ICT-based Cooperative Model for Transparent and Sustainable Scholarly Publishing Ecosystem

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The overall purposes of this study are to identify actions taken to counter predatory publishing practices as well as to propose an ICT-based model to detect such practices. The need to raise quantitative performance metrics to support career goals has created immense pressure on researchers to publish in the literature as frequently as possible. This "publish or perish" syndrome appears to be fueling a rise in scholarly journals and conferences that provide quicker and easier routes to publication. However, such avenues sometimes involve questionable academic practices with important ethical ramifications. One notable example is the proliferation of predatory publishing, including predatory journals and fake conferences. The widening impact of such activities is beginning to prompt academic societies, publishers, and institutions to take measures. This paper discusses the issues on predatory publishing practices, and some of the actions taken by various stakeholders to address these practices. In order to

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** According to our journal's new policy to be transparent about a possible conflict of interest, some authors included in the list of editors are requested to disclose their editorial position - even as they are not involved in handling the manuscript. As the statement reads "*editors are exempt from handling their own manuscripts and requested to reflect their position in the journal in published manuscripts.*"

build a transparent and sustainable scholarly publishing ecosystem, this study highlights multi-dimensional and specific solutions, including reforms to research ethics codes, research management rules, and legal protection from exploitative practices. This paper proposes an ICT-based cooperative model for monitoring of predatory publishers as a potential solution to create a sustainable and transparent infrastructure for a scholarly publication system guarding against misconduct in publishing practices.

Keywords: scholarly publishing, predatory journal, fake conference, open access, transparency, ICT based monitoring

1. "Predatory Issues" in Scholarly Communications

Scholarly communication is the backbone of academia. Proactive communication enables researchers to share knowledge within and across disciplines and validate the findings of other experts or their peers. One prominent form of such activity is scholarly publication through journals and conferences.

Scholarly publishing is a unique and ever-evolving ecosystem with a long history. Ever since the establishment of the world's earliest scholarly journals *Journal des Scavans* and *Philosophical Transactions* in 1665 (Banks, 2017), scholarly publishing has evolved into a gigantic industry, with some 80,000 publishing companies worldwide currently featuring approximately 300,000 journals, according to UlrichWeb (Meeks, 2018). Technological advances in digital research platforms and digital content production have not only facilitated the transition from print to electronic publication but also paved the way for relatively new, successful journals such as *F1000 Research*, *PeerJ*, and *eLife* that experiment with new innovative models, spanning peer review, business models, and publication models (Mudrak, 2018).

The rapid expansion of digital content, advances in IT, the growth of the scientific community, and the *zeitgeist* toward globalization have brought about a paradigm shift in scholarly communication. The "open science" initiatives, spearheaded by Europe and the United States, aim to facilitate cooperation between society and the scientific community and promote innovation. Under this drive toward open-access publishing, research articles published through publicly funded projects should be made available in digital format, and the grantees of these projects have the obligation to make their publications free for other scientists, industry insiders, and the general public to read. The scholarly publishing industry has also witnessed the emergence of "Gold" open-access (OA) journals that collect article processing charges (APCs) from authors rather than subscription fees, to maintain quality throughout their operations,

including those of editing, publication, governance, and platform maintenance. Plan S, one of the latest bids of the European scientific community to make publicly funded research freely available, has given powerful momentum to this ongoing trend toward OA publishing (Yeager, 2018).

However, these developments surrounding scholarly communication are accompanied by one less desirable trend: the emergence of predatory publishers. Predatory publishers were firstly defined by Jeffrey Beall: They publish counterfeit journals to exploit the open access model in which the author pays (Beall, 2012). From discussion among various stakeholders, the consensus definition reached was "Predatory journals and publishers are entities that prioritize self-interest at the expense of scholarship and are characterized by false or misleading information, deviation from best editorial and publication practices, a lack of transparency, and/or the use of aggressive and indiscriminate solicitation practices" (Grudniewicz et al, 2019, p. 21). With regard to the consumption of predatory publishing, the pressures of quantitative performance amid competition for recruitment, promotion, and research funding have caused its proliferation. The "publish or perish" syndrome has become more intensified than ever before due to the increasing application of bibliometric data to the assessment of research capabilities and outcomes (Eriksson & Helgesson, 2017). As a result, researchers are easily scammed by predatory publishers that offer a quick, easy route to publishing their research articles (Bell, 2018).

