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Early Career Researchers Open-Up on Citations in Respect to Reputation, Trust, Ethics, AI and Much More

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ABSTRACT

This paper, part of the Harbingers project studying early career researchers (ECRs), focuses on the impact of artificial intelligence (AI) on scholarly communications (https://ciber-research.com/harbingers-3/index.html). It investigates citations and citing, its purpose, function and use, especially in respect to reputation, trust, publishing and AI. We also cover journal impact factors, H-index, Scopus, Web of Science and Google Scholar. All of this, regarding a research community, to whom citations have special reputational and career-advancing value. This interview-based study covers a convenience sample of 91 ECRs from all disciplines and half a dozen countries. Furthermore, this study has been conducted with minimal prompting about citations, so providing a fresh feel by using the voices of ECRs wherever possible. Findings include: (1) citations are all-pervasive, although cropping up mostly in the reputational and trust arenas; (2) citations remain a major force in determining what is read, where to publish and what to trust; (3) there are no signs their value is diminishing; if anything, the opposite is true; (4) AI has given a boost to their use—primarily as a validity check; (5) there are strong signs that altmetrics are being taken up. Note, this was a preliminary study working with a convenience sample attempting to inform a future study. Our findings should therefore be treated more as early observations.

1 | Introduction

Citations pervade the whole of the scholarly communications enterprise, underpin and legitimise many of its activities and have been the reputational/assessment (gold) currency of the scholarly system for decades and, surely, as such, should be a big concern for early career researcher (ECRs) what with their career worries. Yet, qualitative papers on ECRs and how they use and what they think of citations are not thick on the ground and especially so now in the artificial intelligence (AI)-driven world we find ourselves in. This paper hopes to fill the gap and, in doing this, approach the topic differently by listening to ECRs rather than prodding and positioning them, as so often is the case. A pull rather than push methodological approach is adopted.

We deep dive into the topic by: (1) burrowing into all the corners of their scholarly communications to find out about their use, not just regarding the normal suspects, such as reputation and assessment; (2) examining 100s of pages of verbatim transcripts from 91 ECRs from all over the world to discover how and in which contexts citations are mentioned; (3) covering all manifestations of citations, such as H-Index, Scopus and journal Impact Factor (JIF).

Summary

- Citations are all-pervasive in the scholarly communications environment.
- Citations are still a major force in determining what is read, where to publish and what to trust.
- If anything, citations are becoming more important in a growing AI and KPI scholarly environment.

2 | Aims

The broad aim is to establish what ECRs thought of citations and how they used them in the brave new world of AI and all this with a minimum amount of prompting. To portray their views and practice in their very own words. Specific aims are to discover:

1. Whereabouts in scholarly communications citations most feature and for what functions;
2. To determine whether use/interest in citations is waning in the light of highly publicised questionable citation practices, including citations to predatory journals. Is trust in citations being chipped away?
3. Whether ECRs are falling out of favour with citations because they could be considered a straightjacket on their behaviour in a growingly open and AI-driven scholarly world.

3 | Scope and Working Definitions

We are interested here in citations themselves, the metrics built on/around them (e.g., H-index, JIF), the scholarly platforms that populate and promote them, such as Scopus, Web of Science (WoS) and Google Scholar. For convenience and brevity, throughout this paper we shall use the term citation(s) to cover all these aspects. Also, we cover citations made by ECRs and those made from other researchers to them.

Lacking a universally accepted definition, a pragmatic concept of the ECR has been adopted. It focuses on common factors: their being employed in a research position, being relatively young, in an early phase of their career, and not yet established as permanent faculty. Thus: Researchers who are generally not much older than 40[1], who either have received their doctorate and are currently in a research position or have been in research positions and are currently doing a doctorate. In neither case are they in established or tenured positions. In the case of academics, some are non-tenure line faculty research employees. The definition was deliberately broad because the various countries covered had slightly differing definitions, and this one embraced them all.

AI has no firm or formal definition. Consequently, when asking about attitudes to and anticipations of the place of AI it necessary to consider—'what do you actually mean by AI' and we had several questions which disclosed that. Furthermore, the quotes throughout the AI questions suggest a variety of software and 'apps' are considered by some to be 'AI'. By collecting this data, we aimed to establish both the differences and similarities in how AI is defined. We were seeking definitions based on what ECRs said.

Regarding subject coverage, throughout the Harbingers project has covered science and social sciences, but with this study we have also included the arts and humanities. Regarding the social sciences, we have divided it into two: hard and soft social sciences—hard including Economics and Business, Geography and Psychology and soft including Anthropology, Politics and Sociology.

4 | Literature Review

With authorship—and the recognition that flows therefrom—traditionally held to be, as Cronin (2001, 559) put it 'the undisputed coin of the realm in academia', it is hardly surprising to find that citations and citation-data-derived indicators have numerous potential functions for a researcher. Indeed, a host of studies, which explore the utilisation of citations for scholarly purposes, leave no doubt that citations have the potential to be put to wide-ranging uses by researchers both in their undertakings as producers and disseminators of new knowledge and in their efforts to build-up their performance-based scholarly standing (Bornmann and Daniel 2008; Tahamtan and Bornmann 2018, 2019). In fact, a taxonomy of citing behaviour/practices, suggested by Erikson and Erlandson (2014), comprises four main categories, one of which focusses on the functions of citing in the processes involved in contributing to the extant body of knowledge, and two others which focus on the functions of citing for reputation-building and credit gaining purposes (the fourth category, which is concerned with uses of previous literature as data in review papers, is not relevant to us here).

