourably related to open access. The Budapest Open Access Initiative (BOAI), which outlined the principles and guidelines for OA in 2002, was a significant development in the movement toward OA. The BOAI divided open access into two primary categories: “green” open access, which entails self-archiving research findings in repositories, and “gold” open access, which consists of publishing in Open Access journals. Following that, several initiatives, including the Bethesda and Berlin Declarations, solidified support for the ideas of open access [15].

Studies about researchers’ views and behaviours with OA models have been conducted as a result of their rapid rise [16,17]. The reasons why scientists would wish to publish in an OA journal or not may yet not be thoroughly discussed. It is therefore crucial to understand the forces driving and restraining OA publication, as well as the necessity to consider the long-term effects and develop effective solutions. This motivated the study to look into the use of OA by scientists in the Crop Research Institute (CRI) for the dissemination of scientific information. The CRI is one of the thirteen (13) research Institutes of the Council for Scientific and Industrial Research of Ghana (CSIR). It is important to highlight that the CSIR is the foremost national science and technology institution in Ghana with the mandate to pursue, among others, the implementation of government policies on scientific research and development.

In Ghana, there is a strong need to understand the experiences of researchers regarding the use of OA for dissemination of scientific information because of the paucity of literature. It has been argued that there are still limited discussions on the reasons why researchers would like to publish in an OA journal or not. For instead, a study conducted by Ref. [18] concluded that the majority of researchers in Ghana’s Scientific and Industrial Research Council were aware of the OA journals. The research scientists accessed OA publications for their research. However, a few of them were publishing their research output in OA journals. Some of their concerns were about the quality of peer review in open-access journals, while others were not sure whether copyright and ethical status for open-access materials were intact. By focusing on Ghana, the study provides unique insights into how researchers in a developing country perceive the benefits and challenges of OA, how they become aware of OA journals, and what factors influence their decision to publish in OA journals. These insights are crucial for informing policy and practice to support the use of OA for the dissemination of scientific knowledge in similar contexts.

Thus, it is therefore necessary to understand the experiences of researchers to be able to wholly understand their views and perceptions about OA especially in developing countries like Ghana, where they were confronted with some of the challenges of the OA, and came up with the right strategies and also provide new insights into the motivations and challenges of researchers in regarding OA which is currently underexplored. The current era of rapid information dissemination and retrieval has made open access publishing a viable option for removing subscription-based access restrictions and creating a more welcoming atmosphere for knowledge sharing [3,11,13]. However, as more and more researchers adopt this model, there are different barriers that emerge causing a discussion on the equity, credibility and efficiency of such publication [7,9,16].

To arrive at a conceivable end needs a total understanding of researchers’ motivations, experiences and challenges with the use of OA for dissemination of scientific information publishing, thus, the need for this study to examine the experiences of scientist about open access publishing. Also, this study fills a knowledge gap by providing new perspectives on the motivations and constraints faced by Ghanaian researchers regarding open access (OA). The purpose of this study was therefore attained through the following objectives:

1. Explore the factors influencing Ghanaian researchers’ decisions to publish in Open Access journals.
2. Identify the factors that influence scientists’ decision to disseminate scientific information through Open Access
3. Investigate the challenges faced by scientists in their quest to disseminate scientific information through Open Access

2. Literature review

2.1. Conceptualisation of open access publishing

Open access, which has less onerous licensing and copyright restrictions than traditionally published works for both producers and users, is defined as the capacity to freely utilize information that is readily accessible, particularly digital or online, without incurring any costs [10]. Open Access Journals still adhere to strict and rigorous peer-reviewing procedures as well as high criteria for publishing, while being a more recent method of disseminating intellectual material. The majority of open-access (OA) literature are electronic, available online for free, and exempt from most copyright and license restrictions [19]. This is possible thanks to the copyright holder’s permission. There are two main ways for OA to disseminate research findings: through OA journals and through OA archives or repositories. Peer review is conducted for the open access journals, and once they have been accepted, access is made available to everyone in the world. Peer review, manuscript preparation, and server space are all included in the price. Instead of doing peer review, open access archives or repositories simply make their contents available to everyone, wherever.

Currently, as more and more OA journals emerge, Open Access has impacted scientific publishing. Some of the benefits of OA publishing may be seen in works becoming available to everyone after publication and enhancing their influence and citation. Additionally, because some open access publishing requires an upfront payment, the quality of publications declines as more articles

are published and more money is made [9]. It is crucial to remember that OA is not a brand-new phenomenon in terms of how it has evolved. It has a long-standing history and vital ones among them include the Budapest Open Access Initiative in 2002 and the Berlin Declaration on Open Access in 2001 with both of them requiring liberal copyright policy to ensure access to scientific works [20].