With the combined purpose of making easy money and publishing quick and easy papers, predatory publications are flooding the publishing market with a plethora of subpar OA journals, resulting in the negative publicity for OA journals that they are in general low-quality options for prospective authors. Shen and Björk (2015) reported that as of 2014, 996 publishers had published 11,873 predatory journals, with the figures only further increasing year by year. The number of exploitative journals, 1,800 in 2010, grew more than four times over 2010-2014 and their publication volume showed an eight-fold increase over the same four-year period, from 53,000 articles in 2010 to an estimated 420,000 articles in 2014. The tendency of increasing proportions of predatory publication differs when conditioning per field. While all areas have shown a recent rise in the proportion of predatory publications, agricultural sciences and engineering stand out (Perlin et al., 2018). This might be due to the higher rewards granted within these areas for international publications, as shown in Pyne (2017).

Several surveys found that most authors who published their articles in predatory journals were from India, Pakistan or elsewhere in Asia (Xia et al, 2015; Xia et al, 2017; Shen & Björk, 2015) and most predatory publishers come from India, North America, Asia (mostly from China), and others (Shen & Björk, 2015; Yadav, 2018). There is an alarming rise in the yearly number of articles published in predatory standalone journals and predatory publishers that operate fake journals. More and more of these predatory journals are registered on SCOPUS every year as well. It should also be noted that the proportion of standalone fake journals is higher than predatory publishers that publish two or more journals. The number of articles in those fraudulent journals increased from 1,894 in 2004 to 59,433 in 2015. The proportion rose from 0.1% to 2.75% over an 11-year period (Macháček & Srholec, 2017).

These predatory publications churned out to the scholarly community by unverified, predatory journals and conferences stifle legitimate scholarly communication and inflict great damage on research and scholarly communities. Researchers duped by fraudulent publishers also face the risk of having their personal information stolen. Their manuscripts appear in substandard journals without undergoing peer review or the linguistic editing, proofreading, and formatting services that are usually available for approved submissions in reputable journals (Shamseer et al., 2017). There is no guarantee that their research will be distributed, indexed, digitally preserved, or cited through legitimate routes. Furthermore, if fake journals are blacklisted and removed from the current citation index databases, researchers who have published their articles through these journals only earn a bad reputation. Misleading publications in predatory journals also create confusion among organizations in charge of managing nationally-funded research and development (R&D) projects, making them incapable of treating researchers fairly when evaluating their performances. Legitimate academic societies and publishers also fall victim to predatory publishers' dubious practices since these bogus organizations often steal the names or logos of reputable journals and societies to mislead authors. Controversies over fraudulent publications dampen scholarly communication and increase the social cost of screening fake organizations and publications (Berger & Cirasella, 2015; Eve & Priego, 2017; Ferris & Winker, 2017).

In light of these considerations, this study discusses the measures taken by various entities involved in scholarly publishing to tackle exploitative publishing practices. The authors suggest a set of specific strategies that can be taken within a government context. In addition, an ICT-based model is proposed for detecting suspicious publishers or journals, and, towards the end of the paper, we discuss what should be done to create a transparent, sustainable scholarly publishing ecosystem.

2. Responses against Predatory Publishing

The widening harmful impact of predatory publishing on every aspect of scholarly communication has led many countries and stakeholders in scholarly publishing to take their own action. Section 2 provides a host of information about response to predatory publishing practices made by individuals, countries, the journal index database, and the international publishing associated groups. The advantages and limitations of these responses from the different levels are discussed in Section 4.

2.1 Individual Researchers and Information Professionals' Efforts

Jeffery Beall, a librarian at the University of Colorado Denver, published a list of predatory journals on the library website in 2010 to prevent researchers from submitting their manuscripts to publishers with a dubious track record. He provided a list of more than 1,000 predatory publishers based on 52 standards, but he took it down in 2017 after threats and pressure from the publishers on the list. Since then, a small group of scholars and anonymous information professionals have resurrected this list and are currently operating Stop Predatory Journals

(https://predatoryjournals.com) and Beall's List of Predatory Journals and Publishers (https://beallslist.weebly.com). However, their inclusion criteria are unclear and the managers of these lists may not be wholly reliable. In fact, some of the journals flagged as predatory on these lists have appeared in globally renowned journal indices. Furthermore, most predatory journals are based in the Global South, including South Asia, the Middle East, Turkey, and Africa, leaving open the possibility of unfair prejudice that journals from these regions are invariably predatory (Raju et al., 2018; Regier, 2018).

2.2   National Responses to Predatory Publishing

(1) China

The Chinese Communist Party and State Council introduced a raft of reforms for improving research integrity under a new policy. New guidelines to strengthen scientific integrity were issued on May 30, 2018. The Ministry of Science and Technology (MoST) is responsible for managing a list of predatory journals, and researchers publishing their articles in these journals will receive warnings (Cyranoski, 2018). Under the new policy and the guidelines, illegal service agencies will be punished severely and individual researchers committing research misconduct will be banned from teaching and performing research in government-funded schools and scientific institutions[3].

