



How scholars implement trust in their reading, citing and publishing activities: Geographical differences



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ABSTRACT

In an increasingly digital environment, many factors influence how academic researchers decide what to read, what to cite, where to publish their work, and how they assign trust when making these decisions. This study focuses on how this differs according to the geographical location of the researcher, specifically in terms of the country's level of development. Data were collected by a questionnaire survey of 3650 authors who had published articles in international journals. The human development index (HDI) was used to compare authors' scholarly behavior. The findings show that researchers from less developed countries such as India and China (medium HDI) compared to those in developed countries, such as the USA and UK (very high HDI) are more reliant on external factors and those criteria that are related to authority, brand and reputation, such as authors' names, affiliation, country and journal name. Even when deciding where to publish, the publisher of the journal is more important for developing countries than it is for researchers from the US and UK. Scholars from high HDI countries also differ in these aspects: a) they are less discriminatory than authors from developing countries in their citation practices; b) for them the fact that a source is peer reviewed is the most important factor when deciding where to publish; c) they are more negative towards the use of repositories and social media for publishing and more skeptical about their potential for increasing usage or reaching a wider audience.

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1. Introduction

The evolution of the system of communications between scholars, as well as between scholars and those interested in the results of research, has been built upon quality assurance and trust: establishing trusted sources, channels, and metrics for the exchange of scientific and other scholarly information. As Sox and Rennie stated, "scientific literature is a record of the search for truth" (2006, p. 609). But rapid changes in technologies, services, and behaviors mean that it is not so easy to determine trustworthiness anymore and therefore it is increasingly important for everyone involved in the scholarly communication process to examine how established channels of communication, such as peer reviewed journals, are viewed and used alongside the many other emerging information sources and services available on the Web. Changes in trust and quality can manifest themselves in the discovery process (finding information), in the citation process (formally using

information) and where and how researchers choose to have their work published (disseminating information). The data that are presented in this paper comes from an Alfred P. Sloan Foundation supported research project (2012–2013), which sets out to examine how researchers assign and calibrate authority and trustworthiness to the sources and channels they choose to use, cite and publish in.

2. Problem statement

Information exchange, which is the heart of scholarly research activities, has been based on long-established, trusted channels and sources. However, scholarly communication has been transformed as a result of the transition to the digital environment. The internet is now at the center of the research process and this creates great potential to abuse trust (Moss, 2011). While even in the traditional scholarly environment (e.g. peer reviewed journals) research misconduct can happen (Lacetera & Zirulia, 2011), the digital environment with its diversity of information sources, such as social media, can complicate the situation considerably (Agichtein, Castillo, Donato, Gionis, & Mishne, 2008). It is difficult to

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know even whose information is whose anymore with the massive expansion in size and make-up of the scholarly communication world and the introduction of many new players (e.g. Google Scholar). Therefore there is a pressing need to find whether, and how, scholars are adapting their practices and perceptions and a review of the literature shows that this need has not been met to date.

There have been a few studies on changing discovery and information use patterns in the digital world (e.g. Nicholas et al., 2008), but little on whether trust is a contributing factor and little on whether the digital environment has, in fact, had an impact on citation patterns and publishing behavior. More importantly, existing studies mainly deal with scholars as consumers of information, and little is known about scholars as producers and disseminators of information.

In the present research the focus is on the geographical and cultural aspects of scholarly information behavior: the diversity in behavior and attitudes in regard to trustworthiness among researchers from different countries and regions of the world, especially in regard to their level of development as expressed by the human development index (HDI). It is important to know about these geographical differences as new countries and regions, such as China and India, are beginning to have an impact, and the research community needs to know whether they bring anything different with them. In the well-known division of the scientific world into those at the center and those in the periphery (Guédon, 2007), countries such as China and India have long belonged to the periphery. However, with their increasing share in world science (Wagner & Wong, 2012) and their race for world leadership in science (Shelton & Foland, 2009), things have started to change, and it is not clear whether scholars from these countries are now behaving in the same way as scholars from central countries. On the other hand, past studies (such as Callahan, 2005; Komlodi, 2005; Komlodi & Hercegefi, 2010) show that culture makes a difference in information behavior and practices. Therefore, it is critical to find out whether scholars in different countries implement trust in their information practices differently.

3. Literature review

While there have been a good number of studies focusing on students' perceptions and judgments of information credibility (Agosto, 2002a,b; Clark & Slotta, 2000; Fidel et al., 1999; Liu, 2004; Liu & Huang, 2005; Whitmire, 2004), the number of comparable studies on academic researchers is much smaller. This is despite the fact that most information resources, like journals, are intended for researchers rather than for teachers and students, and it seems likely that their practices are somewhat different.

Wang and Soergel (1998) in a qualitative study of agricultural economists found out that researchers consider quality and authority after topicality when they decide what to read. A series of articles reporting on a qualitative study of 15 scholars from diverse disciplines (Rieh, 2002; Rieh & Belkin, 1998, 2000) identified the factors that scholars take into consideration when they evaluate sources found on the web. Apparently, from among the six categories of criteria scholars use for the purpose—characteristics of information objects, characteristics of sources, knowledge, situation, ranking in search output, and general assumption—source characteristics is the primary one. This occurs on two levels: institutional and individual, with greater credence given to academic and governmental institutions, on the former, and to professional experts, on the latter. This last finding, incidentally, seems to contradict Mehta's (2000) study of scholars' citation behavior, which showed a high citation rate to commercial sources (and not to academic or governmental ones). In Mehta's study almost half of the scholars' 110 web citations came from the commercial domain, a fifth from the educational, an eighth from the organizational, and the rest from governmental and international domains.

Tenopir et al.'s (2010, 2011) international survey of researchers in 12 countries showed that local relevance is the most important factor to decide whether to read an article. But they found that after topic

relevance, a combination of online availability and convenience often is as important as a trusted journal brand name. Some of the other indicators researchers consider as markers of quality and trustworthiness include the existence of a pre-publication peer review process, post-publication comments and review articles (Nentwich, 2005), number of citations (Bornmann & Daniel, 2008), impact factor of a journal (Garfield, 2006), and the author's professional reputation and institutional affiliation (Kling & McKim, 1999).

The review of the literature on trust (for a more extensive review see Herman et al., in press) shows that little is known about scholars' ways and means of assessing the quality, authority, and trustworthiness of information sources and channels in an electronic environment. Although the Web may be the most powerful disseminator of information, there is also a great potential to abuse trust (Moss, 2011). Information may be outdated, inaccurate, or biased; authority may be unclear (Fisher, Lauría, & Chengalur-Smith, 2012). Additionally, much of the knowledge gained is limited because the studies explored scholars' judgment of trustworthiness from the point of view of scholars as consumers and users of information, not from that of scholars as producers and disseminators of information. Finally much of the research is dated and not quite pertinent considering today's interactive web-based environment, which some (such as Agichtein et al., 2008) argue has complicated the situation by transforming the type of available content. This study fills the gap by concentrating on academic researchers both as producers and consumers of information in the current information environment.