Plainly then, citations are accorded a variety of important roles in the processes that comprise the production of new knowledge and its reporting. However, it is yet to be seen how things in this area will unfold now that the use of AI-powered novel techniques and platforms for research purposes has become more customary. On the one hand, AI-based tools are particularly well suited to searching, screening, retrieving and analysing large literature databases, rendering the anchoring of a research project in previously established knowledge ever more efficient (AlZaabi et al. 2023). On the other hand, AI is notorious for its tendency to 'hallucinate'—that is, to produce texts that give the impression of being fluent and natural, despite being unfaithful and nonsensical, and to invent non-existent citations (Ji et al. 2023; Ngwenyama and Rowe 2024). Indeed, researchers, whilst clearly aware and appreciative of the considerable help potentially afforded by AI in this area, are also concerned about the dangers involved (ERC—European Research Council 2023; Nordling 2023; Van Noorden and Perkel 2023).

Just how important the reputation-building function of citations is held to be in academia is indicated by the fact that citation counts have been used for decades as a main science indicator to measure the scholarly standing and reputation of individual researchers, alongside that of departments and research institutions, universities, books, journals and nations (Bornmann and Daniel 2008; Bornmann and Marx 2013; Harley et al. 2010; Thornley

et al. 2015; Waltman 2016). Justifiably so, of course: as authors use citations to indicate which publications influenced their work by inspiring or informing it, citations do in fact evidence scientific impact (Bollen et al. 2009; Bornmann and Marx 2013; Tahamtan et al. 2016), which, coupled with productivity, comprise the basic tenets of scholarly reputation (Herman 2018).

With citations thus representing, as Merton's (1968, 620) well-known aphorism goes, 'pellets of peer recognition that aggregate into reputational wealth', it is hardly surprising to find that citation-data based bibliometric indicators, be they simple counts of the number of times a work is cited or more refined measures, based on the distribution of citations, such as the h-index or the g-index (Zhu et al. 2015), inevitably assume a critical role for the researcher. Reputation, after all, as a host of studies have repeatedly suggested, is the key to the allocation of scholarly rewards—employment, tenure, promotions, resources, job mobility, awards/prizes and monetary remuneration (see, for example, Becher and Trowler 2001; Blackmore and Kandiko 2011; Herman and Nicholas 2019; Jamali et al. 2016; Merton 1968, 1973; Nicholas et al. 2015; Nicholas et al. 2018; Nicholas et al. 2020; Van Dalen and Henkens 2012).

Citations, then, afford researchers a host of reputation-building opportunities and tactics, which, coupled with the roles they play in the production and dissemination of new knowledge, can certainly explain their centrality to scholarly pursuits. However, here again it is yet to be seen if, and if so how, the newly introduced AI-based tools will impact the current situation.

A concern that comes to mind, as Moffatt and Hall (2024) note, is that AI-assisted research could have adverse reputational effects. True, as we have seen, publications are a means to build a reputation, and AI might very well accelerate the innovation process and bring about a productivity boost, but then, it could also degrade the quality and transparency of research, producing as it tends to do poor-quality papers with text that may look convincing, but often contains inaccuracies, bias and plagiarism (Van Dis et al. 2023; Van Noorden and Perkel 2023). Thus, as Moffatt and Hall (2024) go on to say, '...the jury is still out on the wisdom of using AI as a text generator for career success. Nobody knows how future hiring and tenure committees will assess the weight of AI-assisted publications. It is currently unclear if generating a substantial number of AI-assisted publications will add to one's academic reputation if people know that AI was used to generate text. It could be seen as a career negative'. This situation must be even more worrying for junior researchers, yet to establish themselves in academia (Jamali et al. 2023; Nicholas et al. 2017, 2020), for in their case any means of enhancing their productivity would be of appeal.

5 | Methodology

5.1 | Recruitment of Interviewees

National interviewers (from China, Malaysia, Poland, Portugal, Spain, UK and US) recruited ECRs, using their local research networks and connections supplemented by mail-outs from scholarly publisher lists. For this pathfinder/pilot phase, each country was originally allocated a potential quota of interviewees (10), but happenings on the ground did not work out quite according to plan. Malaysia, Portugal and Spain did recruit 10 interviewees each. However, in China, AI turned out to be a hot topic with 21 eager ECRs recruited, and in the case of Poland, thanks to local funding[2], more than that—32 ECRs. Indeed, as noted, for the very first time in the history of *Harbingers*, the availability of local funding in Poland provided an opportunity to include arts and humanities ECRs (22 of them). As local considerations delayed interviewing in the UK and US, just 7 ECRs were recruited in time for participation in the pathfinder phase. Given the pilot nature of the project, the imbalance in country coverage was not thought to be a problem, especially as the opportunity to increase the size of the pilot to 91 ECRs, the attraction of extending the study to the arts and humanities, and the ability to take a closer look at China, with its growing importance in the international scholarly world, more than made up for it.

Interviewees included both ECRs who participated in *Harbingers-2* and were happy to continue (26 of them), as well as new ones recruited to fill the ranks of participants who had left research, no longer qualified as ECRs or declined because of work commitments or lack of interest.

The breakdown of the ECR cohort by country, discipline, gender and age-band are given in Table 1. Note especially the age of the cohort and how many relatively older researchers there are. There are three reasons for this. First, for reasons of convenience we retained ECRs from previous stages of the project, they were all a year or two older. Second, it is the nature of academic or indeed any employment, that not everyone moves forever upward. Third, some of researchers who were ECRs at the time of *Harbingers-2* had since become tenured, so, technically, no longer fit our definition of an 'ECR'. Note also that, except for a Dutchman working in the UK, all country cohorts are nationals of that country. Hence, we talk for instance about Spanish researchers etc.