Since China has a highly centralized government and research is largely funded by the governments of China, a policy made by the central government has a strong impact on academia widely. The provincial governments have been releasing new policies recently, which are quite similar to the central policy. The system of a blacklist and early warning list managed by MoST and the continuous monitoring and adjustment of the lists over time is expected to reduce the number of submissions to predatory journals (Petrou, 2020).

(2) India

India has become the third-biggest producer of research papers in the world, challenges on increasing predatory journals and fake conferences lie ahead of the country. Publishing at least two research articles are mandatory for the doctoral degree, many young researchers fall prey to such journals. In addition, Academic Performance Index (API) is yet another factor that drives young researchers for fast and easy publishing practices. India's University Grants Commission (UGC) has managed a list of 32,000 domestic and international journals that are worth considering when Indian researchers seek to publish their research. However, a 2018 study revealed that the UGC's list contains a number of suspicious journals (Patwardhan et al., 2018). On May 2, 2018, as part of its dedication to maintaining the reliability of its list, the UGC

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[3] China issues guidelines to strengthen scientific integrity - Ministry of Education of the People's Republic of China (moe.gov.cn) http://en.moe.gov.cn/news/media_highlights/201805/t20180531_337933.html

removed 4,305 suspicious journals from the list. Consortium for Academic Research & Ethics (CARE), an initiative of the Indian government launched to bring authentic lists of quality journals keeping substandard and unethical publications away. Indian researchers are recommended to check the UGC CARE list, Scopus, Web of Science, and DOAJ before their manuscript submission to a journal. In a broader perspective of Science and Technology Innovation, 'one nation, one subscription' was proposed as one of the agendas from the Indian Science Technology & Innovation Policy 2020. Open research repositories maintain authentic journals and research organizations such as IIT, CSIR, and others have provided advice and guidance to researchers (Patairiya, 2021).

(3) Korea

After a series of press release reporting international investigation into attendance at fake conferences, the Ministry of Science and ICT (MSICT) and the Ministry of Education (MoE) conducted a survey and found a considerable number of Korean researchers have attended conferences hosted by WASET and OMICS since 2014. A Korean outlet that joined the International Consortium of Investigative Journalists found that a number of papers published by these fake conferences were reported and considered as research outcomes of BK21 (Brain Korea 21) Plus projects supported by the Korean government, because of an atmosphere that encourages so-called global capacity enhancement indiscriminately.[4] Many researchers from renowned universities topped the list through publishing government-funded papers at these conferences. A study reported that South Korea comes out by far the worst among OECD countries, with a large amount of its research output published in journals suspected of predatory practices, based on SCOPUS database analysis. A high share of those countries with a large number of indexed documents published in suspicious journals such as in India, South Korea, Russia, Malaysia, South Africa, Saudi Arabia, Egypt and a few others evidently indicates a systemic problem, although individual researchers may have little awareness of predatory publishing (Macháček & Srholec, 2017). The Korean government announced that "intentionally and repeatedly" participating in fake academic conferences could lead to research misconduct and it would assess penalties including possible disciplinary action and the return of research funds. Since July 2018 the Korean government has set up a special committee of universities and research institutes to investigate predatory publications by Korean researchers in detail. On January 1st, 2021, National Research Development (R&D) Innovation Act came into force. As a comprehensive law on research governance and research ethics on national R&D, it provides a uniform legal policy against various research misconduct including questionable research practice. According to Article 58 of Enforcement Decree (Necessary Support to Secure Research Ethics) of the Act, the head of R&D institution shall prepare and operate its own research ethics regulations including ethics related to academic exchange such as submission to academic journals and attendance at conferences (Kim, 2021).

(4) Japan

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[4] https://newstapa.org/43828

According to the Mainichi analysis conducted with Prof. Wada of Wakayama University has found that over 5,000 papers in supposed 320 predatory journals were related to Japan. Researchers from the national institutions including Kyushu University, the University of Tokyo, Osaka University, and Niigata University were involved in the predatory publishing practice as well, possibly some of them were motivated by the inflation of their academic performance (Torii, 2018). Another study found out that 4% of articles in 200 supposed predatory journals came from Japan, however, these rates must be reinterpreted based on scientific output per nation. According to the adjusted rate by productivity is estimated at less than 1% for Japan (Moher et al, 2017). Kyushu University has begun instructing its researchers to refrain from submitting articles to predatory journals while no direct countermeasure against predatory journals has been taken by the Japanese government yet.

