Original Article

The Future Role of the Internet: How University Publishing Houses Will Operate in 21st Century

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Abstract

The 21st century heralded the dawn of the open access era in university publishing houses. The internet has transformed publishing from a lower reliance upon peer review processes, to readers being given direct access to text via digital content delivery. The internet era now enables knowledge transfer free at the point of deliver, without copyright or license. The internet has transformed university presses and publishers, from content providers to service deliverers. As a result, global publishing has changed, and university publishing houses have had to change with it. A global consensus of publishing has been set due to the technological advance of the internet. A global consensus which has been widely accepted by most university publishers. People will need to develop a good grasp of media and information literacy as either providers or consumers of university publishing houses' content and services. The potential effects of the internet on COPE (Committee on Publication Ethics, 2022) compliance features. One of many questions covered in this paper is: How will impact factors, readership analytics and the metaverse, effect publishing in the 2020s. The utility of the internet enables geographically spread authors who have never met, to co-author academia

Keywords: academic publishing, internet transformation, university presses.

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Introduction

In the global north and the global south, middle-income and least developed countries, there are significant challenges in developing successful research Universities (Harvard University, 2022). One of those challenges, is how do such Universities gain recognition as a top global academic institution in the world. This is important because at the local level, an area's University has a key societal role as a social observer identifying the presence of societal threats. Universities are also cultural institutions, being a store of ancient artefacts, acting to ensure that age old heritage is not forgotten (Rivera-Collazo, 2021: 32).

Then, there is one of the Universities primary functions, the creation and dissemination of new knowledge via intellectual hubs which carry specialised discipline-specific information. At this early juncture, the overlapping issues of glocal, global and local, interacting with research and tertiary Universities appear simultaneously. Arnhold (2022) explains that *"Tertiary education refers to all formal post-secondary education, including private and public universities, colleges, technical training institutes, and vocational schools."*

Research Universities and tertiary Universities are remarkably similar, in that they both focus upon educating the individual and benefitting society. They both prepare their students with relevant job skills as required by the local area where the University resides (Cheng et al., 2022: 17).

The relevance with research and publishing integrity, is manifest in the emphasis in the production of new innovative products (research), alongside written training (publishing). In this sense, research and tertiary Universities deliver a strategic priority of most governments globally; production of a highly educated workforce who have acquired pragmatic, relevant vocational skills in their country. Analysis of internet technological advances at research universities, strongly indicate that university publishing houses will be able to use ChatGPT in the publication process. *"An experimental use of ChatGPT to assess its ability to provide peer review of academic papers found that it may be able to help in predicting whether a paper will be accepted"* (Sabzalieva & Valentini, 2023: 9). Tutors can use ChatGPT to openly author an essay on a relevant class topic, then ask students to critique the ChatGPT authored article. Students would acquire learning on the degree subject, alongside the ability to conduct a peer review of an author's manuscript (Dwivedi et al., 2023: 20). University teaching, learning, research and publishing, are all being transformed by the internet.

This theoretical article discusses the factors which influence the research output of manuscripts published by a university's own publications (Grey et al., 2022; COPE, 2022: 3).[I] Previous research outputs influenced subsequent research outputs (Valdivieso et al., 2021: 1), which can lead to a lack of University journal scope (Ye et al., 2022: 4). This happens when the same limited choice of subjects is researched and published repeatedly. There is a propensity that academics, early career researchers and postgraduates will soon realise that at their university; certain subjects are more likely to be published than others. This particularly applies to people who have already acquired media and information competencies, able to understand publishing analytical data. Such university stakeholders will have prior knowledge of university publishing houses' content and services.

In many faculties in the global north and south there are three dimensions to the University: academic career development, knowledge transfer, applying for university teaching and research posts (Docampo et al., 2022: 3). Often there is some form of accreditation system which involves University academics getting their research published. Pragmatically it is much easier for a university researcher to get their work published in their home institution's publishing house; than to be published in an external journal whereby definition, they are not so close to home. Docampo et al. (2022: 6) found that when incentive schemes, to include additional recognition and renumeration for published work, was *'taken out of the academic control of university governance',* national university performance improved. They alerts us to the importance of oversight. The lack of governance and scrutiny afforded by the internet, increases the possibility of poor research practice and publication standards (BMJ, 2022).

Method

This paper provides a conceptual theoretical review, which is compiled using existing literature. Published literature in this review was extracted from Elsevier, Google Scholar, MDPI, Sage Publications, Science Direct, Scopus, Springer among other databases. Numerous well-informed, individual and organisations' blogs and webpages have been included. These websites have particular issue-specific expertise and pragmatic knowledge, relevant to an analysis of how the internet will transform global academic publishing processes. To search for articles likely to be relevant, a basket of keywords and phrases were used to ensure articles chosen, fall within the category. Some of the keywords and phrases used in internet searches include: university publishing houses and

the internet; ChatGPT and publishing; distributed blockchain ledgers; communication, information and media literacy; data analytics and impact factors; global north and global south publishing processes; global academic publishing processes; grey literature and the internet; open access publishing; research integrity, ethics and the internet; university presses and the internet; the potential role of cryptocurrencies, DAOs (decentralised autonomous organisations), NFTs (non-fungible tokens) technologies in verifying publishing processes.

The results of the research is the analysis detailed in the critical review that unfolds, in the discussions contained in the headed sections that follow.

Discussion: Causal factors influencing the growth of University Publishing Houses

Since the start of 21st century, *"Over the past decades, the number of scientific publications has increased exponentially"* (Soehartono et al., 2022: 1; see also Pandita & Singh, 2022: 131; Thelwall & Sud, 2022: 41). Due to academic growth in relatively new subjects, for example, biotechnology, cryptocurrency, the Internet of Things (IoT), alongside various aspects of COVID-19; scientific publication has increased dramatically. Social science published papers have also grown in 21st century, not as markedly as in the sciences; but the social aspects of COVID19 have provided a rich source of new learning which was virtually non-existent pre-2020 (Van Bavel et al., 2021: 462-463). Universities are able to deliver and process the bibliometric data available from large-scale, worldwide publication multi-disciplinary databases (Bornmann et al., 2021: 2). Communication of research results is essential in academia. Higher education institution (HEI) owned presses, must ensure their universities are able to communicate its scientific contributions to the wider public. Globally generation zen students have developed media and information literacy skills from an early age. They are able to communicate proficiently using social media platforms. Providing millennial students with an early opportunity to have their research interest published, is a policy driver resulting in the growth of university presses.