5.2 | Data Collection

Semi-structured, free-flowing interviews of 60–90 min in duration were the main source of data. The interview schedule consisted of seven pages of questions[3], covering an exhaustive range of general scholarly communication questions as well as questions about AI and its impact on research activities. There were 60 questions in all, but only the 34 that mentioned citations (broadly defined) feature in this analysis. These questions are listed in Table 7.

5.3 | Data Analysis

All interview transcripts, having been read and approved by the interviewees, were translated to English where necessary and transferred by the national interviewers to a coding sheet, which closely matched the questions of the original interview schedule, but left room for information derived from additional enquiries or clarifications during the interview process. Thus, the coding sheets, containing quantitative and qualitative data, as a question could, and often did, generate both, and capturing as they did quotations and sometimes explanatory comments from the interviewers, were multi-faceted.

TABLE 1 | Demographic breakdown of convenience sample in 2024.

Discipline										
	CHEM	**ENVIR**	**HUM/ARTS**	**LIFE**	**MATH**	**MED**	**PHY**	**SOCH[a]**	**SOCS[b]**	**Total**
N	7	4	23	6	9	12	16	5	9	91
%	8%	4%	25%	7%	10%	13%	18%	5%	10%	100%

	CN	**ES**	**GB**	**MY**	**PL**	**PT**	**US**	
N	22	10	3	10	32	10	4	91
%	24%	11%	3%	11%	35%	11%	4%	100%

	Youngest (26–30)	**Younger than most (30–34)**	**Median (35–37)**	**Older than most (37–39)**	**Oldest (39–51)**	**N/A**	**Median**	
N	18	18	18	18	18	1	36	91
%	20%	20%	20%	20%	20%	1%		100%

	Male	**Female**	
N	43	48	91
%	47%	53%	

[a]Includes Economics and Business, Geography and Psychology.
[b]Includes Anthropology, Politics and Sociology.

Just two questions had a quantitative component and these were coded as Y/N etc. and both featured 'impact factor' as an option in a list of responses to a question. Otherwise, a search and collation of all the interview records was undertaken for the term citations and its derivatives (cite, citing, citations) and manifestations (H-Index, JIF, impact factor, Scopus, WoS, Google Scholar) and this identified questions for further thematic analysis. Mentions alone, of course, are merely evidence of recognition, they may be negative, positive or just mentioned in passing; the context is all-important. For insight and analysis, there is the need to dig-down—to the quotes and comments. Herein the number of 'mentions' are calculated to count a mention only once per interview, so totals of mentions are always relative to the total number of ECRs in the study (91).

6 | Results

As mentioned, of 60 questions in the interview schedule, just two were direct questions about citations, which asked about the JIF and indexation (e.g., Scopus). However, a keyword search of the interview data identified a further 32 questions on numerous aspects of scholarly communications, with responses that mentioned citations and its various manifestations and are, therefore, covered here.

6.1 | Quantitative Data

6.1.1 | Questions on Impact Factors

There were two multiple-part, quantitative questions without a qualitative component. These were found to have little relevance for the (Polish) A&H cohort, both because their publishing activities centred on the monograph rather than journals, and because citations in humanities papers are often references to primary sources, which therefore serve more as *data* for the analyses rather than *information sources*, whose ideas inspire the citing papers (Lin 2018).

The first question asked, in the context of information discovery, was: 'When you have searched and found an article on a topic important to their research what criterion persuades them to read it: (On a scale of 0 as *no importance* to 5 as *very high importance*) (a) the name/reputation of the author; (b) the type of peer review process which the article has undergone; (c) the editor of the journal and members of the editorial board; (d) the name of the journal; (e) the name of the publisher; (f) abstract; (g) JIF'.

We focus here on the response to the last listed criteria. Clearly, the data show that the JIF is a major determinant as to what is read, with more than three-quarters of ECRs scoring it in the top 3–5 category and nearly a quarter scoring it as category 5, with percentages rising to 40% in the case of Malaysians (Table 2). To put this into a wider context, ECRs thought that the abstract (nearly half rating it as 5), name of the author (38%), the name of the journal (36%) were even more important criteria. So, JIF is not the be all and end all. No surprise then that ECRs from Chemistry, Medicine and Physics rated it most highly.

The second question, which came from the publishing section of the interview, asked: 'When choosing a journal to submit your paper to which factors rate most highly: (Score 0 as *no importance* to 5 as *high importance*): (a) it is a high impact factor journal; (b) it has much prestige in the discipline; (c) appropriateness of the audience; (d) the speed from submission to publication; (e) it is open access; (f) the geographical location/origins of journal/publisher; (g) where it is indexed (e.g., SCOPUS, WoS); (h) high standards of peer review'.

Factors (a) and (g) above are relevant to the analysis here. We were aware of the overlap between the two questions and wanted to see whether the wording approach would generate differences in response. In fact, in both cases, it was clear that they were very important factors (Tables 3 and 4). Overall, JIF scored marginally higher, with no one saying it was not important or of small importance, but indexation scored the highest importance rating. So, not much in it really. The Spanish rated JIF most highly and the Chinese and Portuguese less so. In respect to indexation, it was the Chinese and Malaysians who rated it most highly and Poles less so. All the sciences rated JIF very highly. Indexation was similarly most highly rated by the sciences, but, surprisingly, also by the soft social sciences. There was just one age difference that stood out and that was the oldest group of ECRs who most highly rated indexation.