(5) United States

The U.S. Federal Trade Commission (FTC) sued India-based OMICS Group based on allegations that it was withholding information on publishing fees and misrepresenting the nature of its journals and obtained a preliminary injunction to halt the company's deceptive practices. OMICS claims to publish more than 700 "peer-reviewed open-access journals" on a wide variety of research topics and to have "editing committees consisting of more than 50,000 members, prominent reviewers, and more than 1,000 academic societies." In its complaint, however, the FTC asserted that these claims are fraudulent and most publications in OMICS journals are not peer-reviewed (Zimmer, 2017).

The U.S. National Institutes of Health recommended that researchers make use of existing international guidelines such as "Think, Check, Submit", "Principles of transparency and best practices in scholarly publishing" and "Recommendations for the conduct, reporting, editing, and publication of scholarly work in medical journals" to enhance the reliability of their articles.

(6) Germany

Germany is the first country in the world to have enacted a law against unfair competition, "Act against Unfair Competition." Third-party hijacking of domain names is strictly prohibited by law. The Helmholtz Association of German Research Centers, in a Frankfurter Allgemeine report, dubbed predatory publishers "an utterly negative and problematic phenomenon in the scientific publishing and communication system, which must be combatted consistently through all legal options." Anja Karliczek, German Federal Minister of Education and Research, called for thorough investigations into bogus scientific publications through fake conferences and journals. In 2019, the Code of Conduct "Guidelines for Safeguarding Good Research Practice" was adopted by the DFG (Deutsche Forschungsgemeinschaft, German Research Foundation). It represents the consensus among the member organizations of the DFG on the fundamental principles and standards of good practice. The DFG stated, "The guidelines underline the importance of integrity in the everyday practice of research and provide researchers with a reliable reference with which to embed good research practice as an established and binding

aspect of their work" (DFG, 2019). Though the guidelines avoid direct reference to predatory publishing phenomenon but note that its recommendations on "ensuring good scientific practices" and "selecting publication medium and taking the role of editor carefully, with due regard for the journal's quality and visibility in the relevant field of discourse." One or two guidelines of the DFG Code should be implemented by all higher education institutions and research institutions. Compliance with this Code is a prerequisite for receiving DFG funding; institutions that do not implement the guidelines are not eligible for funding (DFG, 2019).

2.3 International Citation Index Databases' Response to Predatory Publishing

(1) Web of Science (Clarivate)

The Journal Selection Process of the Web of Science (WoS) Core Collection, updated in June 2018, states, "evidence of unethical policies such as predatory publishing practices or editorial instructions leading to excessive, inauthentic journal self-citation or any other fraudulent practices are not acceptable in any journal under evaluation and result in immediate rejection. When discovered in a journal already covered in WoS Core Collection they may result in deselection or the suppression of any affected citation metrics" (Testa, 2018). In fact, biomedical journal *Oncotarget* was removed from the MEDLINE database on suspicion of predatory publishing practices. The journal was also de-indexed and removed from the WoS Core Collection in June 2018 (McCook, 2018).

(2) SCOPUS (Elsevier)

Elsevier also applies rigorous selection criteria and conducts post-publication quality assessments as part of its utmost commitment to the quality of its SCOPUS database. The publisher receives feedback on alleged predatory journals from users and other relevant parties. Then, using pre-determined indices and standards, it investigates all flagged journals and determines whether they are predatory. All of these journals then undergo a re-evaluation process by the Content Selection and Advisory Board (CSAB). Journals found to be predatory at this stage are deleted from the SCOPUS list and publications in such journals are removed from the index (Steiginga, 2017).

(3) Directory of Open Access Journals

The DOAJ is one of the most well-known databases of open-access journals that provides a well-curated list of OA journals across the world. It applies more rigorous evaluation criteria for journal registration in order to prevent predatory journals from finding a way into the directory. It also joined the COPE, OASPA, and WAME to declare the Principles of Transparency and Best Practice in Scholarly Publishing. The DOAJ strives to maintain the quality of its database. In 2015 it re-evaluated the journals on its database and de-selected 3,300 of them on suspicion of being predatory. It also grants a DOAJ seal to journals that satisfy the transparency and sustainability criteria in regard to publication and governance (Baker, 2016).