University publishing houses perform a vital academic function of democratising information and providing equality of access to research (Kara, 2020). Expertise exists everywhere in the world, including resting with people who are not connected to a university. University presses have grown as they enable collaboration between people to solve problems (Cocks, 2022: 3). In this sense they act as an intellectual hub

for free, as they don't pay shareholders or print costs. This is especially true for university presses, which will increasingly become during 21st century, online only (Anderson, 2022). University publishing houses will be able to offer multiple journals, due to having the option of online only publication. This is an example of the internet being transformative in publication. Kara (2020) encapsulates the importance of research and publication integrity, alongside the pragmatic wisdom of university publishing houses. *"And in general, if you can, please consider publishing your articles in university press journals, because overall they are rather more ethical than other types of publishers."*

Another policy driver contributing to the growth of university presses are changes in the Record of Science, with much more online publishing only publication formats (Watkinson, 2021: 18; see also Newman, 2022). Readers will want interactive articles with electronic portals to access more data, alongside enabling visibility of key aspects of the text. Academia recognised record keeping standards, for example, DOI, ISBN, ISSN and MARC, are able fit in with current trends towards large-scale data-driven science (Duine, 2022: 2). The shift towards online only University publication enables public access to a published manuscript's altmetric and metadata, creating a new multi-stranded Record of Science. Altmetric (alternative) data are research outputs, a record of social media activity, hits, likes and mentions. Altmetric data includes chat room, online focus groups, online forums, which are various forms of readership engagement (Nicholson & Smith, 2022: 680). These people meet online discussing where the published research can be used, where it fits, what it means to different online readers. This is online internet interaction with the University press website which published the research. University publication houses will virtually all become online only journals, easily manageable on campus.

> *"He said that the future scholarly record needs to be much more than a PDF. It needs to be interoperable, machine-readable, and available in multiple formats, with an adaptive design, accessible for everyone, transformable, preservable, linkable, trackable, and with high-quality metadata."*
>
> (Duine, 2022: 2)

Academic publishing has become the established mechanism for disseminating academic research and scholarship, alongside being the main vehicle to establish and validate academic careers (Palmer, 2022;[II] Perkmann et al., 2021: 7).

> *"Indeed, the professionalisation of academia which took place in the early twentieth century has led to publishing becoming a key driver of career progression. Academic recognition and reward are contingent on publication in the traditional forms of academic publishing"*
>
> (Palmer, 2022)

There are concerns within university-based academia that the need to have research work published, is a policy driver which can result in academics cheating. Numerous studies have identified other threats to publication and research fidelity (Morressier, 2022; Roje et al., 2022: 641; Helgesson & Bulow, 2021: 7). The threats are manifest for example: as a culture of 'publish or perish' (Rawat & Meena, 2014: 87), amounting to publish regularly or experience University career stagnation; 'rushing to publication', cutting research practice corners in the process (Soehartono et al., 2022: 2); 'salami slicing' putting forward the same research in slightly different formats to multiple different publications (Kaltenbrunner et al., 2022: 6). Perhaps most damaging to publication and research integrity, is a failure to disclose negative outcomes. The act of such non-disclosure supports desired aspects of the research, whilst covering up less favourable results questions research integrity (Elsevier, 2022: 48; Palmer, 2022). One approach could be to use distributed blockchain ledger (DBL) technology, where the research team would record all their results immediately. This would provide an immutable, verifiable record of what the results were, where and when, which is publicly accessible for scrutiny (Anselmo et al., 2023: 8; Tan, 2023: 9). The internet and associated technological advances, will be quite transformative in the field of academic data verification. Using DBL technology, it has become much simpler to create an irrefutable record of the data used in an academic study before subsequent publication.

The cost of printed journals is another factor. Online University journals are far cheaper to produce and manage, than hard printed paper copy which needs to be delivered. This mirrors the trend towards online teaching accelerated by COVID-19 (Rapanta et al., 2020: 930). Online only journals will continue to grow as readers will be less likely to pay a subscription, due to the increased availability of high-quality online research. The global surge in open access publishing prevalent in the first two decades since 2000, will continue apace through the 21st century. At the end of 2021 *"An estimated 30% of all scholarly articles are available for free to anyone"* (Amnet EnableOA, 2022).

In 2016 the United States National Science Foundation (NSF), transformed from article process charges, institution subscription type model, to an open access policy. UKRI (United Kingdom Research and Innovation) is making a similar switch in 2022. *"UKRI's new policy requires peer reviewed work to be available immediately upon publication. Policies such as these pave the way for continued growth in OA publishing"* (Amnet EnableOA, 2022; see also Elsevier, 2022: 34). Universities indirectly pay the costs of peer-review as their researchers evaluate research papers, providing the specialist knowledge required on employment time (Aczel et al., 2021: 3). Universities also face cost pressures from COVID-19, which often meant library services being cut. COVID-19 was a double-edged sword acting to demonstrate the importance of online learning and that research needs to be widely available online (Josep, 2022). Universities have met this demand by increasing their in-house publications, alongside collaboratively partnership links with other like-minded Universities. This has contributed towards the growth of university presses in 21st century. COVID-19 has been a policy driver, resulting in an increase in demand for open access publication and university-based journals (Amnet EnableOA, 2022).

In the mid-2020s post-COVID-19 recovery period, we are witnessing a fundamental shift in university publishing houses operations. We have seen a plethora of online multidisciplinary journals, coupled with the continuance of online learning. Higher education has been transformed by the internet, even though there is little requirement for social distancing in the global north. Many countries' postal systems closed during the COVID19 pandemic, preventing the distribution of academic journals by post. University publishing houses and other publishers were able to attach a copy of their journals to an email. Alternatively, they could contact people by text with an email link, which directed them to an online journal. People could choose which articles they read from the online journal. Without the internet, most university publishing houses would have ceased operation during COVID-19 (Publishers Association, 2023).

COVID-19 also accelerated open science by knowledge dissemination using preprints (Elsevier, 2022: 7). As 21st century progresses University publication houses will proactively enable preprints, in special sections or separate publications. There is a very real risk that research work could be published, which has not been through a rigorous double-blind peer-review process. Universities need to ensure they have robust, internal governance systems in place, so that preprints publications are clearly marked as having not been peer-reviewed (CPNI, 2022).