6.1.2 | Mentions Analysis

A word first on the use of the term 'mentions', it is used as shorthand for 'ECRs who mentioned'. A 'mention' is counted once per ECR, repeat mentions by the same ECR do not count. But sometimes we look at the whole interview, sometimes we are considering individual questions. So, if you add up individual questions there may be multiple counts from the same ECR.

Thus, of our 91 ECRs 66 ECRs mentioned 'citation' at least once, but we have in total 131 mentions of 'citation' across 37 questions. This shows how widely citations crop up in the context of various scholarly activities. Table 5 shows the context ('topic'); only those with more than 10 mentions being shown. Reputation clearly stands out accounting for the most (58 mentions) and

TABLE 2 | Journal impact factor and its importance in determining what to read.

Rating	Total	CN	ES	GB	MY	PL	PT	US
0	3 (4%)	0	1	0	0	0	2	0
1	5 (7%)	2	1	0	0	2	0	0
2	5 (7%)	2	1	0	0	1	1	0
3	17 (25%)	6	2	1	2	2	4	0
4	18 (26%)	4	3	0	4	3	3	1
5	16 (23%)	7	2	0	4	2	0	1
N/A	5 (7%)	1	0	2	0	0	0	2
Total	69 (100%)	22	10	3	10	10	10	4

TABLE 3 | Journal impact factor in determining where to publish.

Rating	Total	CN	ES	GB	MY	PL	PT	US
2	1 (1%)	1	0	0	0	0	0	0
3	14 (20%)	5	1	1	1	1	3	2
4	15 (22%)	4	1	0	4	3	3	0
5	35 (51%)	12	8	0	5	6	4	0
N/A	4 (6%)	0	0	2	0	0	0	2
Total	69 (100%)	22	10	3	10	10	10	2

TABLE 4 | Where journal are indexed in determining where to publish.

Rating	Total	CN	ES	GB	MY	PL	PT	US
0	1 (1%)	0	0	0	0	1	0	0
1	3 (4%)	1	1	0	0	1	0	0
2	1 (1%)	1	0	0	0	0	0	0
3	8 (12%)	0	1	1	1	2	2	1
4	14 (20%)	6	1	0	2	3	2	0
5	38 (55%)	14	7	0	7	3	6	1
N/A	4 (6%)	0	0	2	0	0	0	2
Total	69 (100%)	22	10	3	10	10	10	3

TABLE 5 | Context of 'Citation' mentioned by broad scholarly communication area (with more than 10 mentions).

Topic	No. of questions	Mentions
Reputation	6	58
Artificial intelligence	12[a]	30[a]
Authorship and publishing	13	28
Information evaluation, trust, ethics	6	18
Information discovery and information usage	3	16

[a]This total includes mentions of AI in the special section in the interview on also in the rest of the scholarly topics mentioned in the table (see Table 7).

it was followed by AI, which is no surprise given the project's overall focus. Information evaluation and authorship/publishing followed with 28 mentions. The questions which generated the most mentions are shown in Table 6. How do they judge success as a researcher, unsurprisingly, came top of the list by quite some margin (26 mentions). Table 7 provides the full list of questions that yielded a mention to citations and there is a high degree of scatter over the 37 questions.

6.2 | Qualitative Data

We shall now look at the crucially important qualitative data (the voices behind the numbers) by broad scholarly topic in order of the scholarly aspects most mentioning citations.

6.2.1 | Reputation

This area of questioning received, by some margin, the most mentions (58) from 6 questions, all of whom received a minimum number of 4 mentions, which suggests that citations are highly important for this crucial aspect of scholarly communication. It need be said here, though, that quite a few Chinese and Malaysian ECRs did not answer this question, and this was put down to cultural values of modesty and respect for authority and seniority. That is, ECRs felt it was inappropriate to judge success, a role they believed should be reserved for more senior colleagues, who notably were the ones conducting the interviews. Around half of these mentions came from just one question, and this is the one we start with first.

How would you judge your success as a researcher (and that of others)?

In answering this broad question, ECRs mentioned lots of factors and not just citations, so let us look first at the whole dataset for the question and compare the citations to all the other factors mentioned. Well, the number of citations did come first, grants obtained second place, JIF third, with H-index trailing in seventh place. Citations then dominate the top three places, quite an achievement. The explanation for H-index's low score is that ECRs were too junior to trumpet their own H-index score, as it is a score that rises with age and experience. Also, they were not as familiar with it.

TABLE 6 | Questions in which ECRs most often mention 'citation' (five or more).

ECRs	Question
26	How would you judge your success as a researcher (and that of others)?
12	Where do you go to search for formal scholarly communications
11	Do you consider download data, social media indicators/alternative indicators (i.e., altmetrics) to have a reputational value for them or others?
9	What would make you suspect that published material was possibly AI generated?
6	Argued there is a need to improve the ways in which scientific research output is evaluated by considering openness and transparency, such as OA, open data and outreach. What are your views on such a policy?
5	How does your institution, national panels and/or funders assess you?

Out of the 26 ECRs who mentioned citations in this context, three were negative ones in that ECRs said that citations were not important (2 of these were from A&H). Given their longevity as reputational markers and widespread availability, not surprisingly, citations were the most mentioned success factor, but they still only attracted mentions by just over a third of ECRs.