The Gold and Green roads are the most pertinent OA advocacy movements, however there have been others [10]. The major publication of scientific work in a legitimate OA journal or by selecting the OA option provided by a subscription-based journal is known as the "Gold road," also known as the "Gold OA." With this, access to the work's contents is free and instantaneous upon publication, but the rights and terms of usage will be made clear. The majority of the money used to support the Gold Open Access comes from publishing fees, commonly referred to as Article Processing Charges (APC), which are payments made by the authors of accepted and published articles. The Green road, also known as self-archiving or Green OA, refers to the submission of a scientific paper in the form of a preprint to an institutional repository.

Researchers view open access (OA) as a viable alternative to traditional approaches and believe it can democratize the publication of scholarly works to a wider audience [5]. Moreover, studies over the past few years have shown that researchers are interested in promoting OA and this is explained by factors like the potential to boost their visibility and the influence of their works [4,21]. However, there are some who are unwilling to totally accept it [16].

2.2. Researchers' awareness of open access publishing

People's attitudes and behaviours are influenced by their level of awareness, which also improves their comprehension of how technologies can benefit both individuals and society as a whole [22,23]. It thus become clear that the researcher's awareness can have a significant impact on the utilization of open access. A previous study found that the majority of postgraduate students were unaware of OA publications despite using them for their studies and research [24]. Similarly, Gross and Ryan (2015) found that the University of Western Australia's faculties in the arts and humanities were seemingly not aware with Open Access publications [25]. Similar findings were revealed in Nigeria among academics [26,27].

However, new technology advancements have raised awareness of open access. According to studies by Yang & Li as well as Kenneway, majority of faculty members express positive opinions of OA publishing [28,29]. Similarly, a survey conducted by Seethapathy et al. revealed that every respondent was completely informed about open-access journals [30]. Researchers seem to now have a positive attitude toward open access publishing because it is essential to their study [31].

2.3. Advantages of disseminating scientific information through OA

As shown in the literature, there are various factors that influence researchers' decisions to publish in OA journals. The major advantages of OA publishing for researchers may be observed in the increased visibility, greater accessibility, and availability [32]. Similar to what Oyedipe et al. reported, researchers were driven to publish in OA journals by variables like increased online visibility, accessibility, and availability [33]. Kenneway (2011) supports this by pointing out that OA journals provided for better visibility, citation, and journal impact [28].

Additionally, OA journals have the advantage of wider accessibility because their content is freely and unrestrictedly available online [34,35]. This makes it easier for readers of all ages and professions to access the research. Due to its accessibility, OA publications have a high likelihood of being discovered and cited by other academics, which increases the influence and visibility of the researcher's work as well as the citation rates.

Again, it has been noted that open access (OA) publishing encourages better research collaboration because it allows for greater idea sharing and free access to research outputs [35,36]. While there are many advantages to open access publishing, authors must be careful about the reputation and calibre of the journals they choose to publish in because there are some unscrupulous people out there who may try to take advantage of them.

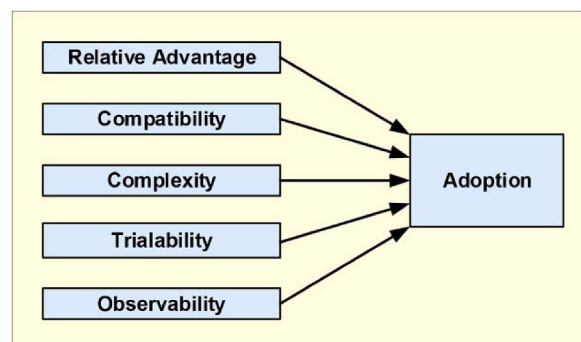


Fig. 1. Diffusion of innovation theory (roger 1983).

2.4. Theoretical framework

The study adopted the Diffusion of Innovations Theory as the theoretical framework. This was developed by Everett M. Rogers to describe how and why new innovation, ideas, technologies and practices spread and are accepted in a given place or group of people [37]. The innovation, which defines the new practice being introduced, adopters, or the people who will ultimately embrace the new innovation, and diffusion process, which examines how the innovation spreads, are the theory's primary components. This is explained in five stages: knowledge, when people become aware of it; persuasion, when they seek out more information to better understand the innovation; decision, when people decide whether or not to accept it; implementation, when people put the innovation into practice; and confirmation, when people weigh the benefits and results, which can solidify further adoption.

There are also five categories for adoption: innovators, who are the first to adopt, early adopters, who are receptive to innovation but more selective than innovators, early majority, who adopt as soon as they begin to see the success of the innovation, late majority, who adopt under pressure, and laggards, who adopt last because they resist change as depicted in Fig. 1. In addition, the theory highlights the variables that affect adoption, which include relative advantage, compatibility, complexity, trialability, and observability. The communication channels, which outlined the ways used to spread information about the innovation, make up the final component. As a result, the study was able to understand the motivations behind research scientists' adoption of open access platforms and practices as well as the influencing elements that led them to accept or reject OA publications and the sources via which they learned about OA publishing.