Previous work (such as Gursoy & Umbreit, 2004; Komlodi, 2005; Komlodi & Hercegefi, 2010) shows that culture plays a role in information behavior and there are cross cultural differences in information practices. Some studies, such as Komlodi and Carlin (2004), have tried to use cultural frameworks by social scientists such as Hall (1976) and Hofstede (2001) to explain the differences. For example, those using a language other than their native language are more likely to browse for information since they want to compensate for their low language skills by gaining higher knowledge (Kralisch & Mandl, 2005). However, knowledge of the role and the impact culture has on information behavior and scholarly communication is not very comprehensive. Few studies have included cross country comparisons and little is known about the perception of trust of scholars from different countries. Even Tenopir et al.'s (2010) international survey, which included 12 countries, did not include a country comparison. This study is a cross cultural comparison that can pave the way for further studies on cultural differences in scholarly communication, especially in regard to that key value, trustworthiness.

4. Methods

After conducting an extensive literature review and conducting interviews and focus groups in order to define and scope the study, a questionnaire was developed, pilot tested, and distributed online via SurveyMonkey and made available on the 28th of May, 2013.

Contacts at six publishers agreed to send an e-mail invitation to authors who contributed to their journals. The publishers represent a wide range of academics worldwide, and they included: BioMedCentral, Elsevier, PLoS, Sage, Taylor & Francis, and Wiley. Each publisher sent the same link to the questionnaire, and their participation should not have influenced the participant's responses. While a response rate cannot be calculated, it is clear in numerical terms that the survey constitutes the biggest survey of its kind undertaken.

Participants were asked a total of 24 questions regarding their using and reading information resource habits, dissemination practices, citation practices, and personal demographics. The core of the questionnaire relied on five-point Likert scales rating the importance or agreement with factors or statements related to the trustworthiness of a source (many of these statements were raised in focus groups and interviews). By assigning a number to each point on the importance or agreement scale, it is possible to average all the responses to see

which activities and criteria received the highest importance or agreement rating overall. Note that a rating of “5” is the highest rating possible, indicating that something was extremely important or something had very high levels of agreement.

The research looked at the three key areas where trust is a key issue: using/reading, citing, and dissemination/publication. In this paper the focus is on the geographical variations of these practices. Respondents were asked in which country they were based. The human development index (HDI) (<http://hdr.undp.org/en/statistics/hdi/>) was used to categorize countries by level of human development into four tiers: very high (e.g. USA and UK), high (e.g. Russia and Iran), medium (e.g. India and China), and low (e.g. Afghanistan and Pakistan). According to Wikipedia (2014) HDI is a composite statistic of life expectancy, education, and income indices used to rank countries into four tiers of human development HDI, which was first released by the United Nations Development Program (UNDP) in its *United Nations Development Program, 1990*, recognizes that development is much more than wealth and income and because it takes into account other elements such as education and health, it is generally considered better than one dimensional measure of development (e.g., the gross domestic product; Sagar & Najam, 1998). HDI was also used because undertaking analyses by individual country would have been too unwieldy given the number represented in the survey (118 countries) and for many countries responses were too low to sustain any meaningful analysis. Analysis also showed that it proved to be a helpful indicator for grouping the countries and look for possible differences.

5. Results

5.1. Demographics

The demographics of the responding researchers are presented in Table 1. Nearly two-thirds of respondents are male (64%). The mean age is 45 years ($SD = 13$). Approximately a quarter of respondents come from the life sciences, a quarter are from the physical sciences, and 43% are from the social sciences. Well over a third (36%) are full-time faculty members. They have on average 14.5 ($SD = 11.5$) years of experience and wrote an average of 9.8 ($SD = 17.6$) journal articles.

Table 1
Demographics of respondents.

| | Item | N | % |
|---------------------|--------------------------|------|------|
| Gender | Male | 1094 | 36.0 |
| | Female | 1943 | 64.0 |
| Age | ≤29 | 296 | 9.8 |
| | 30–39 | 864 | 28.7 |
| | 40–49 | 756 | 25.1 |
| | 50–59 | 579 | 19.2 |
| | ≥60 | 519 | 17.2 |
| Subject area | Life sciences | 770 | 25.5 |
| | Physical sciences | 735 | 24.4 |
| | Social sciences | 1293 | 42.9 |
| | Humanities | 218 | 7.2 |
| Job | Full-time researcher | 887 | 29.0 |
| | Part-time researcher | 436 | 14.3 |
| | Full-time faculty member | 1107 | 36.2 |
| | Part-time faculty member | 134 | 4.4 |
| | Student | 277 | 9.1 |
| | None of these | 218 | 7.1 |
| Geographic location | North America | 985 | 32.8 |
| | South & Central America | 156 | 5.2 |
| | Europe | 893 | 29.7 |
| | Middle East | 193 | 6.4 |
| | Asia | 498 | 16.6 |
| | Australia & Oceania | 158 | 5.3 |
| Human development | Africa | 121 | 4.0 |
| | Very high HD | 2040 | 68.0 |
| | High HD | 425 | 14.2 |
| | Medium HD | 442 | 14.7 |
| | Low HD | 91 | 3.03 |

They are generally quite involved with the scholarly communication system, with 72% reviewing articles for journals, 38.4% being or have been members of a journal editorial board, and 19.8% being or have been a journal editor. The top 10 countries in terms of the number of respondents are USA (876, 29.2%), UK (213, 7.1%), India (156, 4.3%), China (143, 3.9%), Australia (131, 3.6%), Iran (120, 3.3%), Canada (109, 3%), Italy (88, 2.4%), Brazil (86, 2.4%), and Spain (70, 1.9%). Out of 3650 respondents, 647 refused to disclose their country and therefore they are not included in the analyses and thus the total number of respondents upon which this paper is based is 3003. The largest number of respondents (68%) belonged to the very high HDI countries (e.g. USA and UK).

Two types of analysis are presented here: 1) the main one, based on the HDI classification of countries; and 2) one based on a comparison of the four countries which generated the most respondents (USA, UK, China and India) and belonged to the center and the periphery of world science. A categorization by continent was rejected because the groupings produced would not be very homogenous (e.g., Israel and Iraq would be in the same category as would Japan and Afghanistan).

In the following sections, the analyses are divided up in terms of reading/using, citing, and publishing/dissemination. Reading and using in this context mean reading an information source beyond the abstract and any type of use other than citation. For example one might read and use a source to keep up-to-date, or use it as background information for teaching. Citing, on the other hand, is a specific type of use, i.e., when somebody uses an information source in what she/he writes and publishes. Since this type of use is rather more formal and is documented, users might have stricter criteria for deciding whether to cite an information source. Disseminating and publishing relate to when scholars choose an outlet to publish the findings of their research and the criteria they have to make for that decision.