Interactive interoperable data sharing will also increase, partly as a result of convergence on how research outputs should be reported. The utility of the internet enables authors who have never met to co-author academia. The internet enables people geographically spread across the globe, to work together using the same research protocol, followed by the publication process itself. Tests can be done live online, so research team members can see project work taking place in real time. Interactive surveys can be filled in by research participants, where the survey form automatically updates a blockchain ledger with the details. The usage of electronic equipment, for example, assistive technological devices can be tracked. The telemetry of usage could be stored and sent to authorised researchers in any location connected to the internet globally. Any difficulties the user/ research participant was having can be detected by keystroke activity, and the results emailed across to the project team in real time. Universities will need to train people to become media and information literate.

Due to internet transformation, future students will be required to conduct research whist working in cyberspace, and also participate in academic publishing processes. Perspective publishers can see how data was collected by accessing the publicly available distributed blockchain ledger, to verify results claimed in the submitted manuscript. The internet and associated technological advances make all this possible. It is clear the utility new internet technology provides, has enabled universities to deliver higher education virtually and sustain their publishing houses. *"However, higher education publishers' investments in digital learning solutions are now paying off"* (Guren et al., 2021: 4). Any members of the project team can be given 24/7 full access to all the research results, whilst the project is ongoing. Potential publishers could also be given similar access if all stakeholders feel this would be appropriate. The research agenda is changing as open access publishing becomes the normative position, competition for funding will even out (UKRI, 2022). Most altmetric, bibliometric and metadata will be publicly available. There will be little to distinguish one University from another in the same country, or between most neighbouring countries. There will be some differences between global north and global south university presses, differences which are discussed in the following section of this paper.

Discussion: The Global North/ Global South divide will continue in 21st century

There is a north/south academia divide biasing research collaborations and publications in favour of universities who are based in the global north (WEF, 2022). This research and publication bias that clearly exist

between global north and global south institutions is most acutely evident in funding grant award applications (Albanna et al., 2021: 8418). Global funders predominantly based in the global north need to remove inherent biases in their application processes which create artificial structural barriers. Research funding applications are quite complex to navigate. They often include an over emphasis on past research grants awards, which many global south institutions are not able to evidence. The social inequity caused by these artificial structural barriers manifest itself in research projects actioned and publication of the results (Richards, 2022). Graduates will be required with proficiency in media and information literacy, to work with public and non-governmental organisations (NGOs). These are skills global south countries will require, people who can communicate online, or in cyberspace, on grant funding bids and research study publication. The content of global/north/global south research papers can be skewed to highlight aspects of the research desired by global north funders. Skewed in the sense that the contribution of global south universities is not equally recognised with that of the global north institution. *"North South collaboration between research institutes and universities does exists, but too often they are Global North-led as opposed to peer-to-peer. This means the funding and professional opportunities – as well as recognition for success – are rarely distributed evenly across regions"* (ibid). Evaluation, monitoring and reporting forms prior to research completion or project report publication, seem to focus upon the contributions made by the global north partner (Kotze & Dymitrow, 2021: 13).

Global north funders need to provide much more assistance to global south funding applicants, alongside making application processes simpler and fairer. To improve research and publication integrity global south researcher must have more genuine input into the research, followed by equal recognition. *"Enabling more researchers from the developing world to access grants is a critical first step"* (Richards, 2022). Internet's ability to transform academic publishing is apparent, manifest in the global north/global south divide. Global south countries need more international development assistance with their electrification projects, which will enable internet access for a higher proportion of their populations. Until more global south based universities have increased internet access, their university presses will not be able deliver their service on a reliable basis (United Nations, 2023: 21; WEF, 2023: 76; UNESCO, 2021: 35).

Mwambari et al. (2022) in their study discussing the impact of open access in Kenya's higher education system, mirror concerns raised by

Richards (2022). Mwambari et al. (2022) inform us that acceptance of external funding, predominantly from global north institutions, impose conditionality on research conducted. There is also neo-colonialism, manifest as global north funders and universities deciding what is worthwhile knowledge that should be published (Gani & Marshall, 2022: 12; Mwambari et al., 2022: 1413).

There is research and publication bureaucratic gatekeeping, when equally valid global south scholarship is not recognised, ignored by global north institutions. Open access publishing is beneficial in the global north as it acts to make the cost of research dissemination lower for university presses (Ravinetto & Singh, 2022: 1). It is a much more complex affair in global south countries: who do not have the connectivity, internet speeds, security of electricity supply and internet access, experienced in global north Universities. Due to internet connectivity problems the situation sometimes arises, where global north sourced research is accessible in global south universities but not vice versa (Mwambari et al., 2022: 1411). Open access in the global south is often at the behest of global funding agencies, for example, the Bill Gates Foundation; or from foreign direct investment. If a corporate sector or private enterprise is working in partnership with a global south university; a global north university can choose to fund internet connectivity as partnership of the research project, or as work towards the Sustainable Development Goals (Augusdinata, 2022: 1590).

Open access publishing can lead to international research collaborations and publications between global north and global south universities (Artigas et al., 2022: 3992). There can be library exchanges and partnerships between university libraries, to enable people to access cultural knowledge about the north and the south (Mwambari et al., 2022: 1420). Comparative studies could be done to discuss the effect of climate change on water table levels in, for example, Ethiopia and Southern Italy. Similarly, there could be partnership work between global north and south institutions; to discuss how sustainable employment alternatives could be delivered for people living in rural fishing communities, for example, in Spain or Ghana (Roscher et al., 2022: 921). This would be interaction between research partners and/or participants, resulting in the co-production of knowledge which can subsequently be published. With or without open access publishing, University presses have duality, being able to initiate international development partnership work between global north and global south universities, alongside acting as knowledge brokers (Rhannam, 2021).