3. Methodology

The study employed the qualitative research approach to investigate the research scientists at CSIR-Crops Research Institute's perceptions and experiences with the dissemination of scientific information through OA. To gain a deeper understanding of research scientists' experiences with open-access publishing, a qualitative study methodology was applied. The qualitative method facilitates an in-depth understanding of the motivations, challenges, and decision-making processes of individual researchers, which might not be as effectively captured through quantitative methods. The study was conducted under the auspices of the phenomenological interpretivism research paradigm [38,39]. The study was able to emphasize comprehension of scientists' experiences with open access (OA) in relation to their perspectives, the many elements that motivate or dissuade them from disseminating scientific material through OA, thanks to the application of interpretivism. It also helped the study in examining the difficulties encountered by the scientists when publishing in open-access journals. Data for the study were gathered using a semi-structured interview schedule, and the interviews aided in examining the phenomenon.

The population for the study included all the research scientists at the Council for Scientific and Industrial Research-Crops Research Institute (CSIR-CRI) located in Kumasi, in the Ashanti Region of Ghana. The Institute had about 78 interdisciplinary research scientists in the various divisions. The study employed convenient sampling, hence, scientists who were willing and available were selected to participate in the study. Nineteen scientists from the CSIR-CRI expressed their interest in participating in the study (sample size). However, 15 of them were available for data collection since the remaining four had other engagements during the data collection period. The implication of employing convenience sampling limits the generality of the findings as they may not be representative of a broader population and the results may be skewed towards those who were accessible.

During the gathering of data period, each research scientist was called personally and given a brief explanation of the objectives of the study before being asked to participate. In order to be included in the study, the individual had to be a research scientist who was still employed by the research institute. Moreover, the individual should have served at least two years as a research scientist and had not less than five published papers. Appointments were scheduled for those who agreed to be part of the study. Interviews were held at the offices of the participants and it took between 20 and 35 min to complete each interview. Responses from the interviews were recorded and transcribed for analysis. For this study, a thematic analysis was conducted and the process of eliminating biases and determining the overarching impressions of the data were involved in the analysis. For this study's qualitative research, an inductive analytical strategy was used and the study employed NVivo software to analyse the data. One of the factors that made this strategy seem appropriate was the small sample size. Seven themes emerged after the rigorous analysis of the data obtained through the interviews with the participants. These themes were formed based on the objectives of this particular study. For ethical considerations, there was informed consent as participants were made aware of the contents of the study and explanations were provided when

Table 1

Themes generated through thematic analysis from the interviews.

<u>Perception of researchers on the use of OA to disseminate scientific information</u>
Definition of Open Access Publishing
Experience with Open Access Publishing
How participants became aware of OA
Accessing Open Access Publications
<u>What influence researchers' decision to disseminate scientific information through OA</u>
Factors that Encourage Scientific Information Dissemination in Open Access Journals
<u>Challenges faced by scientists in their quest to disseminate scientific information in OA</u>
Article Processing Charges (APC)
Credibility Concerns

needed, participant confidentiality was assured as data provided by them were by no means to be traced to a specific individual or given out. Permission from the Council for Scientific and Industrial Research-Crops Research Institute (CSIR-CRI) in Kumasi was sought for the study to be undertaken.

4. Results

Six (40%) out of the fifteen (15) participants were male and the remaining nine (60%) were female (see appendix 1 for participants' profile). The themes that emerged from the analysed data are presented in [Table 1](#).

4.1. Objective one: examine the perception of researchers on open access publishing

4.1.1. Definition of open access publishing

With the main focus of the study being open access publishing, it was essential to find out the meaning that the participants ascribed to OA. It was evident among the participants that they all had knowledge about what open access was and overall, they understood open access publishing as a model where research publications and articles were made freely available to the public without financial or legal barriers. It was also seen that open access enabled easy and unrestricted and dissemination of scientific information.

Well, open access means that access to any publications published there becomes open to all the public who would like such information, literature and articles for their work or knowledge purposes. The key to me is that information becomes easily accessible to those who need it (P1, Senior Research Scientist, Female).

Open access journals are those journals that when published audience or users do not have to pay any amount in order to access or download them (P5, Senior Research Scientist and an Agronomist, Male)

Open-access publishing is a publishing model that allows unrestricted access to scholarly research outputs, such as journal articles, books, and other research materials. It means that anyone can freely read, download, copy, distribute, and reuse the published content without financial or legal barriers. Open access promotes the democratization of knowledge by making research findings more widely available and accessible to researchers, students, practitioners, and the general public (P12, Research Scientist, Female).

4.1.2. Experience with open access publishing

The analysed data revealed that most of the participants had published in open access journals before. Some of the scientists who participated in the study highlighted their motivation to disseminate their research findings through OA portals and journals. It was evident that, some of the participants had resolved to exclusively publish their scientific works in OA publishers. Some of the participants also highlighted a mixture of closed-access and open access publications.

... Yes I have been publishing in open access journals and I must say that about 70% of my works are in open access (P5, Senior Research Scientist and an Agronomist, Male)

... all my publications are open access (P8, Research Scientist, Male)

I am familiar with open access publication. Currently, I have almost 50% of my papers published in OA journals ... the reason is, when I publish with big people from IITA and CYMMT, they assist in the payment of the APC (P9, Senior Research Scientist, Female)

4.1.3. How scientist become aware of open access journals

The study enquired about how the participants got to know about open access journals for the purposes of disseminating their scientific information. Various sources including university platforms, web searches, conference attendance, colleagues, library references, online databases, and recommendations from experienced scientists were mentioned.