5.2. Using and reading information

Researchers were asked how important they considered a range of scholarly activities to be when deciding what information to use/read in their own research area. Table 2 presents the mean rating (where 1 is not important and 5 is extremely important) for countries with different levels of HDI. Creating cross tabulation tables and conducting Somers' D test of association showed that the higher the HDI of the countries the more likely they were to place more importance on the credibility of the data, the soundness of logic and content of the article, and the fact that it was peer reviewed. These characteristics can be called internal criteria as they relate to the content of the source itself. They were also less likely to give higher rating to the source from which the article is obtained, its number of downloads, author's country of affiliation, name of publishers, and indexing authorities. These can be called external criteria as they are external factors that are used to judge the trustworthiness of an information source. A hierarchical clustering was undertaken using Ward's method. Clustering involves comparing all respondents one by one with each other based on their answers to find out how similar they are and put those which are more similar in the same or closest clusters. Two main clusters emerge. The first cluster includes mainly those that look for internal criteria and the second cluster includes mainly those who look for external criteria when assessing trustworthiness. Cross-tabulation of cluster membership and HDI showed significant difference among countries with different levels of HDI and cluster membership ($\chi^2 = 99.1, p < 0.001$). Countries with a higher HDI were more likely to belong to cluster 1; that is they tend to judge trustworthiness on internal factors.

When comparing USA, UK, China and India, the four countries which had the biggest number of respondents, but which are different in terms of scientific development, one can see that Chinese and Indian researchers (especially Indian) rate external criteria such as checking the name of publisher or number of downloads higher than researchers in the USA and UK (Fig. 1).

Table 2
Mean rating of actions taken to decide what to read by HDI.

| | | Low HDI | Medium HDI | High HDI | Very high HDI | All |
|-----------------------|--|---|------------|----------|---------------|------|
| Internal | Checking the figures and tables | 3.52 | 3.59 | 3.59 | 3.54 | 3.55 |
| | Checking the methods | 4.00 | 3.94 | 3.98 | 3.87 | 3.90 |
| | Checking to see if the data used in the research are credible** | 3.04 | 3.01 | 2.91 | 2.89 | 2.92 |
| | Checking if the arguments and logic presented in the content are sound* | 4.30 | 4.14 | 4.08 | 4.45 | 4.34 |
| | Checking to see if it is peer reviewed* | 3.62 | 3.58 | 3.45 | 3.97 | 3.83 |
| External | Checking to see the means by which it has been disseminated/published (e.g. in a subscription journal, an open access journal, a repository, a blog) | 3.42 | 3.43 | 3.32 | 3.29 | 3.32 |
| | Checking whether the source is indexed by an authoritative indexing body (e.g. ISI, PubMed)* | 3.47 | 3.48 | 3.49 | 2.70 | 2.95 |
| | Checking the name of the author | 3.63 | 3.67 | 3.45 | 3.36 | 3.43 |
| | Checking the name of the journal* | 3.16 | 3.05 | 2.82 | 2.33 | 2.53 |
| | Checking the name of the publisher* | 4.24 | 4.21 | 4.15 | 4.31 | 4.27 |
| | Checking whether author's country of affiliation is known for its research* | 2.37 | 2.60 | 2.36 | 1.95 | 2.12 |
| | Checking to see how many times it has been downloaded/accessed* | 2.70 | 2.71 | 2.47 | 1.94 | 2.15 |
| | Taking into consideration colleagues' opinions of it** | 2.67 | 2.79 | 2.66 | 2.61 | 2.64 |
| | Taking account of where it was obtained from (e.g. publisher's website, university library catalogue, search engine)* | 3.02 | 2.90 | 2.61 | 2.21 | 2.39 |
| | Other | Reading the information source (article, book chapter, etc.) in its entirety* | 4.11 | 4.01 | 4.14 | 3.69 |
| Reading the abstract* | | 4.08 | 4.26 | 4.08 | 4.04 | 4.08 |

Likert scale: 1 (not important) to 5 (extremely important).

* Significant at $p < 0.001$.

** Significant at $p < 0.01$.

Researchers were asked to what extent they agreed/disagreed with a number of statements concerning the quality and trustworthiness of information sources (Table 3). With the exception of the statement about peer reviewed open access (for which there is not a significant difference according to Cramér's V), the difference between countries with different levels of HDI is statistically significant ($p < 0.001$). For

example, authors in countries with lower HDI agree more than authors from countries with higher HDI that impact factor (IF) is important for deciding what to read. Authors from very high HDI countries are least likely to agree that if they are pressed for time they would compromise quality of a source for the ease of availability. Of course, one needs to know that the access to information sources has a cost. Many of the

