

Review research paper

INTERNET KNOWLEDGE EXCHANGE AND CO-AUTHORSHIP AS FACILITATORS IN SCIENTIFIC RESEARCH

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Abstract. *The aim of this paper is to determine to what extent the use of Internet as a way of acquiring information for research purposes is a successful tool. The Internet can facilitate the research in different ways, some of which are being presented in the paper. Researchers have access to a wide range of databases available on the Internet, also having the opportunity to use sites designed as a social media for academics such as ResearchGate or Academia. Apart from that, there exists some degree of correspondence between open access philosophy and hacker ethics which is being related to academia to point to the possible ethic value researches have towards one another. The paper focuses on advantages of using Internet for the purposes of facilitating research, at the same time introducing the topic of collaboration and co-authorship as vital in today's 'publish-or-perish' academia world.*

Key words: *Internet, research, information, collaboration, so-authorship, open access publication*

1. INTRODUCTION

Oxford dictionary defines Internet as “an international computer network connecting other networks and computers from companies, universities, etc” (Oxford Advanced Learner’s Dictionary, s.v. “internet”, accessed on March 4, 2020). Cambridge dictionary gives even more detailed and precise definition stating that it is “the large system of connected computers around the world that allows people to share information and communication with each other” (Cambridge Dictionary, s.v. “internet”, accessed on March 4, 2020), the key element of the definition being information and communication, due to their importance and necessity in the modern world. Researchers find this media an excellent tool in their scientific research, considering it one of the most convenient avenues of current flow of new information, otherwise difficult to retrieve. Moreover, it can be considered to be modern encyclopedia, its databases being immense and ever-growing. Furthermore, it reduces the cost of conducting research, as well as reducing the time spent on the research itself. However, the biggest advantage of obtaining data online rather than in a library is the immediate access and the ease of search. This aspect of search for

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information can drastically shorten academic searches, resulting in a vastly focused research effort.

One of the biggest disadvantages of obtaining information from the Internet is certainly the inaccessibility to high standard journals, which can be accessed only through licensed libraries paying subscription fees to the publishers or buying them. Being of high standard and value, these are usually quite expensive. Limited accessibility to data leads to less thorough research, which ultimately results in not thorough enough findings.

2. LITERATURE SEARCH AND ONLINE DATABASES

Literature search is often an exhaustive and time-consuming undertaking. Prior to the existence of the Internet, the main sources of information were libraries, both local and national, containing current and archived scientific journals, books and articles, and it still remains an important component of any systemic academic search. However, following the advancement of technology, the Internet now offers plenty of information and literature. A part of conducting a scientific literature search now consists of web-based search engines, such as Google Scholar, and a variety of electronic databases, which are listed by Wikipedia to approximately 150 online databases and search engines. When doing a research, scientists have various methods of literature research at their disposal, such as hand search and electronic search of journals; snowballing, which includes reference searching and tracking citations, and personal knowledge (Grewal, Kataria and Dhawan, 2016). Analysis of previous literature research methodology and results allow the researcher to examine critically how scientists had approached issues before and can help in the formulation of new ideas about the problem in question.

2.1. Using online academic journal databases

As written information in academia became vaster, the libraries had to dispose of the majority of their records, sometimes having to discard useful information that could be further utilized. In order to stop this detrimental practice, in 1995 a company named JSTOR (Journal Storage) was founded by the president of Princeton College, William G. Bowen, so as to provide digitalized versions of academic journals, economy and history journals, which marked the beginning of creating and using online databases. Digitalization of existing archives provided the opportunity for the older volumes of journals to be still accessible in the libraries and universities and for the new ones to be accessible in both ways, printed and digitalized, as well as for the ones that are created only in the digitalized version. JSTOR offers access to approximately twelve million academic articles published in the US before 1924 without charge. Following the foundation and success of the JSTOR model, other databases came into existence offering further research resources. Some of the most famous and utilized besides JSTOR, are: Scopus, Web of Science, PubMed, ERIC, IEEE Xplore, ScienceDirect, etc.