Through the references I cited in the paper, I am about to publish. So far as I get free access to it, it means it is an open access journal (P3, Entomologist, Research Scientists, Male)

... normally at the point of submission. the request of the journal asks whether you want to publish it in an open access or open subscription. Also, as a requirement, certain journals require open access only (P5, Senior Research Scientist and an Agronomist, Male)

Normally you need to read from the publishing house or the website. Then you can also look for the open access logo on these sites. Again, asking experienced staff and scientist is also a great way to know ... (P7, Research Scientist, Male)

4.1.4. Accessing open access publications

The participants were asked if they were used to accessing Open Access publications for their scientific works and the findings from the study revealed that the participants were making use of OA publications. They highlighted some benefits they were enjoying from OA journals especially their ease of access. Thus, the scientists made use of OA journals and found them easy to access for literature reviews, references in their publications, and building upon their knowledge.

I frequently access open access journals and I normally do not encounter any challenges using them (P8, Research Scientist, Male)

It is a kind of relief when you are looking at a particular paper and you are able to get the full text of the paper freely (P9, Senior Research Scientist, Female)

I access open access portals in order to use other authors' scientific work when conducting literature reviews, referencing previous research in my publications, or building upon existing knowledge to advance my studies (P12, Research Scientist, Female).

4.2. Objective two: to ascertain the factors that influence researchers' decision to disseminate scientific information through open access

4.2.1. Factors that encourage scientific information dissemination in open access journals

There are benefits associated with the use of OA to disseminate scientific information. The analysed data depicted that increased visibility and wider readership encouraged the participants to disseminate their scientific information through OA journals. Thus, the participants highlighted the wider readership and visibility that open access provided their research articles as some of the factors that encouraged them to publish in OA journals. Most of the participants were of the view that, having their works reach larger audience and potentially get more citations encouraged them to publish in OA journals. It was also observed that participants appreciated the democratization of knowledge that open access promotes.

For me what encouraged me to publish in open-access journals was the fact that my work would be easily available to the public for their use ... the relative cost involved as compared to the other journals and the ease/fastness in communicating with the administrators of the journals. You get several citations and you get promoted with your publications (P1, Senior Research Scientist).

The factors that encourage me to publish in open access are increased visibility, as open-access publications can reach a larger audience and have a higher chance of being read, cited, and shared. Also, open access can result in higher research impact as it results in wider dissemination, and potentially higher citation rates, which can enhance the overall impact of my research work. Again, some funding agencies or institutions may have policies that require that I publish my work openly ... open access also has the potential to foster collaboration by allowing researchers from different institutions and disciplines to access my work and contact me to work on building upon my work (P12, Research Scientist, Female).

4.3. Objective three: Look into the challenges faced by research scientists in their quest to disseminate scientific information through open access

4.3.1. Article processing charges (APC)

The findings of the study showed that high cost of publication fees or Article Processing Charges (APCs) associated with many open access journals were serving as constraints to many scientists' quests to disseminate their scientific information openly and freely. Participants of the study observed these fees as burdensome, especially for researchers without sufficient funding support.

What discourages me is the amount being charged by open access publishers ... which is so high when you do not have any support and may require users to use a whole month's salary to cater for. To the challenge of high cost or charges, I recommend that the amount be reduced or varied depending on the geographical location (P5, Senior Research Scientist and an Agronomist, Male).

High AP charges are the discouraging factor and recommended that going forward if the charges could be reviewed on a global level (P7, Research Scientist, Male).

Some of the factors that inhibit me from open-access publication are that most open-access journals require authors to pay article processing charges (APCs) to cover the costs of publishing. (P12, Research Scientist, Female)

4.3.2. Credibility concerns

The participants expressed concerns about credibility of predatory journals in the open access publishing landscape. Participants observed that a number of the OA journals had credibility issues in respect of the quality of papers published in some of these journals as some of them do not adhere to the rigorous peer review processes. They highlighted that these credibility concerns were negatively affecting their decisions to disseminate scientific findings through OA journals because most of the predatory journals flagged by their institutions were open access journals that were charging huge APCs. They were of the view that, the publishers of these predatory journals seemed to hide under the disguise of OA to enrich themselves financially.

I worry that some conservative researchers may be concerned about the perceived quality or impact of certain open-access journals, as the publication landscape varies, and not all open-access journals have the same rigorous peer review processes. (P12, Research Scientist, Female).