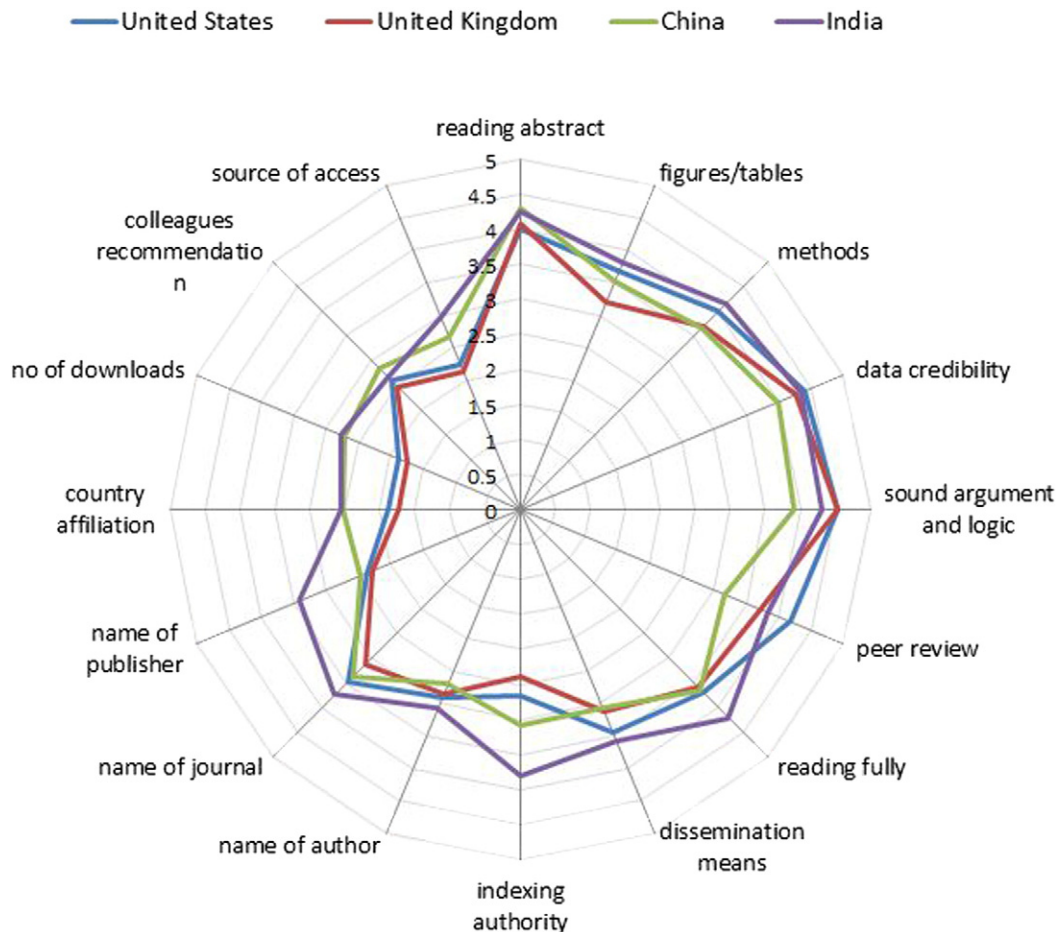


Fig. 1. Mean rating of actions taken to decide what to read by country.

Table 3
Mean rating of agreement with opinions by HDI.

| | Low HDI | Medium HDI | High HDI | Very high HDI | All |
|---|---------|------------|----------|---------------|------|
| Peer reviewed journals are the most trustworthy information source.* | 4.29 | 4.09 | 3.96 | 4.16 | 4.12 |
| The journal's impact factor is important for deciding what to read.* | 3.73 | 3.60 | 3.45 | 2.81 | 3.05 |
| Wikipedia has become more trustworthy over the years.* | 2.89 | 3.22 | 2.98 | 3.01 | 3.03 |
| Open access publications that are peer reviewed are trustworthy. | 3.86 | 3.56 | 3.62 | 3.62 | 3.62 |
| I am very likely to read an article recommended to me by a colleague.* | 3.84 | 3.82 | 3.92 | 4.12 | 4.04 |
| If the information is not central to my research area, the ease of availability of a source is more important than its quality.* | 2.78 | 3.15 | 2.86 | 2.64 | 2.75 |
| My main criterion for finding out if a source is trustworthy is the content itself (e.g. whether it makes sense, it is consistent with what I believe etc.).* | 3.42 | 3.81 | 3.71 | 3.65 | 3.67 |
| When pressed for time, the ease of availability of a source over-takes considerations about its quality.* | 2.96 | 3.22 | 3.03 | 2.52 | 2.71 |

Likert scale: 1 (strongly disagree) to 5 (strongly agree).

* Significant at $p < 0.001$.

high quality scholarly journals are available through subscription from well-established publishers. Although the number of open access (OA) journals is increasing, many of the new OA journals are of lower quality and from less established publishers. As a matter of fact there is a list of predatory OA publishers (Beall, 2013) that do not have a proper peer review system. Therefore, some users, due to cost or other reasons, may not bother to look for quality sources and resort to any available relevant paper whether it is low quality OA or it is a pre-print from a repository that has not been peer reviewed. In Tenopir et al.'s (2010) survey that included respondents from 24 universities worldwide (including countries such as the USA, India, and Saudi Arabia), online accessibility

was the second most important criteria (after topical relevance) in deciding what to read. Unfortunately, the researchers did not conduct any geographical comparisons. In a World Health Organization (WHO) study, researchers and academics in developing countries identified access to the “priced literature” (i.e., journals) as their most pressing information problem (Aronson, 2004). To make matters worse, the fact that the accessibility of digital information is contingent upon the availability of costly technologies and infrastructures inevitably exacerbates the access problem.

Fig. 2 shows the mean rating of agreement with the same statements for four biggest countries by respondents. The Chinese ($M = 3.53$) and

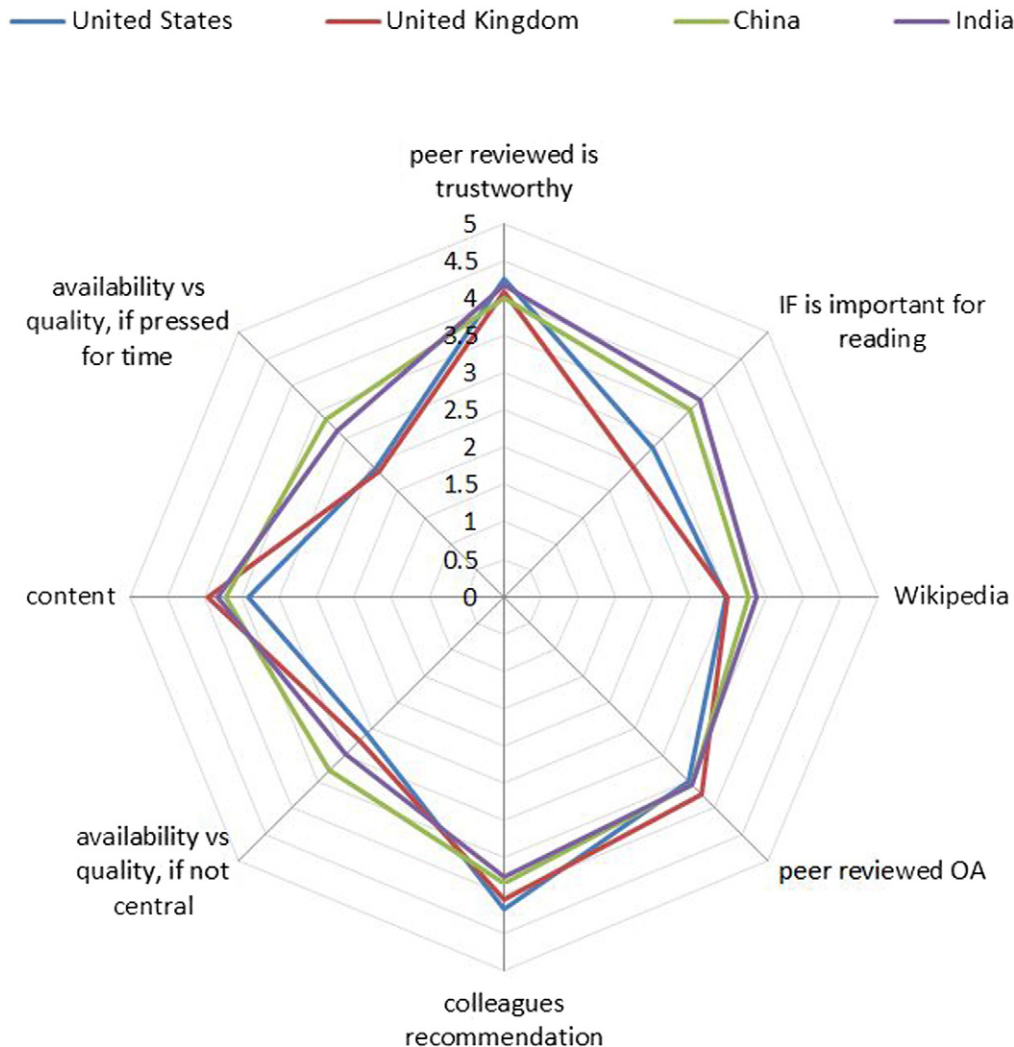


Fig. 2. Mean rating of agreement with opinions by country.