2.4   International Publishing Organizations' Response to Predatory Publishing

(1) STM (International Association of Scientific, Technical, and Medical Publishers)

The STM is an association of more than 120 major publishers that collectively publish nearly 66% of all journal articles worldwide. STM requires its members to comply with its code of conduct and international ethical principles for scholarly publication. In August 2018 it issued a statement on the increase in unethical and deceptive journal practices.[5]

(2) OASPA (Open Access Scholarly Publishing Association)

The OASPA issued a joint declaration titled "Principles of Transparency and Best Practice in Scholarly Publishing," with the Directory of Open Access Journals (DOAJ), the Committee on Publication Ethics (COPE), and the World Association of Medical Editors (WAME).[6] The declaration contains principles on transparency, ranging from a journal's governing body to editorial boards, peer reviewing, APC, and revenue sources, and principles on sustainable operations for journals, ranging from publishing ethics to archiving and access. These guidelines are used to vet prospective members of these four organizations and reject membership applications from exploitative publishers. The four organizations also require their existing members to observe their code of conduct that prohibits fraudulent practices.[7]

(3) ISSN

The ISSN reveals no information on the origin or quality of journals, but ISSN publication identifiers, unique to each journal, reduce the confusion that may arise between journal names. The ISSN International Centre sponsors the "Think, Check, Submit" campaign along with the COPE, ALPSP, DOAJ, and OASPA (Reynolds, 2016).

3.   Recommendations

As shown in previous sections, a considerable number of predatory journals and publishers originated from Asian countries was reported. Regardless of whether there are excessive generalization errors in the existing reports or not, the Asian journal publishers and researchers

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[5] https://www.stm-assoc.org/2018_08_09_STM_statement_on_the_increase_of_unethical_and_deceptive_journal_practices.pdf

[6] https://oaspa.org/principles-of-transparency-and-best-practice-in-scholarly-publishing-3

[7] https://doaj.org/bestpractice

have suffered from the lack of information and communication with the scholarly communities mostly initiated from the Western countries. The proliferation of predatory publishers, journals, and conferences is a multi-faceted, complicated phenomenon involving a variety of complex causes. This complexity warrants a multi-dimensional response.

This section discusses recommendations on establishing a transparent and sound scholarly ecosystem aimed at providing solid support for ongoing endeavors toward safeguarding scholarly content from predatory research practices, and for facilitating wider utilization of research publications. Particularly, a cooperative model based on ICT is suggested and highlighted in the Asian context where the culture of scholarly publishing is not sufficiently mature.

3.1 Regulatory and Legal Reforms Dependent variables

Government-controlled organizations and research bodies in charge of managing public funds in many countries have their own ethical codes. In Korea, the Ministry of Education, the National Research Foundation of Korea, the Korean Association of Academic Societies, and the Korean Institute of R&D Human Resource Development compile and distribute guidelines on the code of research ethics and provide education on research ethics to researchers. In 2007, the Center for Research Ethics Information was established as an organization designated by the National Research Foundation for projects related to research ethics. The center is tasked with collecting and publishing information on the codes of research ethics in Korea and abroad, guidelines, educational materials, and the latest trends in research ethics. However, its list of research malpractices does not include deliberate research publication in predatory journals or conferences. This warrants reforms in the rules and guidelines, which may involve a practical and detailed policy on research malpractice criteria, monitoring, investigation procedures, and severity of disciplinary actions for each type of malpractice. In fact, there are already ethical rules against research publication through predatory publishers, but to some extent, the absence of detailed procedures on disciplinary action sends some rogue researchers the wrong signal that they can flout ethics and repeatedly publish their manuscripts in predatory journals or conferences. Clearly defined disciplinary procedures are required as a warning to researchers that such deliberate violation of research ethics will have consequences.

3.2 Legal Protection

Individual researchers who have suffered financial loss, violation of intellectual property rights, and defamation from predatory publishers, and scholarly organizations that have suffered trademark infringement due to confusingly similar journal or domain names should have access to legal protection. Korea has legislated against unfair competition (Unfair Competition Prevention and Trade Secret Protection Act) with reference to the equivalent U.S. law. A 2004 amendment to this act, an emulation of the U.S. Anti-cybersquatting Consumer Protection Act (ACPA), prohibits cybersquatting. Internationally, the Internet Corporation for Assigned Names and Numbers (ICANN) has approved five dispute resolution service providers that support the

settlement of disputes related to domain names under the Rules for Uniform Domain Name Dispute Resolution Policy. The Asian Domain Name Dispute Resolution Center, one of these five service providers, established a Seoul office in 2006, lowering the geographical and language barrier for local researchers and organizations so that they can benefit from easier, quicker dispute resolution. We propose close collaboration between these domestic and international organizations to provide trademark holders (publishers and journals) and consumers (individual researchers) with information on legal protection and dispute resolution procedures in a timely manner and, ultimately, to protect their rights from predatory publishers.

