

EARLY CAREER RESEARCHERS: THE HARBINGERS OF CHANGE?

Report on Year Two from Ciber
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Final report

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Harbinger Project researchers and authors

David Nicholas (UK)
Anthony Watkinson (UK)
Abrizah Abdullah (Malaysia)
Jie Xu (China)
Blanca Rodríguez Bravo (Spain)
Chérifa Boukacem – Zeghmouri (France)
Marzena Świgoń (Poland)
Eti Herman (Israel)

1.0 Executive summary

Introduction

The report is a work in progress and provides the findings for year 2 of a three-year long study. It provides: a) data about changes in early career researchers' (ECRs) scholarly communication attitudes and behaviour between 2016 and 2017; b) an exploratory analysis of the data by age/status, gender and subject/discipline; c) new information from three additional questions on mega-journals, new sharing mechanisms and reproducibility introduced for the first time in 2017. This year 109 ECRs from 7 countries (China, France, Malaysia, Poland, Spain, UK and USA) were interviewed. These countries account for 50% of all papers published globally in 2016.

Changes

One year down the line and our panel has inevitably aged and around three-quarters of the ECR population are now in their thirties, and some in the forties (in Spain most notably). A contributing factor is that because of strong competition to obtain a job ECRs have to be relatively experienced (in China many start a ECR career at 29) and that when one gets a job it usually takes an increasingly long time to get tenure. The panel have also matured, are better informed, more measured and provide plenty of insights.

All countries recorded changes in scholarly communications in the past year with much change being of a small, minor or incremental nature, which is probably to be expected given the passage of only 12 months. The question, of course, is do these minor changes represent the start of the trend? More tellingly, perhaps, every one of the 19 scholarly topics monitored registered changes in at least one country. There were, however, significant changes in a number of areas, most notably regarding:

- a) jobs, employment and the nature of research work, where there is a high degree of churn;
- b) open access publishing, which is felt to be more acceptable largely because of the alleged benefits of outreach and increased citations. Although not so much in the UK/US where ECRs are more interested in the (imagined) speed of OA, although in both countries they would have liked to publish OA, but had to opt for high impact instead. In choosing a journal to submit to, whether it was OA was hardly ever considered;
- c) peer review, where there is disquiet partly raised by a flurry of retractions affecting some countries;
- d) changing career aims brought on by a precarious environment and increased competition;

and, in less respect, to:

- a) authorship/publishing practices and policies, which are tightening up in some countries;
- b) metrics, with altmetrics being thought about more;
- c) sharing and collaboration both of which are being boosted by the social media. Social media and social networks are building on last year, most quickly in China and Malaysia and, maybe, Europe is having to catch up. ResearchGate is on the rise everywhere.

While all countries have seen changes, it has been the greatest in China, which raises the question whether Chinese ECRs are the harbingers of change among the countries we have covered. Interestingly, another Asian country, Malaysia saw the second greatest change. There are differences between change in these two countries. In Malaysia, many areas are seeing significant change, but it is not happening for everybody. In the case of China, there changes are being felt by more people, but not in all areas. France also saw significant changes with many ECRs becoming less conservative. Poland and Spain saw the least amount of change. In Poland, the system is centrally-directed and formal, whereas Spain is still reeling from 8 years of austerity which has hit higher education particularly badly. The UK/US are in the middle and this might, partly, be because there is less left to change there as it has already happened. But what is striking about the USA is the numbers of ECRs turning away from an academic career.

Topics that require watching

Two topics are being watched because last year they produced data that seemed to go against current perceptions and beliefs. The two were the role of libraries and the importance of altmetrics. Last year libraries either were not mentioned at all or when they were this was largely in negative terms. This year we probed a little more, not directly, but in the context of various scholarly activities. What we found was that ECRs are conscious of the library's role in providing access to discovery tools, but sentiments towards the library and its future role is much the same, although it has to be said it was a little higher in the social sciences and in the USA. Despite much conference and commercial interest in altmetrics, last year ECRs showed very little interest in the topic. Generally speaking, this year, ECRs are a little more conscious of what they are and more interested in what they could do/show, but not in China.

Demographic and disciplinary differences

On the basis of two years' data the influence of age/status, gender and subject/discipline was investigated. Age analyses were complicated by the fact that our cohort has aged, leaving a small proportion of ECRs in their twenties and the fact that most doctoral students were in their twenties. However, from what we could tell, there were not many differences other than older ECRs feeling disaffected because they did not have tenure and being more informed generally about scholarly matters and the younger ones feeling pressured to succeed in a precarious and competitive environment. There is also a sense in some countries

(France and the UK, for instance) younger researchers are taking a more independent look at the scholarly system. The published literature contains very little on gender differences in scholarly behaviour; the exception being the use of online communities, where studies suggest that women are more active in these communities. We found no evidence to support this, detecting only concerns about the status and position of women in the workplace and the extra pressures on them.

An analysis based on subject/discipline is much more productive. Just less than three-quarters (72%) of the ECR population are scientists and this was because the funder's (PRC) interest lay mostly in this area and also that the majority of ECRs are found in scientific disciplines. Always allowing for the fact that social scientists constitute a quarter of our sample there does appear to be differences in behaviour between these disciplines best summed up as: a) social scientists are not as paper productive as their counterparts in science; b) scientists are more concerned with publishing in high impact factor journals; c) scientists are more familiar and knowledgeable about scholarly communications; d) scientists collaborate more and work more in groups; e) competition is greater in the sciences.