> *"Like other collaborative initiatives between scholars in the Global North and Global South, these interactions and the co-production of knowledge allow African scholars' knowledge to spread to wider networks (…). The allow for mentoring a new generation of researchers, including knowledge brokers (…). In addition, partnership across university libraries in the Global North and the Global South can facilitate access to information and knowledge exchange. Moreover, African governments need to invest in research and encourage knowledge production, by local publishers, scholars and students. Therefore, these governments need to commit more public funds and prestige to locally produce knowledge to encourage a culture of excellence in research. It is through the development of such independent research networks, broadening research initiatives that enhance the OA structure, that African scholars can continue to work towards 'epistemic freedom in Africa' (…)*
>
> (Mwambari et al., 2022: 1419-1420)

This quote above demonstrates the need for global north actors to assist the global south, by giving their researchers more prominence in knowledge dissemination. Internet access plays a vital role in closing the digital divide, alongside cultural divides due to lack of interaction and knowledge. Mwambari et al. (2022) study also helps us consider wider questions regarding academic publishing in the 21st century: How will impact factors, readership analytics and the metaverse, effect publishing in the 2020s. At a more nuanced level, global north institutions need to develop a better understanding of different ways of knowing. Government funding might not be forthcoming, especially from impoverished global south nations. Global north based philanthropic agencies and individuals need to fund university publishing houses, if not the university as a whole; to bridge the North/South research project and publication divide. As the 21st century develops global north and global south countries will require people with grasp of media and information literacy skills. Globally, more social protection services will transition from only being accessible online, already well underway, to information provided by memes and avatars in cyberspace. Most countries will need media and information literate workforces in the 2020s. People able to communicate in multiple languages, enabled by software to access translation services. Due to internet technological advances, academic publishing processes will be transformed in tandem with these global critical resource allocation realities elsewhere.

Discussion: Grey journals and low-quality journals will continue to grow in the 21st century

There will be an increase in University publication houses grey literature journals as the 2020s unfold. Grey literature journals include annual, evaluations, government documents, project, research, technical reports, alongside white papers and ongoing working papers. The University of Exeter (2022) inform us:

> *"A widely accepted definition in the scholarly community for grey literature is 'information produced from all levels of government, academia, business and industry in electronic and print formats not controlled by commercial publishing' ie. where publishing is not the primary activity of the producing body."*

Unless each individual source chooses to inform the reader, a substantial amount of the content of grey journals will not have been peer-reviewed (Kousha et al., 2022: 3489). Graduates who have acquired media and information literacy proficiency, will be able to assist university presses by being able to design filters which identify grey literature. Academic centres, civil society organisations (CSOs), corporate bodies, government agencies and departments, freelance and/or independent consultants, NGOs, private sector organisations; all deliver reports of their work. This is grey literature which often by definition, for example, government agency or department reports, are not peer-reviewed (Stridsberg et al., 2022: 3; Adams et al., 2017: 434).

Journals with an overreliance on unverified reports from a variety of organisations can be considered to be low-quality. The five-year corporate plan of global corporate giants, for example Google or Shell are not beholden to anyone, they can publish what they like (see also Kirchherr, 2017).[III],[1] The five-year future plan reports of such organisations, do factually tell us what they intend to do over the intervening period. In this sense robust peer-review is not required, this means the production and review of repot and the published journal containing such reports can be of low-quality. Grey literature can sometimes only be accessible by authorised or invited agencies, organisations and individuals, *'often not well represented in indexing databases'* (University of Exeter, 2022).

1 Kirchherr's (2017) article alerts us that there is a replication crisis in academia, partly caused by defective peer-review. This peer-review deficit results in questionable research practice, as academics feel pressurised to produce novel results for publication in high-impact journals; Results which are not independently verified. Publication and research integrity is undermined by peer-review deficit.

University presses have the utility of being able to provide open access publishing to a wider readership, they can act to fill this gap. This aspect of 21st century research and publication landscape, will drive an increase in University publishing houses producing low quality grey literature journals. This mid-2020s academic publishing crises regarding university publishing houses, will be addressed by the development of globally accepted publishing standards. University presses will be required to demonstrate, external independent peer review has taken place for each manuscript published. University publishing houses will also be required to disclose, the level of non-peer reviewed literature used in work they have chosen to publish. It is only a matter of time before the use of DBL technology or similar becomes mandatory, in global academic publishing processes.

Vie (2021: 15) discusses various aspects of commissioned research, which can result in low-quality research. The inappropriate influence of commissioned clients on researchers, by definition will subsequently result in low-quality journal publication (The Norwegian National Research Ethics Committees, 2022: 6). Funding for University research comes from three generic sources: government funding, student tuition fees, commissioned or sponsored research fees (Vie, 2021: 2). Commissioned research fees come mainly from philanthropic individuals or organisations, wanting to analyse various phenomena or social interaction of particular interest to them (Rosowsky, 2022). Universities have transformed in 20 century, alongside changes in research processes and scholarly publication. Universities have been shaped by globalisation; a decline in government funding; differing approaches and emphasis on student professionalisation; erosion of the collegiate ideals; neoliberal deconstruction of the academic profession (Vie, 2021: 6). When discussing the growth in grey literature low-quality journals, the latter two transformative aspects identified by Vie (2021: 6) have increased salience.

There is a constant need in academia, research and publication to secure further funding. A constant need which creates and perpetuates a power relationship, between the commissioning body and the researcher (Morton et al., 2022: 276; Shanks & Paulson, 2022: 175). The power relationship is in the form of a cash nexus if a researcher reports negative results, or something the commissioning agency is unhappy with. In such circumstances, the commissioning body can simply not engage the University whose researcher delivered the negative research outcomes again. The potential to be passed over for future research funding is a significant threat, which can compromise research integrity (Vie, 2021: 12). Such undue influence can result in negative

results being covered up when they should have been reported. Due to power relationships between commissioning agencies and researchers; University presses being effectively coerced into publishing non-peer-reviewed grey literature low-quality journals, will become more prevalent as 21st century progresses.

Low-quality journals can also be published directly as a result of the misuse of results. University researchers can be exploited or manipulated by commissioning bodies, to present the research in a certain way to highlight specific issues (ibid: 14). Alternatively, the University researcher's work can be misunderstood leading to incorrect conclusions and findings being misrepresented. *"There is a risk that their work may be presented, interpreted or used in a skewed or even disingenuous way"* (ibid). This risk becomes particularly acute if the research work involved is used to inform government policy. People working in university publishing houses need well developed media and information literacy skills, to accurately interpret and communicate research study findings. Erosion of the collegiate ideal, alongside a neoliberal deconstruction of the academic profession, manifests itself in research quality and time pressure. University researchers often find themselves having to conduct research and apply for funding to work on their next project (Woolston, 2022: 834). Questionable research results, as hard-pressed researchers did not have time to carry out the efficacy protocols and quality control tests. Neoliberal deconstruction also erodes reading relevant academic literature time, making delivery of high-quality research more challenging. The use of DBL technology for verification purposes will ameliorate some of the problems described in this section. The internet has duality, being able to provide both surveillance and transparency of global academic publishing processes.