Few ECRs mentioned citation factors solely and tended to bundle them with two or three other factors, as this Portuguese life scientist did:

I evaluate my success by considering several factors: scientific production (publications) citations, fundraising, participation in the scientific community through the organisation of events, scientific commissions and communication of science to the public (promotion of scientific literacy) and finally the guidance of students.

Quite a few ECRs, while thinking citations were important, were sceptical about the over-reliance on metrics like citations and H-index, believing they do not fully capture the impact or quality of research, such as this Polish humanist:

The number of citations is one indicator of success, but is not in itself a good indicator of success. The most important thing is the high quality of the text.

Some, like this Portuguese physical scientist, preferred to judge success on broader, more qualitative measures of impact and contribution to their field or society, but their ambitions are hamstrung by the assessment system.

The impact through the number of citations, the ability to obtain funding and have international collaborations, the quality of the

TABLE 7 | All questions where respondents mention 'citation'.

Q. no.	No. ECRs	Question
B03	1	What is the extent of your AI use or engagement?
B04	2	How do view 'AI'?
B05a	1	Do you think changes will come about (now, in a year or two, this decade, in your working lifetime)?
C02	5	How does your institution, national panels and/or funders assess you?
C03	26	How would you judge your success as a researcher (and that of others)?
C04	11	Do you consider download data, social media indicators/alternative indicators (i.e., altmetrics) to have a reputational value for you or others?
C05	4	Achieving visibility for your research outputs is argued as being important in building research reputation: do you agree?
C07	6	Argued there is need to improve ways in which scientific research is evaluated by considering openness and transparency factors, such as OA, open data and outreach. What are your views on such a policy?
C08	4	Does AI have any implications for research reputation? If so, what are they?
D01	12	Where do you go to search for formal scholarly communications?
D02	2	If a document cannot be obtained easily (through their library/virtual network?) where do you go next?
D04	2	Has your searching and discovery behaviour been impacted/changed in any way by 'AI'?
D12	1	To what extent do you feel that the peer review system vouches for the quality and trustworthiness of formally published research?
D13	2	How do you decide how to trust informally disseminated evidence in your own specialisms?
D14	9	What would make you suspect that published material was possibly AI generated?
D15	1	Are you aware of bad science/questionable/low grade practice being undertaken in their field and subsequently published?
D16	2	Do you believe that the AI-associated potential for rapid production of low-quality scientific articles brings about a decline in overall quality of research output, indeed, facilitated the growth of predatory journals and paper mills?
D17	3	Do you think AI is raising any other issues of scholarly integrity and ethics? If so, what are the issues and what can be done about it?
E04	1	Used 'AI' as a tool for summarising scientific articles/extract key information from complex texts to facilitate doing a literature review?
E06	1	Do you see traditional journals, whether open access ones, as still the main way of making research available?
E08b	1	When choosing a journal to submit their paper to which factors rate most highly: (b) it has much prestige in the discipline?
E09	4	Will 'AI' change your relative ratings (of what factors they consider when choosing a journal) or introduce any new factors?
E12	2	Do you feel that the peer review system needs improving in any way?
E13	2	What do you think an AI-based peer-review should be capable of doing, if it is to replace the current system?
E14	3	Does your research team/department/university have a policy regarding OA publishing? If yes, what is it?
E15	4	Does your research team/department/university have a policy on avoiding predatory and questionable journals? If yes, what is it?
E16	1	Can you/your group afford to publish in open access journals, which are entirely open access – so called gold journals? And in journals which are mostly not open access—so-called hybrid journals?

(Continues)

TABLE 7 | (Continued)

Q. no.	No. ECRs	Question
E17	1	Is the final peer reviewed version of your articles placed in a repository in their own institution and if so, why?
E18a	3	Do you consider a preprint to be: (a) an alternative to; a traditional publication?
E18b	2	Do you consider a preprint to be: (b) a replacement for a traditional publication?
E19	1	Making available research results quickly and openly can be at the expense of quality and reproducibility and that there is evidence for this in number of retractions of preprints and final versions of papers. What do you think?
F01	2	What form do you think a transformed scholarly communications system might take?
F03	1	What role do you think libraries will have for researchers in 10 years' time as compared to their current role, especially considering growing utilisation of 'AI'?
F04	1	Will 'AI' be a transformational force? If so, in what ways? What will be the advantages and disadvantages of the transformations that will take place?
Total	118	

work developed/published, awards at conferences, the impact of the research topic on society outside the specific scientific community and *the ability to train/lead good students/researchers*.

Within the citation's dataset, JIF was mentioned most (12 times). For example, a British chemist said the recipe for success was:

Getting published in a journal with a high IF is still important and this does not equate overall with OA gold.

In the same vein, a Polish life scientist said success was: *Publication in a high-impact journal—large IF and relevance in the discipline*.

Do you consider download data, social media indicators/ alternative indicators to have a reputational value for you or others?

While this question saw 11 ECRs mentioning citations it is worth looking at in respect to all 90 of the responses because it was a 'companion' question to the previous question and what most ECRs thought of as an 'alternative' to citations. Many ECRs answered it in yes and no terms, generally supported with many thoughtful comments. The big surprise was how many people did see them in reputational terms. Thus, 50 (55%) said they did have value although answers were sometimes hedged, 38 (42%) said no and 2 said they were unsure. Probably, for the first time in the Harbingers study, we have seen ECRs talk about altmetrics enthusiastically.