Scopus is one of the two biggest commercial online databases that covers scholarly literature from almost any discipline. It focuses on social sciences, arts and humanities, but it also includes literature on science, technology and medicine (STM), Health Sciences, Life Sciences, Physical Sciences. Scopus' provider is Elsevier. (2020)

Web of Science is the second big online scholarly database. Usually, academic institutions provide either access to Web of Science or Scopus on their campus for free. This database is multidisciplinary and its provider is Clarivate Analytics (formerly Thomson Reuters).

PubMed database, whose provider is National Institute of Health US (NIH), is the most reliable and exhaustive resource for research in medicine and biological sciences.

ERIC (Educational Resources Information Center), sponsored by the Institute of Education Sciences of the U.S. Department of Education, is the world's largest digital library of indexed and full-text education literature and the most popular resource database for educational sciences.

IEEE Xplore, whose provider is IEEE (Institute of Electronics Engineers), is the leading academic database in the field of computer science and engineering.

ScienceDirect is a multidisciplinary database featuring millions of academic articles published by Elsevier. ("The Best Academic Research Databases [2019 Update] – Paperpile", 2019)

Google Scholar, on the other hand, is not a bibliographic database but a search engine. However, the items one finds on Google Scholar are academic ones. Items found in databases like Scopus or Web of Science go through editorial process, while Google Scholar's built-in algorithm is such that anything resembling academic articles, papers, book chapters, theses, research reports, conference proceedings is appended to the existing list. "It retrieves documents or page matches based on the keywords searched and then organizes the results using a closely guarded relevance algorithm" (Vine, 2006, 98). What Google Scholar does is provide the link to the information, not the information itself. Furthermore, its identifier is not stable enough for the information to be retrieved on the permanent basis. "To be able to be eligible as a database, Google Scholar would need to have stable identifier for its records and ensure that no records will be eliminated" (Kumar, 2020). Google Scholar "works well for journal articles and conference papers the publishing arenas in which computer scientists, engineers and hard scientists are most comfortable [...]. Books and edited collections, are often indexed with incomplete bibliographic information creating a distributed, invisibly duplicated, scatter of additional work for scholars..." (Zeitlyn& Beardmore-Herd, 2018). On the other hand, Google Scholar seeks to come up with links to open access versions of the articles. Google Scholar is a useful addition to other trusted sources of information, rather than the reliable source of information itself.

3. IMPORTANCE OF OPEN ACCESS INFORMATION SHARING

Nowadays the publishing conventions of Gold and Green Open Access options are used by most academic journals. The Gold option allows publication with costs being met by the author. Green Access is free of cost to the author and independently of publication by publisher, material may be posted to a website controlled by the author, institution which funded the work or an independent repository. The advantage of Gold Open Access is their free accessibility immediately upon the publication. Green Open Access allows an author to publish an article freely; however, publishing houses have different policies on the length of time required for the articles to be freely released, which is also referred to as embargo period. ("What Is Open Access?" 2020) When talking about the more frequent open access publishing method in medical science, Dogra (2015, 1) says that "this is a welcome change from the society-controlled and readers-pay-fee-based journals where only a few privileged members have access to specific material [...]. Indeed, this is a remarkable contribution to science [...]. This free access leads to dissemination of scientific work across the globe promoting innovations in science and sharing of important information that leads to better medical care worldwide." Giustini (2005)

accentuates the importance of open access publishing concerning “anyone not affiliated with a large medical center or university,” observing that “the ability to search for and access research material that is available for free on the web is a boon” (Giustini, 2005, 1488).

3.1. Gift culture philosophy

There exist a significant number of academics nowadays, who are strong believers that “information sharing is a powerful positive good and there is an ethical duty to share expertise by writing free and open-source code and facilitating access to information wherever possible” (Pearce, 2012, 1). The possible parallels between academia open research publishing policy and hacker ethics will be presented and the potential connection with the gift culture established.

The hackers being referred to in this paper are “the people who proudly call themselves ‘hackers’ - not as the term [that] is now abused by journalists to mean a computer criminal, but in its true and original sense of an enthusiast, an artist, a tinkerer, a problem solver, an expert” (Raymond, 2001, *xii*). The philosophy of “hacker ethics” was described in Levy’s book *Hackers: Heroes of the Computer Revolution* (2010). Levy defines it in the following way: “It was a philosophy of sharing, openness, decentralization, and getting your hands on machines [...] to improve the world” (Levy, 2010 ix). This philosophy is “enabled by the gift culture of open source, in which recognition of an individual is determined by the amount of knowledge given away” (Pearce, 2012, 2).