Discussion: Predatory publishers will continue in 21st century

Predatory journals are a significant problem in scholarly publishing and will continue to do so through the 2020s. Moher and Oransky (2022) inform us of a consensus definition, reached by forty academics and publishers to describe predatory journals.

> *"Predatory journals and publishers are entities that priorities self-interest at the expense of scholarship and are characterised by false or misleading information, deviation for best editorial and publication practices, a lack of transparency, and/or the use of aggressive and indiscriminate solicitation practices"*
>
> (Moher & Oransky, 2022)

Predatory publishing can result in dual publication of University research or result in knowledge not being disseminated due to fake journal profiles (Linacre, 2020). Some journals publish as frequently as weekly, which is an indication the journal does not go through an external peer-review process (Schmitz, 2022). Journals who do not disclose their editor details along with their Editorial Board members are often low-quality predatory journals. The general presentation of communications from the journal can reveal its predatory nature, inappropriate use of changing font sizes within the same word provides a clue. As does the use of clashing, garish colours and oversized fonts (Linacre, 2020). Top quality university publishing houses would ensure their staff resources have a high standard of media and information literacy. This is to ensure staff teams can design university journals and update social media platforms, with the latest news of relevance to their readership. University researchers will need to be wary in the 2020s, as people's H-Index scores will be affected by academic appearance in a predatory journal. Excessive difficulties in retracting or withdrawing an article after acceptance or publication, is behaviour associated with a predatory journal. An insistence that virtually all of an article processing fee is retained after article withdrawal, underscores the predatory nature of some journals.

Journals with an ISSN which cannot be traced, often alongside false JIF claims made in unsolicited emails, is predatory journalistic activity (Linacre, 2020). Such emails often use condescending language, for example, 'your fantastic paper' or 'long standing expert'; and/or refer to people with often an inaccurate salutation, calling virtually everyone they contact professor. Fake weblinks which do not allow access to a journal's website are another common indicator (ibid). The only means of communicating with such journals are by the unsolicited email enclosed electronic link, which often cannot be traced. University researchers are not able to contact the journal or find out who is responsible for the journal's behaviour (Wager & Kleinert, 2021: 4). Journals publishing submitted work without any revision, followed by an invoice email asking for payment, which was never mentioned prior to publication. These are typical behaviours of predatory journals, which will become commonplace during the 21st century. In 2019, a predatory journals publishing house called OMICS were fined $50million for many of these types of activities (Dyer, 2019). The problem constellation caused by predatory journals demonstrates the internet is a double edged sword. Respectable university publishing houses are undermined by the activities of predatory publishers, needing the surveillance and transparency aspects of the internet to maintain trust.

Conclusions and Policy recommendations

One approach to improve scholarly publications is the introduction of policies to reduce citation distortion (West & Bergstrom, 2021: 8). Some academics can choose journal or manuscript titles, which can result in increased self-citation and/or citation stacking. These strategic choices can act to manipulate the journal impact factor (JIF) rates (Quaderi, 2022). There is also a problem with self-stacking. *"This is where the journal contains one or more documents with citations which are highly concentrated to the JIF numerator of the title itself"* (ibid). Universities need to introduce policies to ensure their home institution manuscript submissions, do not enable excessive self-citation or self-stacking (ibid).

To facilitate research and publication in global north and global south collaborations; global north actors should be encouraged to learn the chosen language of their global south partner. North/South research collaborations will be improved by adopting an international development approach (McSweeney et al., 2022: 264; Fransman et al., 2021: 329). For example, global north researchers should be operationally junior members of fieldwork teams, during research conducted in global south countries. Global north publishers should liaise with global south actors to catalogue their various publications on their databases. It is likely there are numerous global south reports with new knowledge, which have not been uploaded onto the internet.

The academic publishing world now uses an Olympic style colour coded system, to operate different kinds of publishing related to readership access (Costello, 2023; Chiriboga, 2019: 95). There is gold open access where the publisher and author(s) allow academic papers to be published for free, using a creative commons license. University publishers can use green open access, where authors can publish their articles before or after peer review and/or before manuscript acceptance. A number of non-university repositories offer this service, usually in the form of authors being able to upload their papers onto their website. Bronze open access enables authors to have their papers published, initially via subscribers to the journal. After the subscription period has been ended, access becomes freely available to anyone connected to the internet, bronze open access transforms and becomes gold. There is a hybrid open access option which some publishing houses deliver. The publisher including university presses has a publication fee, which provides access to specific content for the fee (Costello, 2023; Chiriboga, 2019: 95).

In practice there is little difference between hybrid open access and bronze. The internet era has introduced analytical cookies, impact ratings

and the metaverse, the latter enabling memes and avatars (effectively anonymous authors) to become published. Internet technology is advancing at pace, people can write, add and update new content at will. This state of affairs creates a whole host of unresolved issues in academic publishing, for example, if an attack piece is written; or research data is subsequently debunked. In such circumstances what recourse is there, how does the other party respond, when the author of an attack piece is an avatar or meme chooses not to reveal their identity. Similarly, how does the university publishing house or any other publisher respond, when the data turns out be accidentally (or deliberately) misleading. A global regulatory consensus is urgently required to address these publishing crises which foreseeably, will be enabled or exacerbated by the internet.

Ethical considerations

The author has completely considered ethical issues, including informed consent, plagiarism, data fabrication, misconduct, and/or falsification, double publication and/or redundancy, submission, etc.

Conflicts of interests

The author declares that there is no conflict of interests.

Data availability

The dataset generated and analyzed during the current study is available from the corresponding author on reasonable request.

Endnotes

I. This COPE (2022) literary source contains three presentations from a COPE Seminar in 2022 called 'Relationships between Universities and Publishers'. The section referenced, is from a presentation with the working title 'The Critical Relationship Between Universities and COPE'.

II. The Palmer (2022) source is a Guest Editor introduction of a special issue of 'Publications' by MDPI. This was a call for papers to discuss various aspects of scholarly publishing which closed 22 June 2022.

III. Kirchherr's (2017) article alerts us that there is a replication crisis in academia, partly caused by defective peer-review. This peer-review deficit results in questionable research practice, as academics feel pressurised to produce novel results for publication in high-impact journals; Results which are not independently verified. Publication and research integrity is undermined by peer-review deficit.

References

Aczel, B.; Szaszi, B. & Holcombe, A.O. (2021). "A billion-dollar donation: estimating the cost of researchers' time spent on peer review".

Research Integrity and Peer Review. 6, article number 14. https://doi.org/10.1186/S41073-021-00118-2.