A&H ECRs were somewhat split down the middle in their opinions, so, interestingly, not that different from the whole cohort. Chinese ECRs, many of whom did not want to discuss success at all, were eager to answer this question, with the large majority 17/22 (three-quarters) seeing a reputational role for altmetrics.

Looking first at those that who felt altmetrics had a reputational value. In general, quite a few comments shine the light on and pick holes in the traditional formal model because ECRs tend to make comparisons in their answers, so this way you learn a lot about more traditional reputation. The following comments give a flavour of what ECRs told us:

A Chinese mathematical scientist saw its benefit as telling you something about how their work is going down with another audience and providing a critique you do not get elsewhere:

It's not just about the reputation value, as we aim to present our work to a broader audience. On one hand, it facilitates others in utilising our work, and on the other hand, it invites constructive criticism. I particularly appreciate when people critique my work. For instance, if someone identifies areas that could be improved, from my perspective, I might think the work has reached a point where further enhancement is unnecessary.

Another Chinese ECR, but this time a physical scientist, felt that downloads had value by demonstrating how well your paper was going down—its 'weight' as they put it: *The number of downloads may more than anything else determine the weight of this paper in the eyes of your peers*.

A Malaysian mathematical scientist, offering his views in millennial terms, described the ability to attract attention as his great asset: *If my work gets downloaded or gets attention on social media, it's like a shout-out saying, hey, this stuff is cool and people care about it*.

Interestingly, quite a few ECRs saw altmetrics boosting their citation scores:

> Indeed, it is worth sharing the results of your research online; it increases access to scientific knowledge and gives you a chance for more citations.
>
> (Polish soft social scientist)

> I recognize their reputation value, and they could eventually contribute to my H-index. However,

> currently, I simply share my work on social media without actively tracking it.
>
> (Malaysian chemist)

> But not all thought this way: It's easy to track attention with downloads and tweets, but I'm not entirely convinced that these indicators always translate into citations.
>
> (Malaysian mathematical scientist)

Argued that there is need to improve ways in which scientific research is evaluated by the considering openness and transparency factors, such as OA, open data and outreach. What are your views on such a policy?

Citations tended to be mentioned here negatively by ECRs who wished for a broader and fairer assessment of researchers' work, as this one from a Polish humanities ECR.

I personally do not share open data. Yes, this type of evaluation system would be fairer in assessing young researchers than citation rates. If data sharing had an impact on the reputation or evaluation of researchers, it would encourage all researchers, both young and very experienced. For now, however, open data is neither a requirement nor a common practice among researchers.

And this from a Spanish mathematical scientist:

Incorporating these elements into research evaluation can help overcome the shortcomings of the traditional metrics system, such as the JIF which is often criticised for its lack of objectivity and its focus on quantity rather than on the quality of research. However, I believe that the implementation of these approaches is not simple and poses challenges, such as managing the costs of open access publishing.

How does your institution, national panels and/or funders assess you?

All the mentions were an assertion that they were measured by citation-based metrics and were part of their Key Performance Indicators (KPIs) and most were Malaysian ECRs. This Malaysian mathematical scientist told us: *For KPI, they look at how much you've published, number of students you've supervised, the research grant, what students think of your course and the money you've generated in for the faculty. Oh, and they also look at your h-index and citations for promotion*. This highlights the growing importance of citation metrics in shaping academic success and career progression in Malaysia.

6.2.2 | Artificial Intelligence

Given that the project focussed on AI changes, it is important to see whether citations are raised in this regard, and given the novelty of the topic, it would be difficult to predict how. There were no direct questions put to ECRs in these terms, nor were the two linked together in a question, so we need to deep dive into the transcripts themselves to find out. A keyword search identified 12 questions across all the scholarly areas, which yielded 30 mentions (Table 8). Because we looked for AI mentions outside the main AI questioning area, some of these questions are also dealt with under the other scholarly categories. So, we have some data to go on, and most of the mentions crop up in the trust, quality and ethical areas of scholarly communications, which is interesting. Citations, it seems, are mainly seen as an integrity check, something of an AI testing tool, which is thought to be needed by ECRs.

TABLE 8 | Questions which contained references to both AI and citations and their derivatives (those with two or more mentions listed).

Q. no.	ECRs	Question
D14	9	What would make you suspect that published material was possibly AI generated?
E09	4	Will 'AI' change your relative ratings (of what factors they consider when choosing a journal) or introduce any new factors?
D17	3	Do you think AI is raising any other issues of scholarly integrity and ethics? If so, what are the issues and what can be done about it?
E13	2	What do you think an AI-based peer-review should be capable of doing, if it is to replace the current system?
B04	2	How do you view 'AI'
C08	2	Does AI have any implications for research reputation?
D17	2	Do you think AI is raising any other issues of scholarly integrity and ethics? If so, what are the issues and what can be done about it?

What would make you suspect that published material was possibly AI generated?

A Malaysian life scientist mentioned doing a check on the citations in a paper to spot 'dodgy' AI-generated papers when you are a reviewer.

In articles, one key giveaway is the writing style; watch out for sudden shifts in tone, language or structure. Another clue is repetitive phrasing; if sentences sound weird or repeated, that's a red flag. Check for missing citations or references. If the paper lacks references altogether, be suspicious. Keep an eye out for overly complex language in scientific papers; AI models sometimes make things unnecessarily intricate. Look for these signs when reviewing papers.