Open access publishing is the best if you can afford it but be careful as some of them are only in for the money, they publish rapidly and does no proper or quality peer-review. Select wisely. (P14, Research Scientist, Male)

5. Discussion

Unrestricted access to scholarly research outputs is made possible by the open access publishing paradigm, which has gained

popularity in the academic community. The theoretical framework for the study was Rogers Innovation Diffusion Theory and the theory's diffusion process stage of 'knowledge' helped in examining the study's first objective by examining how participants perceived open access. The participants appeared to have a thorough understanding of open access publishing. They defined open-access publishing as a business model where research articles and publications were freely available to the public without restrictions based on cost or the law. Unrestricted access to scientific knowledge was envisioned as being possible through open access. This understanding aligns with the principles of open access that aims to make research findings widely available. The meanings they ascribed to open access were in consonance with definitions provided by Suber, Björk et al. and Bonfadelli et al. [5,10,19].

Most of the interviewees mentioned that they had already published their work in open-access journals when asked about their experiences with open-access publishing. The study's conclusions show a favourable trend in the study participants' acceptance of open-access publishing, which is motivated by their desire to make scientific knowledge widely available. These results are consistent with those of Yang and Li, who found that most academics have favourable opinions of open access publication [29]. Kenneway had also found that researchers were very aware of open access [28]. The study's findings concur further with a study by Seethapathy et al. that found that all research scientists were completely aware of open access (OA) and have published their work in journals with open access [30]. Also, the findings corroborate that of the study that concluded that researchers had favourable attitude when it comes to OA publishing as they were vital to the dissemination of their research findings [31].

The data analysis revealed a wide variety of sites that helped the participants learn about OA. They emphasized the need of receiving and spreading information on open access through a variety of channels, allowing the scientists to make educated decisions about the dissemination of scientific information by OA publishers. The study's results also highlight several useful advantages of open access for promoting research and information dissemination, which, in the opinion of the participants, helped promote scholarship. The participants primarily cited accessibility at no cost and a larger readership as the primary drivers for their decision of disseminating their scientific information through OA. This is particularly relevant in a country where access to scientific literature can be restricted by economic barriers. OA publishing can democratize access to knowledge and allow for a wider dissemination of research findings, which is in line with the global movement towards more open and accessible scientific communication.

The theory's stages of 'persuasion' and 'decision' were employed by the study to look into factors that encourage research scientists to disseminate scientific information through OA. Based on the findings of the study, the participants viewed OA as a space to enhance the impact and citation rates of their work which thereby contribute to the overall influence of their research. According to the study's analysis of the data, open access's inherent democratization of knowledge was valued. These reasons are consistent with other studies like Ofua's, which found that the key benefits of OA publishing for researchers may be observed in the increased visibility, greater accessibility, and availability [32]. Similar findings were also reported by Oyedipe and colleagues' study, that found that OA publishing increased online visibility, accessibility, and availability, which in turn encouraged researchers to publish in them [33]. Kenneway (2011), who found that OA journals allowed for better visibility, citation, and journal impact, also supports the study's conclusions [28]. In line with the findings of this study are findings of other studies that maintain that there is also the benefit of wider accessibility in the use of OA journals for scientific information dissemination because they provide free and unlimited access to the content of the research work making people from across the globe to get access to them [34,35,40]. In relation to the theory underpinning this study, these findings underscore the fact that factors influencing the adoption of 'relative advantage' and 'compatibility' are two major elements that influence scientists' adoption of OA.

The results further showed that the theory's components of "complexity" and "observability" negatively influenced the participants' adoption of OA, despite the fact that there were aspects that positively influenced scientists' adoption of OA for the dissemination of scientific information. High Article Processing Charges (APCs) and trustworthiness issues were among the top barriers that participants identified when examining the issues preventing scientists from adopting open access publishing. Clearly, the issues of high publication charges and credibility issues could be mapped to 'complexity' and 'observability' as depicted in Roger's theory. The participants mentioned high Article Processing Charges (APCs) as a major constraint in open-access publishing. The high costs associated with these charges were seen as a significant financial burden for researchers, particularly those with limited funding resources. The inability to publish in open access journals is therefore mostly driven by financial considerations, which emphasizes an equality problem. The open access model's inclusion and accessibility are seemingly called into doubt by this difficulty. These worries brought to light the necessity of judgement and careful consideration when choosing appropriate OA publications for the dissemination of scientific knowledge. This reflects a broader issue in the developing world, where the financial constraints can limit the participation of researchers in the global scientific dialogue.

The findings are in line with related studies that revealed that some challenges faced by researchers included monetary issues [41–43]. With the APCs limiting researchers to publish in OA journal, similar findings were reported in earlier studies that highlighted that APCs tend to be a heavy burden to researchers especially those without funding and using their own monies [7,9,26,44,45]. More on the issue of funding, the study's findings are in line with that of Finch et al. (2013), Gogotsi (2023) and Spann et al. (2017) as they revealed that because of limited funding, researchers were not able to cover the publication costs and as such, rarely disseminate scientific findings in OA journals.