Adams, R.J.; Smart, P. & Huff, A.S. (2017). "Shades of grey: Guidelines for the working with the grey literature in systematic reviews for management and organizational studies". *International Journal of Management Reviews.* 19(4): 432-454. https://doi.org/10.1111/ijmr.12102.

Albanna, B.; Handl, J. & Heeks, R. (2021). "Publication outperformance among global South researcher: An analysis of individual-level and publication-level predictors of positive deviance". *Scientometric.* 126: 8375-8431. https://doi.org/10.1007/S11192-021-04128-1.

Amnet EnableOA. (2022). *Open Access Publishing Trends for 2022: Growth Is Set To Continue.* https://enableoa.amnet.com/2022/01/21/open-access-publishing-trends-for-2022-growth-is-set-to-continue/.

Anderson, P. (2022). "England's Oxford University Press is migrating its catalogue to its online platform". *Publishing Perspectives.* https://publishingperspectives.com/2022/08/oxford-university-press-to-migrate-its-catalogue-to-online-platform/.

Anselmo, A.; Materazzo, M.; Di Lorenzo, N.; Sensi, B.; Riccetti, C.; Lonardo, M.T.; Pellicciaro, M.; D'Amico, F.; Siragusa, L. & Tisone, G. (2023). "Implementation of blockchain technology could increase equity and transparency in organ transplantation: A narrative review of an emergent tool". *Transplant International.* 36, article 10800. https://doi.org/10.3389/ti.2023.10800.

Arnhold, N. (2022). "Higher Education". *The World Bank.* https://www.worldbank.org/en/topic/tertiaryeducation

Artigas, W.; Gungula, E.W. & Laakso, M. (2022). "Open access in Angola: a survey among higher education institutes". *Scientometrics.* 127: 3977-3993. https://doi.org/10.1007/S11192-022-04410-W.

Augusdinata, D.B. (2022). "The role of universities in SDGs solution co-creation and implementation: a human-centred design and shared-action learning process". *Sustainability Science.* 17: 1589-1604. https://doi.org/10.1007/S11625-022-01128-9.

BMJ (British Medical Journal). (2022). *Research Integrity.* https://www.bmj.com/company/researchintegrity/.

Bornmann, L.; Haunschild, R. & Mutz, R. (2021). "Growth rates of modern science: a latent piecewise growth curve approach

to model publication numbers from established and new literature databases". *Humanities and Social Sciences Communications.* 8, article number 224. https://doi.org/10.1057/S41599-021-00903-W.

Cheng, M.; Adekola, O.; Albia, J. & Cai, S. (2022). "Employability in higher education: a review of key stakeholders' perspectives". *Higher Education Evaluation and Development.* 16(1): 16-33. https://doi.org/10.1108/HEED-03-2021-0025.

Chiriboga, L. (2019). "The changing landscape of scientific publishing". *Journal of Histotechnology.* 42(3): 95-97.https://doi.org/10.1080/01478885.2019.1636554.

Cocks, C. (2022). "Back in person: The association of university presses 2022 annual meeting". *The H-Net Book Channel: Humanities and Social Sciences Online.* https://networks.h-net.org/node/1883/discussions/10488081/back-person-association-university-presses-2022-annual-meeting.

COPE. (Committee on Publication Ethics) (2022). *Panel Discussion.* Eastleigh (UK): Committee on Publication Ethics. https://publicationethics.org/files/universities-cope-relationship-seminar2022.pdf.

Costello, D. (2023). "Open access vs. paywalls: New paradigms in academic publishing". *Servicescape.* https://www.servicescape.com/blog/open-access-vs-paywalls-new-paradigms-in-academic-publishing.

CPNI (Centre for the Protection of National Infrastructure). (2022). *Trusted Research Guidance for Academia.* https://www.cpni.gov.uk/trusted-research-academia.

Docampo, D.; Safon, V. & Albert, C. (2022). "Research, teaching, and knowledge transfer assessments in Spain: Strategies and results". *Frontiers in Research Metrics and Analytics.* 7, article number 817031. https://doi.org/10.3389/FRMA.2022.817031.

Duine, M. (2022). "Summary report APE 2022: The future of the permanent record". *Information Services & Us/e.* 1: 1-14. http://dx.doi.org/10.3233/ISU-220162.

Dwivedi, Y.K.; Kshetri, N.; Hughes, L.; Slade, E.L.; Jeyaraj, A.; … & Wright, R. (2023). "Opinion paper: 'So what if ChatGPT wrote it?' Multidisciplinary perspectives on opportunities, challenges and implication of generative conversational AI for research, practice and policy". *International Journal of Information Management.* 71, article 102642. https://doi.

.org/10.1016/j.ijinfomgt.2023.102642

Dyer, O. (2019). "US consumer agency wins $50m order against predatory publisher OMICS". *BMJ.* 365, article number I1639. https://doi.org/10.1136/bmj.l1639.

Elsevier. (2022). *Research Futures 2.0: A new look at the drivers and scenarios that will define the decade.* Amsterdam: Elsevier. https://www.elsevier.com/__data/assets/pdf_file/0017/1250423/Research-Futures-2_0-Full-Report.pdf.

Fransman, J.; Hall, B.; Hayman, R.; Narayanan, P.; Newman, K. & Tandon, R. (2021). "Beyond partnerships: embracing complexity to understand and improve research collaboration for global development". *Canadian Journal of Development Studies/ Revue Canadienne d' etudes du development.* 42(3): 326-346. https://doi.org/10.1080/02255189.2021.1872507.

Gani, J.K. & Marshall, J. (2022). "The impact of colonialism on policy and knowledge production in International Relations". *International Affairs.* 98(1): 5-22. https://doi.org/10.1093/ia/iiab226.

Grey, A.; Avenell, A. & Rolland, M. (2022). "Guest post – Who cares about publication integrity". *Society for Scholarly Publishing Blog.* https://scholarlykitchen.sspnet.org/2022/08/18/guest-post-who-cares-about-publication-integrity/.

Guren, C.; McIlroy, T. & Sieck, S. (2021). "COVID-19 and book publishing: Impacts and insights for 2021". *Publishing Research Quarterly.* 37:1-14.https://doi.org/10.1007/s12109-021-09791-z.

Harvard University. (2022). "The global South deserves respect – and support". *Officer of the Dean.* https://www.hsph.harvard.edu/deans-office/2022/05/12/the-global-south-deserves-respect-and-support/.