Indians ($M = 3.72$) agree more strongly that the IF is important for deciding what to read and also agree more strongly that “When pressed for time, the ease of availability of a source over-takes considerations about its quality.” They were also more likely to agree with the statement “If the information is not central to my research area, the ease of availability of a source is more important than its quality.” This might be because access is a problem for researchers in developing countries, such as India, and since they have more limited access and options they are more likely to compromise on quality for access.

5.3. Citing

The accumulative evidence from previous studies (Bornmann & Daniel, 2008) shows that, in general, a citation is normally an indicator of the (high) quality of the cited work. Of course, all citations are not equal and each citation indicates different levels of influence and importance to the author's work. Authors' decisions to cite involve a complex mixture of analyzing intellectual content and using trusted social and research contacts. In order to learn about the factors driving citation behavior respondents were asked “How characteristic of your discipline are each of the citing practices listed below?” Table 4 shows the mean rating for these practices. The higher the rating the more characteristic they thought they are. The lower the HDI of the country the more characteristic it is for its researchers to cite the most highly cited information sources, and to cite sources with open peer review. For scholars from countries with a very high HDI (compared with those with a low HDI) it was less characteristic to cite one's own work, cite papers from the target journal to increase the chances of getting acceptance, or cite papers only from developed countries. The differences between countries with different levels of HDI were statistically significant ($p < 0.001$) except for the second statement on citing the seminal work for which the difference was not statistically significant.

Fig. 3 shows the mean rating of the above practices by country and some clear differences between USA/UK and India/China are evident. Compared to British and Americans, it was more important for Chinese and Indian researchers that a source be more highly cited, be the published version, and be authored by a researcher from a developed country in order to determine whether to cite it. Indians and Chinese are also more likely to cite the articles suggested by referees and papers from the target journal. They probably feel this would improve their chances of getting published in a highly competitive English Language environment. As Horton (2000, p. 2232) points out, if English is not the first language of a scholar, he/she is “genuinely apprehensive about submitting research to an English-language journal.”

To find out about the attitudes of scholars towards trust in citation practices, respondents were asked about their agreement/disagreement concerning a number of statements raised by focus group and interview participants. Table 5 shows the mean rating of their agreement. The

clearest difference relates to the statement about IF being important for deciding what to cite. Scholars from very high HDI countries tend to disagree with this statement more than scholars from any other group. They also agree more that social media mentions/likes are only indicators of popularity and not quality or credibility. The differences among countries with different HDI levels were all statistically significant ($p < 0.001$) except for “I only cite conference proceedings if there's...” statements. Comparing the USA, UK, China and India the same difference are revealed, and Chinese and Indian researchers agree more with the IF's importance for citing and agree less with the statements about the significance of social media mentions.

5.4. Publishing and dissemination

Researchers consider different factors when deciding where to publish their work (Table 6). They were asked, “As an author, how important are the following attributes of an outlet when deciding where to disseminate/publish your research work?”. Having both print and online versions and being open access are more important for scholars from low HDI countries. Researchers from very high HDI countries considered the country of the outlet, as well as its being open access, indexed by prestigious databases, and published by a society less important. The differences among countries were significant at $p = 0.001$ level, except for the statement “It is highly relevant to my field” where there was no significant difference. Additionally, the significance level for the statement “It has a reputable editor...” was 0.02.

Comparing the four countries (Fig. 4) shows that for authors from China and India (compared to the UK and USA) in determining where to publish it is more important that the source is highly cited, is indexed by prestigious databases such as ISI, is open access, and is based in a country known for the quality of its research. Being peer reviewed was the most important attribute for UK and USA authors.

Institutions in some countries have policies that require researchers to publish in outlets with certain attributes, typically open access ones. Scholars were asked whether research policy directives and mandates (e.g., national, university or departmental) influence where they publish their research. About a quarter (25.5%) said not at all, 36.3% said yes, somewhat and 20% said yes heavily, and the rest said they were not aware of any policies. Cramér's V test showed statistically significant association between the HDI of countries and mandates: the lower the HDI of a country the more likely were its scholars to say yes to this question. Those who said yes to this question were then asked how they were influenced. Table 7 shows that the mean rating for the type of policy publishing in traditional sources and publishing in high impact factor journals are common among all those who said they were influenced by policy directives regardless of the HDI of their country and there is no significant difference among countries with regard to these two items. For the other items there are statistically significant

Table 4
Mean rating of citation practices by HDI.

| | Low HDI | Medium HDI | High HDI | Very high HDI | All |
|---|---------|------------|----------|---------------|------|
| Citing the most highly cited information sources* | 4.00 | 3.71 | 3.43 | 3.10 | 3.26 |
| Citing the seminal information source published on a topic | 3.42 | 3.46 | 3.24 | 3.40 | 3.39 |
| Citing the first information source published on a topic* | 3.33 | 3.53 | 3.09 | 2.74 | 2.92 |
| Citing the most recent source published on a topic* | 3.98 | 3.86 | 3.60 | 3.40 | 3.51 |
| Citing one's own work to improve one's citation ranking (e.g. h-index)* | 2.98 | 2.88 | 2.70 | 2.41 | 2.54 |
| Citing papers in the journal to which an article is submitted for publication to increase chances of acceptance | 2.70 | 2.77 | 2.64 | 2.20 | 2.36 |
| Citing papers mentioned by reviewers to increase chances of acceptance* | 2.67 | 2.94 | 2.80 | 2.60 | 2.68 |
| Citing non-peer reviewed sources (e.g. personal correspondence, newspaper articles, blogs, tweets)* | 2.39 | 2.12 | 1.89 | 1.59 | 1.74 |
| Citing a pre-print which has not yet been accepted by a journal* | 1.98 | 2.04 | 1.90 | 1.75 | 1.82 |
| Citing sources disseminated with comments posted on a dedicated website (open peer review)* | 2.33 | 2.20 | 1.91 | 1.26 | 1.52 |
| Citing, if possible, only sources published in developed countries* | 2.30 | 2.23 | 2.13 | 1.56 | 1.76 |
| Citing the published version of record, but reading another version found on the open web* | 2.30 | 2.27 | 2.08 | 1.55 | 1.75 |

Likert scale: 1 (somewhat characteristic) to 5 (essential).

* Significant at $p < 0.001$.