Raymond describes the gift culture in his book *The Cathedral and the Bazaar* (2001). He argues that “human beings have an innate drive to compete for power” (Raymond, 2001, 80), and that the way of gaining status has been changing depending on the kind of society people were living in. Talking about the gift culture, he observes that in these cultures “social status is determined not by what you control but by what you give away” (Raymond, 2001, 81), noticing that this can be observed in some aboriginal cultures but also in some social strata close to the western modern man, specifically the social strata of very wealthy, in which the acts of philanthropy tend to be rather common and also a way of gaining a social status. There exist parallels between this kind of culture and the hacker ethics and their society, where, as he says “the only available measure of competitive success is reputation among peers” (Raymond, 2001, 81), which makes their society a gift culture of open source. “This type of philosophy should be familiar to many in academia, which has also historically followed a gift culture, which regards contributors through a process of peer review” (Pearce, 2012, 2).

Bergquist and Ljungberg (2001) explain that the parallel between the gift culture and academia is that giving away knowledge is a way of gaining reputation and the way academic’s career progresses. Giving away knowledge in the academic field and the consequent “acceptance of a gift by a society implies recognition of the donor and the existence of certain reciprocal rights” (Bergquist & Ljungberg, 2001, 318). The most important issue, however, is that by sharing knowledge a researcher gives rise not only to the possibility of their work being referred to, thus both continuing the work and going further to the scientific frontier. It also means becoming or staying visible in the academic field. The reputation of the researcher stays secured by the fact that their work is recognized by being referred to as the original idea by the way of citing it. In this way, peer review is the process by which gaining status in the academic field is obtained (Bergquist & Ljungberg, 2001).

Henriksen (2016, 2) accentuates the importance of publishing as an “essential element in the scholarly communication system.” She adds that in this kind of system publication activity is connected to reward, responsibility and recognition. Recognition is the resulting element of the process of publication which is considered a gift. In that way the social status is gained and maintained thus resulting in what is parallel to the gift culture. “It is by authoring a publication the researchers attribute credit and enable the accrual of reputation in the reward system, and this reputation is influential in the consideration for employment, funding and increases in salary” (Henriksen, 2016, 2).

4. COLLABORATION AND CO-AUTHORSHIP

4.1. Collaboration platforms/social media for scientists

Not all the sites where open access papers can be found are databases modelled like JSTOR or earlier mentioned Internet databases. The different models are collaboration platforms like ResearchGate or Academia.edu which have fundamentally altered the way scientists work, share information and their findings. Founded by physicians Dr. Ijad Madisch, Dr. Sören Hofmayer, and computer scientist Horst Fickenscher in 2008, and with more than 17 million users, ResearchGate is built for open scientific exchange of information and knowledge. “It’s restricted to working scientists, a rule it enforces by requiring users to register via institutional e-mail addresses” (Kintisch, 2014), whereas the Academia.edu’s policy is that everyone can be a part of it. One of the most useful aspects of it is the Q&A forum section where the topics in the form of the questions can be discussed whereby colleagues from the same or different science field can exchange opinions and ideas and even start collaboration. One can also find suggestions and solutions to their problems in research, making the section a form of peer-review before submission for publication. Moreover, academia beginners can start collaborating with academia experts and make use of their experience to enhance their own research. Both experienced and young researchers can benefit from collaborating, working together and sharing ideas; young researchers can benefit from the knowledge and expertise of experienced researchers, but the experienced ones can also benefit from the enthusiasm, zeal and energy of their younger colleagues.

Dr. Ijad Madisch says that “collaboration is key for science. Scientists need to work together to drive progress and they need access to each other’s findings to build on them together.” (“ResearchGate and Springer Nature embark on pilot to deliver seamless discovery and an enhanced reading experience | Corporate Affairs Homepage | Springer Nature”, 2019)

4.2. The Importance of Publishing and Co-authorship Contribution

The drive to publish constantly creates a dynamic that is experienced throughout all levels of academic research. This makes co-authorship an alternative path towards creating a diverse body of published material. Collaboration amongst researchers is a well-established means to avoid detrimental gaps in an academic publishing record. “Network plays an especially important role in research... Researchers rely much more, compared with other work forces, on interactions with collaborators” (Li, Hu & Pei, 2020, 2).