3.3 Government-Academy-Industry Cooperative Model based on ICT

Although a few experienced scholars have advised to appreciate through critical evaluation and not mere blind trust based on white- or blacklisted perception (Teixeira da Silva, 2021; Yamada, 2021), researchers in their early career stage lack information and connection to the wider community and have difficulties in establishing their own criteria. Besides, the exponential increase in the publishing volume in today's global academia and the weekly emergence of new journals make it impractical for individual researchers to learn about and vet every single publisher, journal, and conference worldwide. This practical constraint warrants the establishment of a nationally certified agency to manage the list of journals where publication is recognized as a legitimate research activity, as well as information related to them. In addition, ICTs, in general, are regarded as an effective anti-corruption tool, not only by increasing information access but also by ensuring rules are transparent and by building the ability to track the actions of stakeholders (Bertot et al, 2010).

A cooperative model between government, government agencies, researchers, academic societies, and stakeholders in the scholarly publishing industry to construct a scholarly information security center, which, as shown in Figure 1, bases its operations on the database.
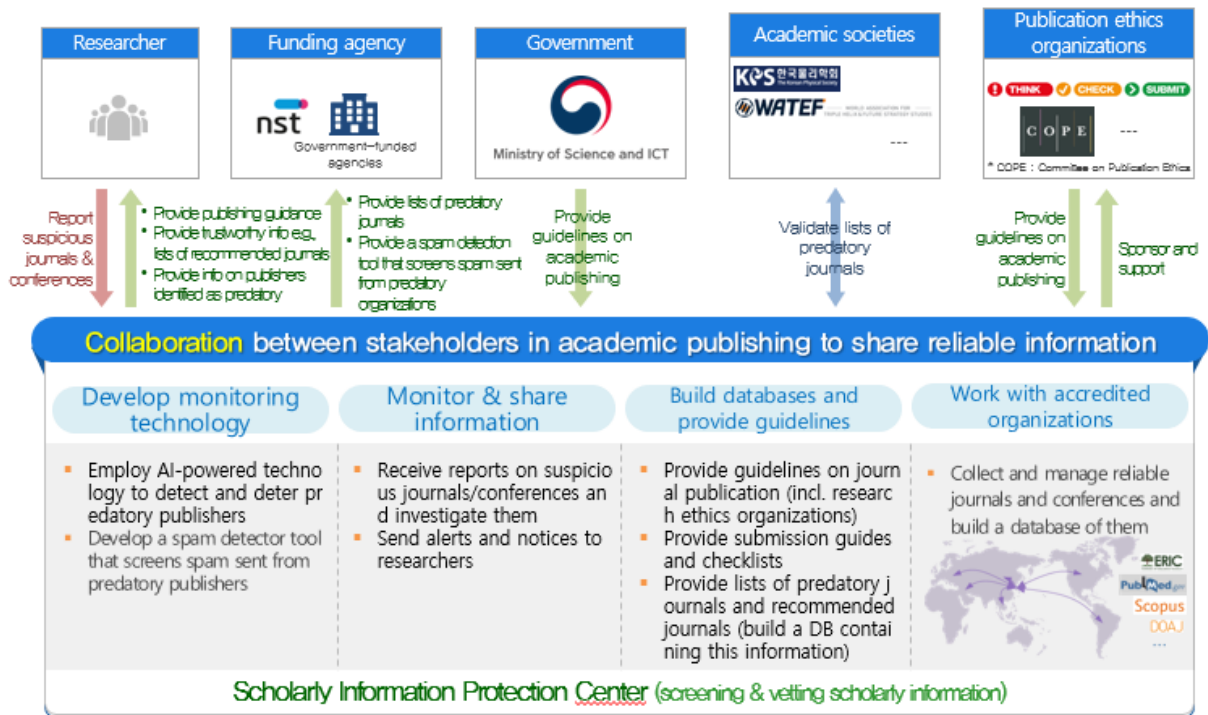
Figure 1. ITC-based cooperative model

The proposed model includes the following functions:

(1) Monitoring and information sharing

Voluntary reports on suspicious journals and conferences from researchers are collected to the centralized database and the information on journals and conferences identified as predatory is shared with researchers. It keeps monitoring the journals identified as predatory in the existing list such as Cabel's list, Beall's list, and its successors and collects journal titles deleted from international abstract and index databases on a constant basis.

(2) Development of detection technology for screening predatory publishers

Previous investigations presented shared features in general among predatory journals (publishers) as follows: (Butler, 2013; Hemmat Esfe et al., 2015; Seo & Jung, 2018).