A Malaysian physical scientist is also using citations to identify AI-generated papers by discovering those papers not using standard practices or citing irrelevant sources:

For example, an engineering paper generated by AI might use inconsistent terminology, like switching between units of

measurement without explanation or using technical jargon inappropriately. It might also lack coherence, with explanations of experimental setups or methodologies being disjointed or incomplete due to a lack of contextual understanding or repetitive.... In engineering papers, you might spot AI by checking the references. They might list sources randomly, not follow standard citation styles like IEEE or APA, or even cite non-existent or irrelevant sources. These issues can make you doubt the paper's authorship.

A Polish soft social scientist again points out to AI papers lacking proper citation:

My AI tests indicate that it cannot yet write deep, well-thought-out text while citing good sources. It writes about everything and nothing. But it suggests cool ideas that can be developed and then implemented during classes. Sometimes I ask it how I can teach a given subject; I ask it to give me ideas, and it generates them. I choose the more interesting ones and discuss with students which of them we could use in our classes.

Will 'AI' change your relative ratings (of what factors they consider when choosing a journal) or introduce any new factors?

This was a question which attracted 4 mentions, with half saying it would. One ECR thought it could raise the impact value of the journals they publish in and make them more attractive:

> For an individual, it's a hard choice, as the addition of AI may help journals achieve a higher impact factor. But if I had to choose, I would still value the journal's disciplinary reputation more.
>
> (Chinese soft social science)

The other ECR, a Polish mathematical scientist, thought AI might introduce new factors, replacing impact factors:

It seems to me that there may be some new measures of evaluation. For example, some replacement for impact factor or a new way of counting. I do not have any other specific ideas in my mind.

Do they think AI is raising any other issues of scholarly integrity and ethics?

A Malaysian life scientist 'moaned' about poor or missing citation practices of AI-generated papers and mentions reputational concerns:

Recently, as I reviewed a paper from China, it was very obvious it uses AI; a significant issue caught my attention—as usual, the cited sources were nowhere to be found. That's a serious red flag, isn't it? As scholars, it's crucial to stay genuine. Our work must be of top quality, use credible sources and real expertise, not just pulled from the random corners of the internet. Why does this matter? Because our academic reputation is at stake. It's not just an individual thing; it's about propelling our fields forward. Academic reputation plays a crucial role in advancing knowledge within our fields.

A Malaysian hard social scientist noted its potential as an aid to spotting papers with citation errors:

AI can assist in this [review] *process by analysing reader feedback, citations and usage metrics to pinpoint articles that may need additional correction.*

What do you think an AI-based peer-review should be capable of doing, if it is to replace the current system?

This was a question from the publishing section of the interviews, with the response from a Malaysian soft social scientist raising doubts about AI's ability to assess the validity of citations:

If AI is really going to take over peer review, it has to be capable in key tasks like evaluating research quality and validity. Can it really understand the context, break down the methodology, complex method and gauge how groundbreaking the research is? Plus, it needs to be a pro at spotting plagiarism, ensuring accurate citations, and overall, doing the whole scholarly review thing. Can AI do it?

And a similar response from a Malaysian hard social scientist who expressed similar doubts, questioning whether journals can support post-publication review, even with AI's help:

Post-publication review would be beneficial, but can journals and the community afford to engage in it? AI can assist in this process by analysing reader feedback, citations and usage metrics to pinpoint articles that may need additional correction. But it's crucial for the research community to actively participate, to promote ethical practices and uphold scholarly standards to ensure the integrity of the peer review process.

How do you view 'AI'.

This was a very broad question stripped of any scholarly communications connection. A Chinese mathematical scientist saw AI as a screening tool for peer review by spotting citation compliance requirements as well as other things:

It should be considered as an auxiliary tool. I believe it can be utilised for some preliminary screening in journal submissions, such as checking for compliance with specific criteria set by journals and conferences. For instance, CVPR (The Computer Vision Foundation) *requires a maximum of eight pages for the main body, prohibits citations in abstracts and tables, and has specific formatting guidelines—tasks that may seem tedious to humans but are convenient for machines to verify. While AI tools can handle these initial screening tasks, individual reviewers like us may not find them necessary, as our primary focus is on how to review and evaluate each manuscript thoroughly.*

A Malaysian mathematical scientist saw AI as a promising tool to improve academic writing and publishing quality:

I am excited about the prospect of using generative AI to enhance the quality of academic writing and publishing. Still exploring automated proofreading, citation analysis and content summarization, I think this could significantly contribute to the extra umph to scholarly publishing.

Does AI have any implications for research reputation?

This Malaysian mathematical scientist suggests that AI could help in assessing reputation by analysing citation metrics, ultimately helping academics to decide whether to engage with or use it:

AI tools can check out stuff like how many times a researcher's work gets cited, mentioned on social media and other numbers. It's like a popularity check that affects how other academics see them. Assessing reputation; reputational check, whether can trust the work/determine whether to use it.

A Malaysian physical scientist was a little worried that AI could unethically manipulate reputation:

Researchers who use AI for top-notch, impactful research can get recognised for their fresh approaches and contributions to their field. But of course there's a flip side if isn't used ethically; perhaps it could skew results and boost citations, collaborations and visibility, artificially inflating a researcher's reputation.

He seemed to be saying that while AI has the potential to significantly enhance research reputation by improving efficiency and accuracy and enabling innovative approaches, there are risks if not used ethically, potentially inflating reputation through manipulated outcomes and raising integrity concerns.

6.2.3 | Authorship and Publishing

We have already learnt from the quantitative analysis that JIF and indexation are very important in determining where to publish a paper.

Twenty-eight mentions are scattered over 13 questions, so we shall just focus on 3 questions that generated 3 or more mentions.