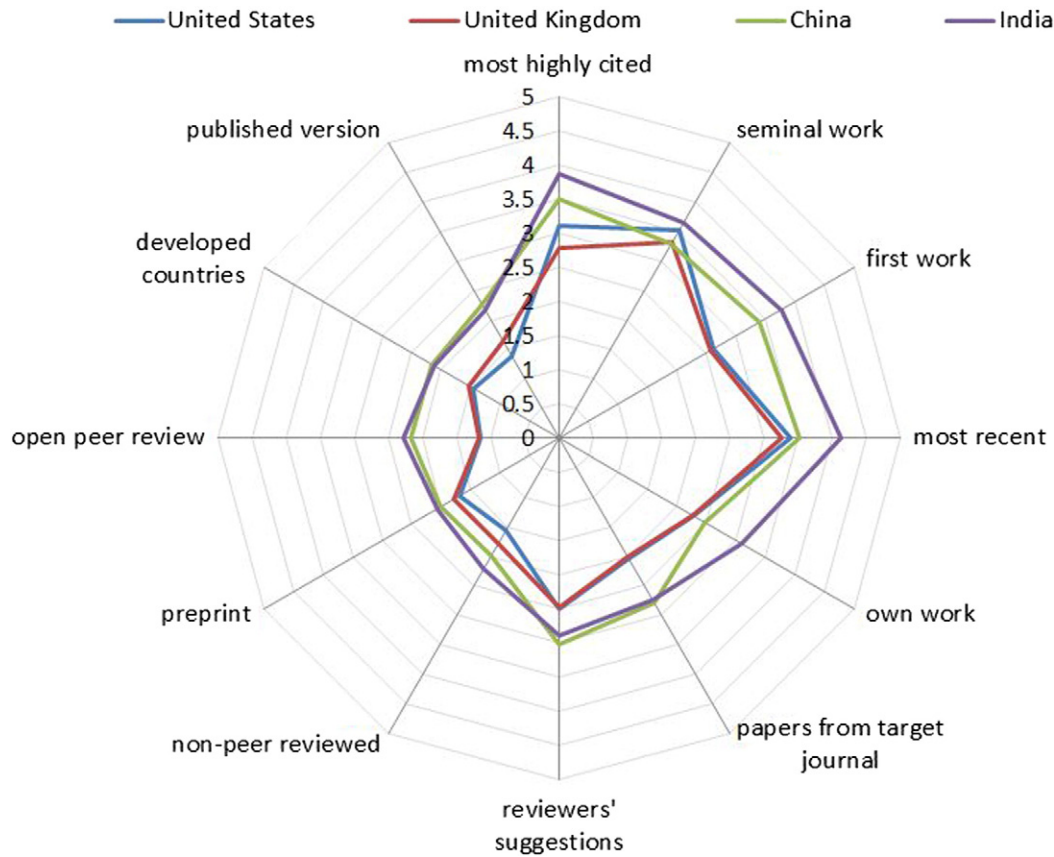


Fig. 3. Mean rating of citation practices by country.

differences ($p < 0.001$) among countries. The most evident difference is related to publishing in sources that have a hard-copy version and publishing in open access journals. Those researchers from countries with a lower HDI rate these two higher than other countries.

The last question concerning trust in the publishing process included a few statements to which scholars expressed their agreement or disagreement (Table 8). The differences are statistically significant at $p < 0.001$ for all items except the third (“I publish in journals because a paper placed in a journal obtains a context, becomes part of a conversation”) where there is no significant difference. The significance level for the first (“As peer reviewed journals are the most prestigious place in which to publish, they are likely to contain high-quality material”) and the sixth item (“I have no problem publishing in an Open Access journal if it is properly peer reviewed”) is $p < 0.05$. The clearest differences are that scholars from countries with a very high HDI tend to

disagree with statements related to depositing, writing blogs, and publishing first in repositories or conference proceedings, while scholars from countries with a low HDI tend to agree with these statements. This might indicate that researchers from less developed countries are keener on using OA-related technologies as they probably benefit from them more than those from developed countries do. Comparing the four countries of USA, UK, China and India shows the same pattern as attitudes of scholars from UK and USA are that of very high HDI countries and attitudes of scholars from China and India resemble those of lower HDI countries.

6. Discussion

The survey was sent to researchers on the co-operating publishers' mailing lists who had published at least one article in their scientific

Table 5
Mean rating of opinions of scholars about trust in citation practices by HDI.

| | Low HDI | Medium HDI | High HDI | Very high HDI | All |
|--|---------|------------|----------|---------------|------|
| From a trust perspective I'm more easy-going in what I read than what I cite.* | 3.43 | 3.57 | 3.41 | 3.55 | 3.53 |
| Usage metrics are indications of popularity only, not quality.* | 2.88 | 3.13 | 3.13 | 3.24 | 3.20 |
| Usage metrics are indications of popularity only, not credibility.* | 2.77 | 3.07 | 3.05 | 3.19 | 3.14 |
| Social media mentions/likes are indications of popularity only, not quality.* | 3.15 | 3.24 | 3.43 | 3.69 | 3.57 |
| Social media mentions/likes are indications of popularity only, not credibility.* | 3.04 | 3.22 | 3.43 | 3.67 | 3.55 |
| I tend to cite people I know because I trust them.* | 2.68 | 3.14 | 3.04 | 3.06 | 3.06 |
| I only cite conference proceedings if there's no other alternative because the work there is still speculative, and, as such, a little unreliable. | 2.84 | 3.08 | 3.10 | 3.14 | 3.12 |
| I don't cite articles published in open access journals because they are of low quality.* | 2.06 | 2.50 | 2.28 | 2.11 | 2.19 |
| I have no problem citing an article published in an open access journal if it has been properly peer reviewed. | 3.99 | 3.84 | 3.90 | 3.98 | 3.95 |
| I prefer to cite articles published in an open access journal only if they are of a reputable publisher.* | 3.37 | 3.42 | 3.23 | 3.07 | 3.15 |
| The journal impact factor is important for deciding what to cite.* | 3.64 | 3.48 | 3.29 | 2.49 | 2.79 |

Likert scale: 1 (strongly disagree) to 5 (strongly agree).

* Significant at $p < 0.001$.