- Features on journal and its ownership: Journal title and Publisher name reminding prestigious journals, incorrect ISSNs, URLs, Editorial boards, Indexing DB, peer review, address, et al.;
- Features displaying less robust system: No submission system, typos in websites, No PDF or (JATS) XML provided, no policy for long-term preservation, broken URLs;
- Features on dubious peer-review process: Too short period from the receipt of submission

to the publication, not known editors and reviews, closure of acceptance rate of the journal.

An ICT-based technology can identify spam sent out by exploitative organizations and screen predatory journals and conferences. The existing AI-powered detection model under the monitoring and control support system at the Science and Technology Cyber Security Center can be used to establish a round-the-clock monitoring system by, for example, feeding data on predatory publishers and journals into the detection module.

(3) Provision of lists of reliable journals and conferences

The proposed center will collect, integrate, and manage a list of trustworthy journals and conferences in conjunction with internationally accredited organizations, and turn this information into a database. The following are some of the sources of information on reliable publishers, journals, and conferences:

- Lists of selected publishers in existing citation index databases: DOAJ, ERIC, Inspec, PubMed, SCOPUS, Ulrich's list, WoS;
- Lists of members at reliable scholarly publishers' associations: COPE, International Committee of Medical Journal Editors (ICMJE), OASPA, STM
- Lists of journals managed by national research organizations: Berlin Institute of Health-Open Access Journal Positive List (Germany), BFI list (Denmark), CNRS journal ranking (France), ISTIC journal list (China), JST journal list (Japan), UGC list of approved journals (India);
- Lists compiled from various sources through a curating process: ABDC Journal Quality List, CORE Conference/Journal Ranking, ERA ConferenceRanks, Cabells Journalytics, JournalGuide Whitelist, Journal Publishing Practices and Standards (JPPS).

(4) Provision of guidelines

The proposed center will guide researchers on the presence of predatory publishers, journals, and conferences as well as the hazards posed by them. It will also publish various international guidelines in Korean in a timely manner to help domestic researchers determine the legitimacy and academic prominence of academic societies, through which they can make the right decision about whether to submit manuscripts to their journals or attend their conferences. The following are examples of such international guidelines:

- **Think, Check, Submit**: Provides guidelines and checklists for reference to researchers when they choose a journal to submit their manuscripts with (https://thinkchecksubmit.org);

- **Think, Check, Attend**: Provides guidelines and checklists for reference to researchers when they choose a conference to make a presentation on their research (https://thinkcheckattend.org);
- **COPE**: Provides an international standard guideline that covers all aspects of research and publication ethics (https://publicationethics.org);
- **Principles of transparency and best practice in scholarly publishing:** provides principles of transparency and best practice for scholarly publications and clarifies that these principles form the basis of the criteria by which suitability for membership is assessed by COPE, DOAJ, and OASPA, and part of the criteria on which membership applications are evaluated by WAME (https://doaj.org/apply/transparency/).

The cooperative model between the government, academia, and industry implemented in South Korea can be effectively applied to other Asian countries if it is customized according to the situation. What is important is to create an environment in which funders, research institutes, and academic societies can cooperate. In addition, researchers should be able to access and use it conveniently. For this, the role of the librarian is very important. Also, if the roles can be divided between countries, the best effect will be obtained. This is because the problem of predatory publication is a global problem that cannot be solved by any one institution or country alone.

4. Discussions and Limitations

4.1 Discussions

The proliferation of predatory publishers, journals, and conferences is a multi-faceted and complicated phenomenon and inflicts great damage on research and scholarly communities. Responses and measures to predatory publishing practices by various stakeholders at different levels were investigated in this study. Individual efforts made by researchers and librarians have provided the concept and the list of predatory publishers and journals for scholarly communities and raised their awareness of the harmful impact of such practices. Those lists have been used as blacklists and organizational and national measures of punishment on illegal publishing practices have been made based on the lists. Those lists, however, lack transparency, validation, and authority. The lists are outdated and sometimes biased since the publishers and journals listed in Beall's blacklists were predominantly from developing countries of Asia, the Middle East, Africa as pointed out in the literature. Though a journal that did reveal clear characteristics of predatory behavior and was included in the lists may have improved their performance and practice (Macháček & Srholec, 2017). Another limitation of the list-based approach mentioned in the recent literature is to place the responsibility on individual researchers rather than systems (Teixeira da Silva et al, 2022). Responses at the national level differ from country to country. US FTC sued an India-based publishing group claiming that they deceived researchers about the nature of their journals and conferences by presenting misleading information on APC and