6. Conclusion

The scholarly profession has undergone a paradigm shift as a result of open access publication, where knowledge is now more widely accessible. It can be demonstrated that scientists have a clear understanding of open access as a means of unfettered dissemination of knowledge. It has the potential to expand the scope of their discoveries, foster close collaboration, and increase the body of existing literature. However, there are some barriers to open access, and they are evident in high article processing charges

(APCs), which emphasize the financial constraint, particularly in developing countries. As a result, finding a balance between affordability and fair access is an important topic that should be investigated. Additionally, the problem of predatory journals necessitates that researchers exercise caution and due diligence when choosing publishers for the dissemination of scientific knowledge in order to protect the integrity of study outputs.

The study was limited by the use of convenience sampling as the participants were selected based on their availability and willingness to participate, rather than being randomly chosen from the larger population of research scientists in Ghana. This non-random selection process can introduce selection bias, as it may not accurately represent the diversity of opinions, experiences, and backgrounds present in the wider research community. Furthermore, the study's focus on the Crop Research Institute (CRI) of the Council for Scientific and Industrial Research (CSIR) in Ghana limits the findings to this particular institution. While CRI is one of the leading research institutes in Ghana, the experiences and perceptions of its researchers may not reflect those of scientists from other institutions within the country. Thus, further studies can be taken where different institutions can be added and also examine the long-term impact of OA in developing countries or comparative studies across different regions.

6.1. Implications for theory and practice

In many ways, the current work broadens the theoretical horizon. For instance, the study shows the advantages and disadvantages of using open access (OA) for disseminating scientific information, which has crucial consequences for publishers, legislators, and the academic and research community. The findings amplify the need for a wider discussion about fair funding support for open access publishing and the problem of high APCs. This might improve access equity and ease the cost burden associated with using OA for the dissemination of scientific information. This should encourage institutional support for the payment of APC. Again, researchers should be made aware of various funding sources available for OA publishing, including grants and waivers, especially those that are tailored for researchers from developing countries.

The study also throws light on the problem of predatory journals and urges for greater awareness and education to ensure the authenticity and quality of research outputs while using open access for the dissemination of scientific information. This should help inform researchers to be more conversant and be able to identify predatory journals. The study suggests that in order for scientists to use open access (OA) for the dissemination of scientific knowledge, they must be given the means to distinguish trustworthy journals from predatory ones. In essence, the academic community can collaboratively design an open access landscape that advances knowledge, fosters cooperation, and empowers researchers around the world by addressing obstacles, fostering inclusion, and upholding a commitment to quality.

Policymakers can create funds to subsidize APCs and develop policies that recognize and incentivize OA publications in academic evaluations. Academic institutions can aid their researchers by maintaining a list of credible OA journals and negotiating with publishers for reduced APCs, as well as establishing institutional repositories for wider accessibility of research. The global academic community should strive for an OA model that accounts for economic disparities, potentially through tiered pricing of APCs.

Funding statement

The study received no funding

Ethics statement

The study required gatekeepers' permission and this was granted by the CRI-CSIR (In 072,023). All the participants took part in the study voluntarily and informed consent was obtained from them.

Data availability Statement

Data will be made available on reasonable request.

CRedit authorship contribution statement

Philip Kwaku Kankam: Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Lawrencia Donkor Acheampong:** Writing – original draft, Formal analysis, Data curation, Conceptualization. **DeGraft Johnson Dei:** Writing – review & editing, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

APPENDIX 1. PROFILE OF PARTICIPANTS

Participant	Grade	Sex	Area of Specialisation	Number of years in Research
Participant 1	Senior Research Scientist	Female	Sociology	30
Participant 2	Principal Research Scientist	Female	Agricultural Economics	18
Participant 3	Research Scientist	Male	Entomology	10
Participant 4	Research Scientist	Female	Plant Breeding	20
Participant 5	Senior Research Scientist	Male	Crop Agronomy	16
Participant 6	Senior Research Scientist	Male	Seed Technology	8
Participant 7	Research Scientist	Male	Crop Physiology	13
Participant 8	Research Scientist	Male	Agribusiness	6
Participant 9	Senior Research Scientist	Female	Plant Breeder (Maize)	19
Participant 10	Research Scientist	Female	Entomology	7
Participant 11	Research Scientist	Female	Agronomy	14
Participant 12	Research Scientist	Female	Farming Systems	9
Participant 13	Research Scientist	Female	Biotechnology/Tissue Culture	10
Participant 14	Research Scientist	Male	Agronomy	10
Participant 15	Principal Research Scientist	Female	Plant Breeding	19

APPENDIX 2. SEMI-STRUCTURED INTERVIEW SCHEDULE FOR PARTICIPANTS

INTERVIEW QUESTIONS

1. Please can you introduce yourself and your role at CSIR-Crops Research Institute?
2. Please which age blanket do you fall in?
3. What are your main research interests?
4. How many years have you been conducting research?
5. How do you normally publish/disseminate your research outputs?
6. What are the most important factors to you when choosing a publication target?
7. Please define “open access publishing” in your own words. (What does open access mean to you?)
8. (a) Have you published in an open access journal before?
b) If yes, how did you hear about this journal?
9. Describe factors that have encouraged your decision to use open access publishing in the dissemination of your research output
10. Describe the factors that inhibited your decision from publishing in open access journals
11. What are some of the benefits of open access publishing?
12. What are some of the challenges you faced when publishing in open access journal?
13. Have you used other authors’ scientific works that are freely available on the web? If so, describe your usage.
14. What advice would you give colleagues in relation to open access publishing