The question: 'Does your research team/department/university have a policy on avoiding predatory and questionable journals?' generated four mentions. All the mentions were to do with employing impact factors and indexation to ensure researchers did not publish in predatory journals: they were a buttress against predatory publishing. Two illustrative quotes follow:

Three mentions came from this question: 'Does your research team/department/university have a policy regarding OA publishing? If yes, what is it?'

The mentions were all from Malaysian ECRs, who consistently stated that APCs were only covered when publishing in WoS indexed journals. For instance:

> My university pays APCs only for OA journals that are in Q1 and Q2 of WoS. No, there's no policy that mandate us to publish in open access journals, or even make our papers available on open access.
>
> (Malaysian mathematical scientist)

6.2.4 | Information Evaluation, Trust, and Ethics

Six questions covering these topics received 18 citation mentions, with half of them coming from just one question (and the rest widely distributed): *What would make you suspect that published material was possibly AI generated ?* This question has been dealt with in the AI section of this report, which showed that most ECRs mentioned looking for poor citing behaviour to identify AI-generated articles and text.

6.2.5 | Information Discovery and Information Usage

This is a potentially very interesting topic area, as it obtains much less attention than citations in reputation. This topic also featured in the quantitative analysis, where we asked about the JIF and indexation and its importance in determining what to read. Both were very highly rated. So, what more did the qualitative date tell us? Three questions delivered 16 ECR mentions and 'Where do you go to search for formal scholarly communications' obtained most of them, so we shall have a look at the responses to this question.

Mostly ECRs just named platforms they used and seldom justified their choice (as if their status said everything). WoS and Scopus were both mentioned nine times, with Google Scholar in third place at six. This Portuguese chemist was unusual in commenting and said:

International journals (covered in Science Direct and SCOPUS), conference publications (mostly old ones, since they had higher quality because they were the main means of scientific dissemination in the past, in my field).

This was not a question analysed for A&H Polish ECRs but more information can be found at Świgoń (2023).

The second question with most mentions was: 'If a document cannot be obtained easily (through their library/virtual network?) where do you go next?' Obtaining only two mentions, and both of those were in respect to WoS, by Chinese ECRs.

The third question was: 'Has your searching and discovery behaviour been impacted/changed in any way by "AI"?' Two mentions here, both Malaysians who highlighted Scite, an AI Assistant for researchers which 'searches the literature to transform the way you discover, evaluate and understand research on any topic.' Both mentioned how Scite has significantly enhanced their ability to navigate and assess research more effectively.

7 | Conclusions

The broad aim of the preliminary study was to establish what ECRs thought of citations and where and how they used them in the brave new world of AI and to portray their views and practices in their very own words and voices. Most importantly, we wanted to discover whether the new generation (largely millennials) held citations in esteem and thought they had an important role in the future. In this regard, we wanted to discover

where citations and their various manifestations/platforms were being utilised across the whole spectrum of scholarly communications and to do this with the minimum amount of prompting and poking. What we discovered was that citations were mentioned in answers to about half of all the questions we asked, which is a big testament to their importance and general utility. Scholarly workhorses is a phrase that comes to mind. Certainly, they appear to be still the main currency of scholarly communications. Citations were mostly mentioned in respect to reputation and scholarly success, with the question on how they would judge their success as researchers attracting the most mentions. AI came next, and although the overall project was weighted towards this topic, it still surprised us to learn how much citations were mentioned in this context, and that was principally down to their use in identifying (and avoiding) AI-generated material. They were mainly seen to provide an integrity check. Other topic areas where citations were mentioned quite a lot included: authorship and publishing; information evaluation, trust and ethics; information discovery; and information usage.

Citations, then, remain a major force in determining what is read, where to publish and what to trust, and that touches on all the principal scholarly bases. If anything, as in the case of Malaysia particularly, there are signs of the growing importance of citation metrics in shaping academic success and determining career progression. However, you do not come away with the feeling that ECRs particularly like them, more a case, as with peer review, that they put up with them because they must as there is no substitute for them and use them in tandem with other criteria.

Overall, then, there are few signs that trust in citations and the use of them is being eroded and citations are being sidelined. Of course, there is recognition that bad scientific practices exist and that they need to be avoided and addressed, but we do not see our ECRs feeling that there is any form of recognition more important than being cited or any measure of quality usurping them. However, a by-product of the study was that altmetrics are catching on—even for reputational purposes, partly because they compensate for the fact that ECRs typically have lower citation scores because of their juniority. There is a general understanding, however, that they are much more easily manipulated than citations, but nevertheless they are regarded quite enthusiastically.

Note, this was a preliminary study working with a convenience sample attempting to inform a future more comprehensive study. Our findings should therefore be treated more as informed observations, filling a knowledge vacuum.

Author Contributions

David Nicholas provided oversight of the article and wrote much of it. David Clark provided the data analysis, technical support and insights. Eti Herman did the literature review. The rest of the authors undertook their country analyses and provided general feedback on the paper.

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Consent

Participants who freely opted to take part in the interviews were asked to provide their names and contact details for follow-up questions regarding the accuracy of the interview transcripts, but access to all personal data was restricted to the investigating team and was removed before the analysis of the results.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Endnotes

[1] While this was true for Harbingers-1 and Harbingers-2, more ECRs in their forties are in Harbingers-3 because our cohort aged.

[2] Poland. National Science Centre no. 2022/45/B/HS2/00041.

[3] https://ciber-research.uk/download/ECRs_Harbingers%203_Pilot%20Interview_schedule_1610DN.pdf.

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