editorial board on their website. US government has not taken direct sanctions against researchers who are involved in predatory publishing practices but recommended the check-up of the existing guidelines and code of conduct. In Germany, researchers should be compliant with the DFG Code of Conduct. For researchers, western countries initiate a system of self-monitoring and voluntary commitment within the national academic research system. On the contrary, Asian countries such as China, India, and South Korea are taking active measures. In China, India, and South Korea, the government or research funders took direct action, whereas, in Japan, the response was made at the university level. In South Korea, the issue of the predatory publication was highlighted through media reports, leading to measures to reinforce research ethics in the academic society. However, researchers agree neither with the direct sanctions by the government based on those lists. Moreover, those responses taken at the national level have been made isolated whereas the predatory publishing practice is a global issue and the rapid and ever-growing expansion of predatory publishing practices these days requires a concerted, coherent, and coordinated approach.

International index databases have strengthened their monitoring and filtering mechanism after facing criticism that rather a considerable number of predatory journals were included in them. However, most predatory journals locate outside of those index databases co-existing with legitimate journals. The associations of publishers and related communities in western countries have shared information, communicated actively, and published the joint principles and code of conduct, however, efforts necessarily engage various stakeholders across the globe to combat the widespread predatory publishing practices.

Regardless of whether there are excessive generalization errors in the existing reports or not, the Asian journal publishers and researchers have suffered from the lack of information and communication with the scholarly communities or associations mostly initiated from the western countries. Reflecting the current situation of Asian countries, the authors believe that the involvement of the government is essential in tackling the predatory publishing practices and foresting the transparent and sustainable ecosystem for scholarly communication. The establishment of regulations and provision of legal protection by the government protects the rights and safety of researchers and underpins the sustainable scholarly ecosystem. In addition, a cooperative model among Government-Academy-industry based on ICT is suggested for detecting suspicious publishers or journals and highlighted in the study. Information and communication technology (ICT) enabled efforts are suggested as a cost-effective and convenient means to improve transparency in the scholarly ecosystem, as they have offered a new and innovative approach so far. The cooperative model based on ICT empowers researchers to make informed decisions and it will function as a potential solution to create a sustainable and transparent infrastructure for a scholarly publication system guarding against misconduct in publishing practices.

4.2 Limitations

In the suggested ICT model voluntary reports on suspicious journals and conferences from researchers are collected to the centralized database and the information on journals and conferences identified as predatory is shared with researchers. The suggested national agency collaborates with various domestic and international stakeholders, collects, curates and updates the journal and conference information on a regular basis. This concept is quite similar to a crowdsourced approach for identifying and classifying predatory publishers or journals. However, the recommendations suggested by the authors do not rely solely on the crowdsource-like approach but include multi-dimensional and comprehensive solutions. The crowdsourced approach could be utilized for detecting and identifying predatory publishing practices if it is well designed and sufficiently big data are collected. A further study deepening into the technical methodology and the specific policy in detail for detecting, identifying, and classifying predatory publishers and journals is left for our next step.

5. Conclusions

This study has discussed the rapid proliferation of predatory publishing practices in recent years and their hazardous impact on scholarly communication. Predatory publishers, in their obsession with profits, flood the scholarly publishing market with substandard articles that have not undergone the appropriate process that legitimate scholarly publishing usually involves, to the detriment of scholarly communication and the open-access scholarly publishing ecosystem. Countries and scholarly publishing and indexing organizations worldwide have invested efforts into tackling this phenomenon, but they tend to take individual action, primarily involving only major organizations, rather than forming a united front. As such, this study has proposed more comprehensive, multi-dimensional solutions to combat predatory publishing, that is, reforms in codes of research ethics and research management rules, legal protection, and ICT-powered and information-based responses. Implementation of the proposed solutions will contribute to creating a more transparent and sustainable scholarly publishing ecosystem.

Also, as mentioned earlier in this study, the lists of predatory publishers and journals compiled and managed in the Western world contain a large number of journals based in non-English-speaking countries and/or in the Asian region, many of them published by small-scale academic organizations in languages other than English. These non-Western journals are often perceived as inferior to larger journals managed and published through the infrastructure of commercial publishers with an established presence in the market, making them susceptible to underrepresentation in the lists of high-quality, reliable journals. This unequal reality warrants consideration for empowering non-Western journals to enhance their quality and satisfy the internationally recommended publishing and ethical standards in their operations. Further study for enhancing and empowering local journals in the non-Western region including Eastern Asia should be investigated and suggested to move toward the transparent and sustainable scholarly publishing ecosystem.

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