References

- [1] T. Arndt, C. Frick, Getting scientists ready for open access, The approaches of Forschungszentrum Jülich. *Publications* 6 (2) (2018), <https://doi.org/10.3390/publications6020024>.
- [2] E. Greussing, S. Kuballa, M. Taddicken, M. Schulze, C. Mielke, R. Haux, Drivers and obstacles of open access publishing. A qualitative investigation of individual and institutional factors, *Frontiers in Communication* 5 (October) (2020), <https://doi.org/10.3389/fcomm.2020.587465>.
- [3] K. Hyland, *Academic Publishing: Issues and Challenges in the Construction of Knowledge*, Oxford University Press, 2016.
- [4] E.D. Dalton, C. Tenopir, B.-C. Björk, Attitudes of North American academics toward open access scholarly journals, *Portal Libr. Acad.* 20 (1) (2020) 73–100.
- [5] H. Bonfadelli, B. Fähnrich, C. Lüthje, J. Milde, M. Rhomberg, M.S. Schäfer, *Das Forschungsfeld Wissenschaftskommunikation*, Springer, 2017.
- [6] R. Haux, S. Kuballa, M. Schulze, C. Böhm, O. Gefeller, J. Haaf, P. Henning, C. Mielke, F. Niggemann, A. Schürg, Exploring possibilities for transforming established subscription-based scientific journals into open access journals, *Methods Inf. Med.* 55 (6) (2016) 481–487.
- [7] M. Spann, L. Stich, K.M. Schmidt, Pay what you want as a pricing model for open access publishing? *Commun. ACM* 60 (11) (2017) 29–31.
- [8] M. Avital, B.-C. Björk, R.J. Boland, K. Crowston, K.J. Lyytinen, A. Majchrzak, ICIS 2008 Panel Report: Open Access Publishing to Nurture the Sprouts of Knowledge and the Future of Information Systems Research, 2014.
- [9] Y. Gogotsi, Pay to publish? Open access publishing from the viewpoint of a scientist and editor, *Graphene 2D Mater.* 8 (1) (2023) 1–3, <https://doi.org/10.1007/s41127-023-00057-3>.
- [10] P. Suber, *Open Access*, The MIT Press, 2012.
- [11] P. Suber, *Open Access Policy Options for Funding Agencies and Universities*, Knowledge Unbound, 2019.
- [12] R. Heaton, D. Burns, B. Thoms, Altruism or self-interest? exploring the motivations of open access authors, *Coll. Res. Libr.* 80 (4) (2019) 485.
- [13] A. Leßmöllmann, in: A. Leßmöllmann, M. Dascal, T. Gloning (Eds.), *Current Trends and Future Visions of (Research on) Science Communication*. Science Communication, De Gruyter Mouton, Berlin, Germany and Boston, MA, USA, 2020, pp. 657–688.
- [14] C. Tenopir, E.D. Dalton, L. Christian, M.K. Jones, M. McCabe, M. Smith, A. Fish, Imagining a gold open access future: attitudes, behaviors, and funding scenarios among authors of academic scholarship, *Coll. Res. Libr.* 78 (6) (2017).
- [15] H.-J. Bullinger, K.M. Einhäupl, P. Gaetgens, P. Gruss, H.-O. Henkel, W. Kröll, E.-L. Winnacker, B. Larroutourou, J. Mittelstrass, P. Galluzzi, Berlin declaration on open access to knowledge in the sciences and humanities. *Open Access to Knowledge in the Sciences and Humanities*, 2003, pp. 20–22.
- [16] J. Rowley, F. Johnson, L. Sbaifi, W. Frass, E. Devine, Academics’ behaviors and attitudes towards open access publishing in scholarly journals, *Journal of the Association for Information Science and Technology* 68 (5) (2017) 1201–1211.