Helgesson, G. & Bulow, W. (2021). "Research integrity and hidden value conflicts". *Journal of Academic Ethics.* 21. https://doi.org/10.1007/S10805-021-09442-0.

Josep, G. (2022). "5 reasons why online learning is the future of education in 2022". *Educations.com.* https://www.educations.com/articles-and-advice/5-reasons-online-learning-is-future-of-education-17146.

Kaltenbrunner, W.; Birch, K., van Leeuwen, T. & Amuchastegui, M. (2022). "Changing publication practices and the typification of the journal article in science and technology studies". *Social Studies of Science.* https://doi.org/10.1177%2F03063127221110623.

Kara, H. (2020). "Why academics should publish journal articles with university presses". *Helen Kara Blog Page.* https://helenkara.com/2020/11/19/why-academics-should-publish-journal-articles-with-university-presses/.

Kirchherr, J. (2017). "Why we can't trust academic journals to tell the scientific truth". *The Guardian.* https://www.theguardian.com/higher-education-network/2017/jun/06/why-we-cant-trust-academic-journals-to-tell-the-scientific-truth.

Kotze, S. & Dymitrow, M. (2021). "North-South research collaborations: An empirical evaluation against principles of transboundary research". *Development Policy Review.* 40(2): article number e12555. https://doi.org/10.1111/dpr.12555.

Kousha, K.; Thelwall, M. & Bickley, M. (2022). "The high scholarly value of grey literature before and during COVID-19". *Scientometrics.* 127: 3489-3504. https://doi.org/10.1007/S11192-022-04398-3.

Linacre, S. (2020). "The A-Z's of predatory publishing". *Cabells, The Source.* https://blog.cabells.com/2020/11/04/the-a-zs-of-predatory-publishing/.

McSweeney, M.; Otte, J.; Eyul, P.; Hayhurst, L.M.C. & Parytci, D.T. (2022). "Conducting collaborative research across global North-South contexts: benefits, challenges and implications of working with visual and digital participatory research approaches". *Qualitative Research in Sport, Exercise and Health.* 15(2): 264-279. https://doi.org/10.1080/2159676X.2022.2048059.

Moher, D. & Oransky, I. (2022) "'Predatory' publications put pressure on the integrity of scientific literature". *European Science-Media Hub.* Brussels: European Parliament Research Service (EPRS). https://sciencemediahub.eu/2022/05/11/predatory-publica3ions-put-pressure-on-the-integrity-of-scientific-literature/.

Morressier. (2022). *Research integrity: An evolving challenge for scholarly publishers.* https://www.morressier.com/post/research-integrity-an-evolving-challenge-for-scholarly-publishers?hsLang=en.

Morton, B.; Vercuiel, A.; Masekela, R.; Heinz, E.; Reimer, L.; Saleh, S.; Kalinga, C.; Seekles, M.; Biccard, B.; Chakaya, J.; Abimbola, S.; Obasi, A. & Oriyo, N. (2022). "Consensus statement on measures to promote equitable authorship in the publication of research from international partnerships". *Anaesthesia.* 77(3): 264-276. https://doi.org/10.1111/anae.15597.

Mwambari, D.; Ali, F.A. & Barak, C. (2022). "The impact of open access on knowledge production, consumption and dissemination in Kenya's higher education system". *Third World Quarterly.* 43(6): 1408-1424. https://doi.org/10.1080/01436597.2022.2056010.

Newman, N. (2022). "Journalism, media, and technology trends and predictions 2022". *Reuters Institute, University of Oxford.* https://reutersinstitute.politics.ox.ac.uk/journalism-media-and-technology-trends-and-predictions-2022.

Nicholson, N. & Smith, S.L. (2022). "How to document scientific and clinical impact of research: six steps to success". *Perspectives of the ASHA Special Interest Groups.* 7(3): 679-695. https://doi.org/10.1044/2022_PERSP-21-00234.

Palmer, N. (2022). "Special issue: "Publication ethics and research integrity". *Call for papers for special edition of Publications* (MDPI). https://www.mdpi.com/journal/publications/special_issues/publication_ethics_research_integrity.

Pandita, R. & Singh, S. (2022). "A study of distribution and growth of open access research journals across the world". *Publishing Research Quarterly.* 38: 131-149. https://doi.org/10.1007/S12109-022-09860-X.

Perkmann, M.; Salandra, R.; Tartari, V.; McKelvey, M. & Hughes, A. (2021). "Academic engagement: A review of the literature 2011-2019". *Research Policy.* 50(1): article number 104114. https://doi.org/10.1016/j.respol.2020.104114.

Publishers Association. (2023). *Publishing Industry Response to COVID-19.* https://www.publishers.org.uk/covid-19-publishing-industry-response/.

Quaderi, N. (2022). "Journal citation reports 2022: COVID-19 research continues to drive increased citation impact". *Clarivate Blog: Academia and Government.* https://clarivate.com/blog/journal-citation-reports-2022-covid-19-research-continues-to-drive-increased-citation-impact/.

Rapanta, C.; Botturi, L.; Goodyear, P.; Guardia, L. & Koole, M. (2020). "Online university teaching during and after the COVID-19 crisis: Refocussing teacher presence and learning activity". *Postdigital Science and Education.* 2: 923-945. https://doi.org/10.1007/S42438-020-00155-Y.

Ravinetto, R. & Singh, J.A. (2022). "Responsible dissemination of health and medical research: some guidance points". *BMJ Evidence-Based Medicine (EBM) analysis.* http://dx.doi.

org/10.1136/bmjebm-2022-111967.

Rawat, S. & Meena, S. (2014). "Publish or perish: Where are we heading?". *Journal of Research in Medical Sciences.* 19(2): 87-89, PMC399612, PMID: 24778659. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3999612/pdf/JRMS-19-87.pdf.

Rhannam, M. (2021). "Open access: creating a level playing field for the Global South". *Elsevier Connect.* https://www.elsevier.com/connect/open-access-creating-a-level-playing-field-for-the-global-south.

Richards, G. (2022). "3 ways to address the North/South divide in scientific research". *World Economic Forum (WEF).* https://www.weforum.org/agenda/2022/02/north-south-divide-scientific-research/.

Rivera-Collazo, I.C. (2021). "Climate change and archaeological sites: A case study for partnering cultural heritage and climate action". Rushfield, R. (Ed). *Stemming the Tide: Global Strategies for Sustaining Cultural Heritage through Climate Change.* Washington DC: Smithsonian Scholarly Press: 25-37. https://www.sanantonio.gov/Portals/0/Files/HistoricPreservation/CurrentProjects/ClimateHeritage/Stemming.the.Tide%20(VOR)_red.pdf?ver=2021-06-15-140117-223.