Table 6
Mean rating of publishing outlet's attributes by HDI.

| | Low HDI | Medium HDI | High HDI | Very high HDI | All |
|---|---------|------------|----------|---------------|------|
| It is published by a traditional scholarly publisher* | 3.37 | 3.61 | 3.45 | 3.39 | 3.43 |
| It is Open Access* | 3.22 | 2.85 | 2.88 | 2.25 | 2.46 |
| It is indexed by reputable/prestigious abstracting/indexing databases, such as ISI or Scopus* | 3.78 | 3.80 | 3.90 | 3.06 | 3.31 |
| It is highly cited* | 3.84 | 3.72 | 3.71 | 3.20 | 3.37 |
| It is peer reviewed* | 4.00 | 3.87 | 3.86 | 4.22 | 4.11 |
| It has both an online and a print version* | 3.70 | 3.24 | 2.99 | 2.65 | 2.82 |
| It is based in a country known for the quality of its research* | 2.84 | 2.86 | 2.63 | 2.07 | 2.29 |
| It has a reputable Editor/Editorial Board** | 3.64 | 3.45 | 3.25 | 3.27 | 3.30 |
| It is highly relevant to my field | 4.12 | 4.09 | 4.13 | 4.20 | 4.17 |
| It is published by a society in my field* | 3.40 | 3.30 | 3.27 | 2.65 | 2.85 |

Likert scale: 1 = strongly disagree to 5 = strongly agree.

* Significant at $p < 0.001$.

** Significant at $p < 0.05$.

and social science journals. Therefore, the results do not represent the small minority of researchers that have completely avoided traditional publishing routes. However, the survey helps reveal some of the trust issues and geographical differences that exist among the majority of researchers with regard to their attitudes towards trustworthiness.

Scholars from countries with high HDI such as the UK, the USA, Canada, Australia, and most of the scientifically highly developed West European countries also tend to rely more heavily on internal criteria when deciding what to read and use and less on external criteria. In other words it could be said that they pay more attention to the quality of the content and less to outward factors, such as brand and reputation (e.g., name of journal or publisher, indexing bodies) and authority (e.g., name of author, country affiliation). Compared to scholars from high HDI countries, scholars from countries with a lower HDI tended to rely more on external factors. External factors such as the country of the author, the databases that index the journal, number of downloads an article receives, matter more to the scholars of low HDI

countries. UK and US researchers appear to rely heavily on their circles of trust, whereas it would seem that Indian and Chinese researchers are not so confident, and probably recognize that they are not yet within the same circles of trust. It seems, as Guédon (2007) maintains, in world science the terms “center” and “periphery” regularly recur, and although neither the center, nor the periphery is monolithic and, on at least some issues, they display points of convergence, there is a clearly discernible divide between mainstream and peripheral science.

Scholars from very high HDI countries are less likely to compromise quality for ease of availability even when they are pressed for time. A journal's impact factor is less important for them when deciding what to read.

With regard to citation behavior, scholars from lower HDI countries were more likely to cite the most highly cited information sources, or cite their own works, or cite papers published in the target journal in order to increase the chance of their paper getting accepted. Perhaps surprisingly scholars from developed countries appear to be

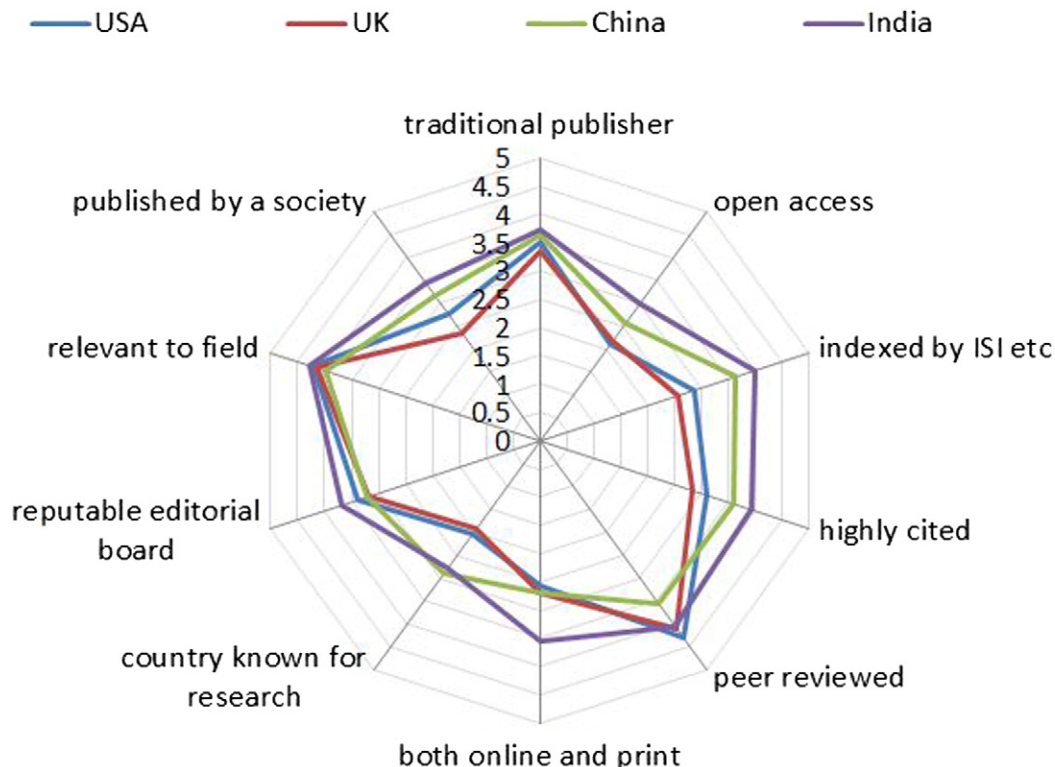


Fig. 4. Mean rating of publishing outlet's attribute by country.

Table 7
Mean rating of policies that influence authors by HDI.

| | Low HDI | Medium HDI | High HDI | Very high HDI | All |
|---|---------|------------|----------|---------------|------|
| Publish in traditional sources (e.g. journals and monographs) | 3.69 | 3.78 | 3.63 | 3.88 | 3.80 |
| Publish in high impact factor journals | 4.18 | 4.01 | 4.04 | 3.87 | 3.93 |
| Publish in sources that have a hard-copy version* | 3.29 | 2.98 | 2.59 | 1.97 | 2.31 |
| Publish in open access journals* | 3.31 | 2.95 | 2.59 | 2.10 | 2.39 |
| Publish in national/local journals* | 3.16 | 3.02 | 2.74 | 2.31 | 2.54 |
| Publish in international journals* | 4.21 | 4.18 | 4.21 | 3.78 | 3.94 |
| Write a blog and/or tweet about your research* | 2.30 | 2.23 | 2.02 | 1.51 | 1.76 |

Likert scale: 1 (not at all) to 5 (extremely).

* Significant at $p < 0.001$.

non-discriminatory regarding citing authors from non-developed countries. This might be because scholars in developing countries are more exposed to papers from non-developed countries than scholars in the West and that makes them think more about this. A journal's IF is less important for deciding what to cite for scholars from countries with a very high HDI than for scholars from other countries. They also agree more that social media mentions and "likes" are only indicators of popularity and not quality or credibility.