The creation of ‘publish-or-perish’ culture leads academics to seek constant publication. Consequently, when such great emphasis is placed purely upon achieving publication, the

quality of academic research may suffer. The stigma of publishing gaps and the forced necessity for researchers to publish make continued publishing more important than the research itself.

4.3. Technology Contributing to Co-authorship

Collaborative research methods, another means of facilitating research among academics, have been facilitated by the “developments in information technologies - especially the launch of the World Wide Web in the 1990s (CERN, 2017),” and they “have probably contributed to an increase in co-authorship as well as co-authors” (Henriksen, 2018, 2). Henriksen explains that the facilitation of communication, interaction and sharing information drives impetus to the raising collaboration among researchers. “Nowadays, science is more accessible and freer than it has ever been before and—because of globalization—there is a particularly growing interest in scientific collaboration” (Popp et al. 2018, 4). Furthermore, in the age of technology, geographical distances present no hindrance anymore to their joint projects. Because of technology, researchers can now, more than ever, find their way to collaborating with each other regardless of the part of the world they are living in. However, live collaboration has got some advantages that outweigh online collaboration. There is an emotional and social element that plays a part in the growth of co-authorship. A shared objective amongst researchers can create general debate where problems are analyzed. This can lead to the creation of a congenial collective endeavor that would otherwise have been isolated and thus more difficult. The collaborations developed among researchers can also lead to successive projects which can result in professional ties becoming friendships as well. The fact that “researchers still favor face-to-face meetings to establish collaboration” (Henriksen, 2018, 2) tells us that numerous technological options are facilitators, however not the only and mostly preferred means of communication.

4.4. The importance of single authorship and early careers

For researchers at the early stages of building an academic career pursuing fractional and mutual involvement in diverse projects can be a pathway to increasing their list of published research and start developing a long-term career in academia. However, single authoring remains an important part of an academic career, being especially important for the beginning of the career to prove the ability of qualitative autonomous research. “Thus, the publish-or-perish culture seems to be partially counterbalanced by the cultural values and emphasis on demonstrating individual contributions” (Drongstrup, 2018, 56).

4.5. The increasing opportunity for citation

Furthermore, co-authorship papers stand better chances of citation. Citations of articles published in academic journals are very important for scholars. It is citations that are considered to add their work valuation. “Fischbach et al. (2011) examined co-authorship networks of researchers publishing in Electronic Markets, particularly the International Journal of Networked Business (EM). Among others, the study found that co-authored papers were cited more compared to those authored individually” (Kumar, 2015, 65). Rovira came to the same conclusion in their research stating that “there is a co-authorship advantage when the average citation of co-authored articles is higher in relation to single-authored articles” (Rovira, 2020, 171).

4.6. Peer review among co-authors

There is another interesting feature that accompanies joint projects. The organization of co-authorship writing is such that authors already fulfill the function of peer-reviewing among each other prior to its submission, thus improving the quality of the paper (Rovira, 2020). Rovira adds that because of such structure of writing, co-authorship paper stands better chance for publishing. "Besides adding a layer of internal peer-review, academic cooperation can also expand the field by pairing expertise, especially when sharing and borrowing ideas from other disciplines" (Rovira, 2020, 185).

5. CONCLUSION

The Internet was presented as the facilitator in the process of conducting research and the various ways in which it is being done, the access to publication and collaboration being very important ones. Being able to know the achievements of other researchers and the continuation of their findings is very important for the science to accelerate more quickly. Collaboration between researchers that can be brought about on certain platforms and media is an important feature that is of great assistance in their work. The results obtained are seen in terms of shortened working time and the quality of work due to the different fields of expertise researchers put into the joint project. However, one of the most interesting collaborations that can take place is the collaboration between younger and more experienced researchers. It is very helpful for the younger researchers to be guided and taught by their more experienced colleagues, but at the same time younger researchers at the beginning of the career bring fresh ideas, are more energetic and eager to contribute to science, prove their worth and promote their further career.

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