Roje, R.; Elizondo, A.R.; Kaltenbrunner, W.; Buljan, I. & Marusic, A. (2022). "Factors influencing the promotion and implementation of research integrity in research performing and research funding organizations: A scoping review". *Accountability in Research: Policies and Quality Assurance.* 30(8): 633-671. https://doi.org/10.1080/08989621.2022.2073819.

Roscher, M.B.; Allinson, E.H.; Mills, D.J.; Eriksson, H.; Hellebrandt, D. & Andrew, N.L. (2022). "Sustainable development outcomes of livelihood diversification in small-scale fisheries". *Fish and Fisheries.* 23(4): 910-925. https://doi.org/10.1111/faf.12662.

Rosowsky, D. (2022). "The role of research at universities: Why it matters". *Forbes.* https://www.forbes.com/sites/davidrosowsky/2022/03/02/the-role-of-research-at-universities-why-it-matters/?sh=2cf70f6d6bd5.

Sabzalieva, E. & Valentini, A. (UNESCO – United Nations Educational, Scientific and Cultural Organization) (2023). *ChatGPT and Artificial Intelligence in higher education: Quick Start Guide.* Paris, France and Caracas, Venezuela: UNESCO and The

UNESCO International Institute for Higher Education in Latin America and the Caribbean (IESALC). https://www.iesalc.unesco.org/wp-content/uploads/2023/04/ChatGPT-and-Artificial-Intelligence-in-higher-education-Quick-Start-guide_EN_FINAL.pdf.

Schmitz, J. (2022). "Peer review: Why is it important?". *PUBLISSO.* https://www.publisso.de/en/advice/publishing-advice-faqs/peer-review/.

Shanks, K. & Paulson, J. (2022). "Ethical research landscapes in fragile and conflict-affected contexts: understanding the challenges". *Research Ethics.* 18(3): 169-192. https://doi.org/10.1177%2F17470161221094134.

Soehartono, A.M.; Yu, L.G. & Khor, K.A. (2022). "Essential signals in publication trends and collaboration patterns in global Research Integrity and Research Ethics (RIRE)". *Scientometrics.* https://doi.org/10.1007/S11192-022-04400-Y.

Stridsberg, S.L.; Richardson, M.X.; Redekop, K.; Ehn, M. & Andersson, S.W. (2022). "Gray literature in evaluating effectiveness in digital health and health and welfare technology: A source worth considering". *Journal of Medical Internet Research.* 24(3). PMC8987953, PMID 35319479, article number e29307. https://doi.org/10.2196%2F29307.

Tan, E. (2023). "The missing piece: the link between blockchain and public policy design". *Policy Design and Practice.* https://doi.org/10.1080/25741292.2023.2233160.

The Norwegian National Research Ethics Committees. (2022). *Guidelines for Research Ethics in the Social Sciences and the Humanities.* https://www.forskningsetikk.no/globalassets/dokumenter/4-publikasjoner-som-pdf/guidelines-for-research-ethics-in-the-social-sciences-and-the-humanities.pdf.

Thelwall, M. & Sud, P. (2022). "Scopus 1900-2020: Growth in articles, abstracts, countries, fields, and journals". *Quantitative Science Studies.* 3(1): 37-50. https://doi.org/10.1162/qss_a_00177.

UNESCO (United Nations Educational, Scientific and Cultural Organization). (2021). *Reimagining our Futures Together: A new social contract for education – Report from the International Commission on the Futures of Education.* Paris: UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000379707.locale=en.

United Nations. (2023). *The Sustainable Development Report 2023:*

Special Edition. New York: United Nations Publications. https://unstats.un.org/sdgs/report/2023/The-Sustainable-Development-Goals-Report-2023.pdf.

University of Exeter. (2022). "Grey Literature: What is Grey Literature?". *LibGuides.* https://libguides.exeter.ac.uk/c.php?g=670055&p=4756572.

UKRI (UK Research and Innovation). (2022). *Publishing Your Research Findings.* London: UK Research and Innovation. https://www.ukri.org/manage-your-award/publishing-your-research-findings/making-your-research-publications-open-access/.

Valdivieso, P.A.; Alecchi, B.A. & Arevalo-Avecillas, D. (2021). "Factors that influence the individual research output of university professors: The case of Ecuador, Peru and Columbia". *Journal of Hispanic Higher Education.* https://doi.org/10.1177%2F15381927211008684.

Van Bavel, J.J.; Baicker, K.; Boggio, P.S.; Capraro, P.; Cichocka, A. ... & Willer R. (2020). "Using social and behavioural science to support COVID-19 pandemic response". *Nature Human Behaviour.* 4: 460-471. https://doi.org/10.1038/S41562-020-0884-Z.

Vie, K.J. (2021). "Can research integrity prevail in the market? Lesson from commissioned research organizations". *Accountability in Research: Policies and Quality Assurance.* https://doi.org/10.1080/08989621.2021.1937603.

Wager, E. & Kleinert, S. and on behalf of the CLUE working group (2021). "Cooperation and Liaison between Universities and Editors (CLUE): recommendations on best practice". *Research Integrity and Peer Review.* 6(6). https://doi.org/10.1186/S41073-021-00109-3.

Watkinson, C. (2021). "University presses and the impact of COVID-19". *Learned Publishing.* 34: 17-24. PMC8013694, PMID 33821102. https://doi.org/10.1002%2Fleap.1352.

West, J.D. & Bergstrom, C.T. (2021). "Misinformation in and about science". *PNAS,* 118(15), article number e1912444117. https://doi.org/10.1073/pnas.1912444117.

Woolston, C. (2022). "Lost funding and unwelcome moves". *Nature.* 608, 833-835. https://www.nature.com/articles/d41586-022-02120-0.pdf.

WEF (World Economic Forum). (2023). *The Global Risk Report 2023: Insight Report, 18th Edition.* https://www3.weforum.org/docs/WEF_Global_Risks_Report_2023.pdf.

Ye, P.; Liu, L. & Tan, J. (2022). "Influencing factors on college students' willingness to spread internet public opinion: Analysis based on COVID-19 data in China". *Frontiers in Public Health,* 10, article number 772833. https://doi.org/10.3389/fpubh.2022.772833.