When deciding where to publish one's works, the main and the most important criteria for everyone seem to be that the outlet is highly relevant to one's field. However, similar to citation practices, scholars from lower HDI countries care more about the country where the outlet is based. Whether the journal is indexed by prestigious databases, such as the ISI Web of Science, is also more important to them than to scholars from countries with higher HDI. Scholars from developing countries are more likely to publish in OA journals. For scholars from the UK and USA, being peer reviewed is the most important factor (after being relevant to the field) in deciding where to publish.

In developing countries, there seem to be more policy directives in operation whose function is to stimulate or steer the publishing practices of researchers. In some of the developing countries authors are required to publish in sources that have a hard-copy version, and in some

others they are encouraged to publish in OA journals. However, all of those who say they have policy mandates in their country, whether from a developing or developed country, mention that the policies require them to publish in higher IF journals. Scholars from countries with higher HDI tended to be less optimistic about the functions of repositories and social media as means to increase the usage or promotion of their works or to help reach a wider audience.

Finally, what then of the differences between the two countries at the very heart of the scholarly communications business, the UK and USA, the focus of much of the qualitative, pre-questionnaire research. Not surprisingly given their very high HDI rating for most of the questions the difference is not statistically significant. However, there are a few interesting differences: a) more people in the UK disagree (compared to the US) that the IF influences what they read; b) checking figures and tables, published by a society, seems to be less important for UK researchers than for US researchers; c) more UK researchers agree that usage metrics only indicate popularity and not quality or credibility.

To find out what the explanations are for these differences, further surveys and qualitative studies are needed. It is not known, for example, how significant the role of language, as a cultural element is in all these differences. Respondents answered the questionnaire thinking about international scholarly communication, which is mainly in English, while English is not the first language of (most) Indians and Chinese. It is not clear whether they behave differently when they read, cite, and publish in their native languages. The second phase of this study which is currently being conducted in native languages in several countries including China, Malaysia, Russia and Brazil will hopefully lead to a greater understanding in this area.

Overall, integrating all of the findings, one can see a consistency in the behavior of each country's researchers in that they apply similar trust criteria for all of their practices including reading and citing as well as publishing. The trend is that researchers from less developed countries, such as India, compared to developed countries such as the USA, are more reliant on external factors and those criteria that are related to authority and brand and reputation (e.g. authors' names, affiliation, country, and journal name). Even when deciding where to publish, the publisher of journal is more important for them than it is for American researchers. On the other hand, researchers from countries

Table 8
Mean rating of opinions of scholars about quality of places to publish by HDI.

| | Low HDI | Medium HDI | High HDI | Very high HDI | All |
|---|---------|------------|----------|---------------|------|
| As peer reviewed journals are the most prestigious place in which to publish, they are likely to contain high-quality material.** | 4.14 | 4.07 | 3.98 | 3.97 | 3.99 |
| People who don't have tenure have to publish in good journals to build up a reputation.* | 3.74 | 3.72 | 3.63 | 3.94 | 3.86 |
| I publish in journals because a paper placed in a journal obtains a context, becomes part of a 'conversation'. | 3.47 | 3.58 | 3.57 | 3.50 | 3.52 |
| To obtain research grants I have to publish in highly ranked journals. | 3.77 | 3.84 | 3.89 | 3.70 | 3.75 |
| I don't publish in open access journals because they are of low quality.* | 2.25 | 2.65 | 2.44 | 2.25 | 2.33 |
| I have no problem publishing in an open access journal if it is properly peer reviewed.** | 3.99 | 3.78 | 3.70 | 3.82 | 3.80 |
| Open access journals make trustworthy research information accessible in countries where journal subscriptions cannot be afforded.* | 4.00 | 3.69 | 3.90 | 3.64 | 3.70 |
| I publish in an open access journal only if it is published by a reputable publisher.* | 3.78 | 3.54 | 3.29 | 3.25 | 3.31 |
| My own website is central for ensuring the reliable dissemination of my work to my target audiences.* | 2.57 | 2.75 | 2.52 | 2.43 | 2.49 |
| I use social media (e.g. Twitter, blogs, social networks) to get out information about my research because it is a reliable way to reach my target audiences.* | 2.91 | 2.75 | 2.53 | 2.17 | 2.33 |
| I tend to publish first in a conference proceedings, because it is a reliable way to reach my target audiences.* | 3.33 | 3.21 | 3.19 | 2.70 | 2.87 |
| I tend to publish first in a subject repository (pre-publication database), such as ArXiv, PMC, RePEc, because it is a reliable way to reach wider audiences.* | 2.59 | 2.69 | 2.49 | 1.98 | 2.18 |
| Depositing a version of my published work in an institutional repository increases usage and thereby helps to build up my professional reputation among my peers.* | 3.44 | 3.39 | 3.14 | 2.54 | 2.78 |
| Depositing a version of my published work in an institutional repository increases citation and thereby helps to build up my professional reputation among my peers.* | 3.56 | 3.47 | 3.26 | 2.50 | 2.78 |
| I tend to blog about the findings of my research, which is a good way to test the veracity of my ideas.* | 2.90 | 2.68 | 2.44 | 1.89 | 2.11 |
| I tend to publish first in conference proceedings, which is a good way to test the veracity of my ideas.* | 3.43 | 3.20 | 3.16 | 2.65 | 2.83 |

Likert scale: 1 (strongly disagree) to 5 (strongly agree).

* Significant at $p < 0.001$.

** Significant at $p < 0.05$.

such as the USA and UK seem to place more importance on the content and quality (factors such as peer review) than brand and reputation.

In this paper the focus was on the scholarly characteristics where there were statistically significant differences in the responses between scholars from different countries. This focus might give the impression that there were no similarities, but in fact this would not be correct as there were a number. For example no difference was found in terms of attitude towards using or publishing in peer-reviewed OA journals, or in terms of pressure scholars feel in publishing in highly ranked or high impact factor journals. Topical relevance is equally important for all researchers regardless of their country when deciding what to read, cite, or where to publish.

7. Conclusion

This is the largest survey to look at geographical differences in factors that influence how academic researchers decide what to read, what to cite, where to publish their work and how they assign trust when making these decisions, and one of the rare studies to concentrate on academic researchers both as producers and consumers of information. The findings showed that there is a consistency across the board in respect to the importance of the traditional practices, pillars, and markers of trust (quality content, personal inspection, peer review, journal). Nevertheless, there were some important differences with respect to country when it came to social media, open access publications and trust proxies, such as impact factors. The key finding is that scholars from developing countries such as India and China, compared to those from developed countries such as USA and UK, rely more on authority, brand and reputation as proxies for trustworthiness and credibility of research.

A divide exists between scholars from the center and those from the periphery of the scientific world in terms of how they trust information resources. The digital environment is specially challenging our understanding of trust and authority in respect to scholars from the developing countries, whose beliefs and actions indicate an openness to change. Transformations in scholarly communication are ongoing; a deeper understanding of how geographical differences might play out in these transformations is essential in preparing for the future of scholarly communication.

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