- [17] A. Severin, M. Egger, M.P. Eve, D. Hürlimann, Discipline-specific open access publishing practices and barriers to change: an evidence-based review, *F1000Research* 7 (2018).
- [18] K. Atiso, D. Adkins, E. Borteye Mensah, Knowledge of open access journals among research scientists in Ghana, *Ser. Libr.* 73 (3–4) (2017) 327–337.
- [19] B. Björk, M. Laakso, P. Welling, P. Paetau, Anatomy of green open access, *Journal of the Association for Information Science and Technology* 65 (2) (2014) 237–250.
- [20] Budapest Open Access Initiative, Budapest Open Access Initiative| Read the Budapest Open Access Initiative, 2002.
- [21] S. Dallmeier-Tiessen, R. Darby, B. Goerner, J. Hyppoelae, P. Igo-Kemenes, D. Kahn, S. Lambert, A. Lengenfelder, C. Leonard, S. Mele, Highlights from the SOAP project survey. What Scientists Think about Open Access Publishing, 2011. ArXiv Preprint ArXiv:1101.5260.
- [22] C. Owusu, P.K. Kankam, Information seeking behaviour of beggars in Accra", *Global Knowledge, Memory and Communication* 69 (4/5) (2020) 205–220, <https://doi.org/10.1108/GKMC-07-2019-0080>.
- [23] P.K. Kankam, Mobile information behaviour of sandwich students towards mobile learning integration at the University of Ghana, *Cogent Education* 7 (1) (2020) 1–14, <https://doi.org/10.1080/2331186X.2020.1796202> [1796202].
- [24] A. Mohammed, Awareness and use of open access scholarly publications by postgraduate students of faculty of science in Ahmadu Bello University Zaria (ABU), Kaduna State, Nigeria, *Samaru Journal of Information Studies* 13 (1–2) (2013) 61–68.
- [25] J. Gross, J.C. Ryan, Landscapes of research: perceptions of Open Access (OA) publishing in the arts and humanities, *Publications* 3 (2) (2015) 65–88.
- [26] G. Christian, Issues and Challenges to the Development of Open Access Institutional Repositories in Academic and Research Institutions in Nigeria, 2009.
- [27] E.-S. Gbaje, *Open Access Journal Publishing in Ahmadu Bello*, 2010.
- [28] M. Kenneway, Author Attitudes towards Open Access Publishing, TBI Communications on Behalf of Intech Open Access Publisher, 2011. URL: <http://www.Intechweb.Org/Publicfiles/IntechOA>.
- [29] Z.Y.L. Yang, Y. Li, University faculty awareness and attitudes towards open access publishing and the institutional repository: a case study, *Journal of Librarianship and Scholarly Communication* 3 (1) (2015).
- [30] G.S. Seethapathy, J.U.S. Kumar, A.S. Hareesha, India's scientific publication in predatory journals: need for regulating quality of Indian science and education, *Curr. Sci.* (2016) 1759–1764.
- [31] G. Mangai, P. Ganesan, Researchers' perception and attitude towards Open Access (OA) resources: an alternative model and important for academic and research libraries, *Libr. Philos. Pract.* (2021) 1–13.
- [32] J.O. Ofua, Awareness, perception, and utilization of open access resources among Delta State University research scholars: a research, *Libr. Philos. Pract.* (2023). March.
- [33] W.J. Oyedipe, S.R. Adekunmisi, R.O. Akinbode, Awareness and Usage of Open Access Among University Lecturers in Nigeria, vol. 63, *New Media and Mass Communication*, 2017, pp. 6–18.
- [34] J. Finch, S. Bell, L. Bellingan, R. Campbell, P. Donnelly, R. Gardner, M. Hall, S. Hall, R. Kiley, W. van der Stelt, Accessibility, sustainability, excellence: how to expand access to research publications. Executive summary, *Int. Microbiol.* 16 (2) (2013) 125–132.
- [35] H. Piwowar, J. Priem, V. Larivière, J.P. Alperin, L. Matthias, B. Norlander, A. Farley, J. West, S. Haustein, The state of OA: a large-scale analysis of the prevalence and impact of Open Access articles, *PeerJ* 6 (2018) e4375.
- [36] S. Kuballa, Open access publishing in the field of medical informatics, *J. Med. Syst.* 41 (5) (2017) 82.
- [37] G. Orr, *Diffusion of Innovations*, by Everett Rogers, 2003, 1995.
- [38] J.W. Creswell, *A Concise Introduction to Mixed Methods Research*, SAGE Publications, 2015.
- [39] P.K. Kankam, Employing case study and survey designs in information research, *J. Inf. Technol. Res.* 14 (1) (2021) 167–177.
- [40] J.P. Tennant, F. Waldner, D.C. Jacques, P. Masuzzo, L.B. Collister, C.H.J. Hartgerink, The academic, economic and societal impacts of Open Access: an evidence-based review, *F1000Research* 5 (2016).
- [41] M.O. Okoye, A.N. Ejikeme, Open access, institutional repositories, and scholarly publishing: the role of librarians in South Eastern Nigeria, *Libr. Philos. Pract.* 612 (2011) 1–8.
- [42] A.U. Musa, *An Appraisal of Open Access Utilization Among Academic Librarians in Federal Universities in Northwestern States of Nigeria*, 2016.
- [43] Y. Ofori, G. Pomfowaa, Awareness and usage of open access journals among academic staff of university of mines and technology, *tarkwa. Ghana Journal of technology* 4 (2) (2020) 90–99.
- [44] J. Bacevic, C. Muellerleile, The moral economy of open access. *European Journal of Social Theory* 21 (2) (2018) 169–188.
- [45] K.H. Joung, J. Rowley, L. Sbaifi, Medical and health sciences academics' behaviours and attitudes towards open access publishing in scholarly journals: a perspective from South Korea, *Inf. Dev.* 35 (2) (2019) 191–202.