Malaysia and France often appear to be contrarians and this could well be down to the fact that the former has the highest representation of social scientists (42%) and France the highest proportion of scientists (82%). This is something we shall explore in the coming year.

New questions

Mega-journals. Just over half of ECRs were familiar with mega-journals, with Chinese ECRs most familiar with them (more than 70%) are. Much fewer (19.3%) had actually published in one, although a much higher proportion of Malaysian ECRs had (42%). Most ECRs who published in mega journals were scientists. PLOS ONE was mentioned most by ECRs, but also attracted some criticism and there is a sense that it has lost some of its esteem. The main attractions of mega-journals are seen to be their higher acceptance rates, the fact most are ranked highly by the Web of Science (WoS) and Scopus citation databases and their quickness in publishing. The biggest criticism is their perceived low standards of acceptance and processing, meaning that quality is very variable. What is, perhaps most striking about the results is that a sizeable proportion of ECRs see these journals - specifically PLOS ONE - as quick and non-selective.

More formal sharing mechanisms. Over half of ECRs would welcome a more formal sharing mechanism. It is the Spanish who most want it with the vast majority saying so. The explanation seems to be that in Spain there is a well-known and a well-used data base called Dialnet, which they like a lot and a new one might extend its reach. The lowest proportion of ECRs wanting a formal mechanism came from the USA (just under a third) where the question also seemed least understood, partly because they seemed to think ResearchGate was being talked about. The high proportions of USA and UK ECRs not understanding the question is explained partly by the fact that they appear less familiar with the concept because national databases of the sort in mind just do not exist in these countries. It is possible, too, that access

is so good they simply do not need them. In contrast, in some countries, such as China, national sharing mechanisms already exist so ECRs are more able to understand what the question was about. Only a small percentage of ECRs who wanted a sharing mechanism (13%) did not want publishers to be involved.

Reproducibility. Most ECRs, even the most conservative ones, appear to be sold on reproducibility and they even worry about it. And it was the scientists who worried the most. Most ECRs had suggestions that would help ensure reproducibility and they can be broadly categorised as: a) making sure the dataset and supplementary materials linked to the article are online and easily/openly accessible; b) articles and, especially the methods section, should be more detailed and extended; c) use videos (and conferences) to explain methodology; d) authors should (honestly) answer questions about methodology/data, maybe, at conferences or via social networks. There were some novel suggestions, too, with one Polish ECR suggesting that authors to publish two types of articles on the Internet: traditional papers and expanded papers with access provided to the data and supplementary materials. A UK ECR suggested that part of the publishing process should be to check if it is possible to reproduce. If not, the paper should not be accepted.

Conclusions

Of course, when assessing change, we need to bear in mind that most ECRs are 'servants' to a reputational or assessment system and their behaviour is shaped by others and, especially, by government policies (as in Poland and China). It is shaped most obviously and powerfully towards publishing in high impact factor journals, from which most rewards flow, and, most importantly, tenure. If ECRs want to change things by adopting new ways then all they can do is chip away at the system, and it is only governments and institutions that can ring the big changes, and there are small signs that they are doing this.

The main finding of the report is that, in the space of just 12 months, changes have occurred, with a few being quite significant and many more minor. That change is happening everywhere, in every area and country. The evidence we have gathered shows that the strong winds of change that are buffeting scholarly communications are beginning to impact on ECR's thinking and behaviour. The very fact that we can find many similarities in the changes observed in the different countries, means that ECRs are behaving as a community, as a whole.

It can be no surprise that the biggest changes recorded were in the job and career areas given that ECRs have very little security and work in a precarious and competitive environment. It seems that, because of their unique position, ECRs are more strategic than other researchers. They observe all the time on what can help them, be useful to them in their career aspirations. This means that they are more likely to change their mind and behaviour if they realize that something they criticized yesterday may actually get them quicker to their primary goal.

It is premature to make firm conclusions on the back of this, however, it is worth returning to our main research question, whether ECRs are showing signs of being the harbingers of change when it comes to scholarly communication? Each national interviewer was asked to answer this question on the basis of two years' worth of data and all said they would be, but they all have qualifications about this. For instance, a lot depends on whether ECRs take their millennial beliefs in sharing, openness and transparency into leadership positions.

Lastly, at the end of interviewing in 2017 a lot of ECRs moved to the other side of the track. Thus, we saw over a quarter of those ECRs in US universities (for example) moving to tenure track positions, so a further round of interviewing in 2018 should produce some very interesting and important results.

2.0 Introduction

This progress report presents the findings of year 2 of a three-year long study and should be read in conjunction with the year 1 report, available on the Publishing Research Consortium (PRC)¹ and CIBER² websites. It represents, uniquely, one of the very few longitudinal studies conducted in the scholarly communications field. It provides: a) data about changes in ECR scholarly communication behaviour and attitudes between 2016 and 2017; b) for the first time, an exploratory analysis of the data by age/status, gender and subject/discipline; c) extra data generated by three additional questions on sharing, mega-journals and reproducibility introduced for the first time in 2017.

The first year of the study, essentially, provided a benchmark of ECR behaviours and attitudes against which future changes could be measured and we have disseminated these results extensively (see Appendix 1 for papers). The second year of the project really constitutes the very first time that we can say anything reasonably solid about change and trends. It is only now the project can play to its strength, because asking people, via surveys or interviews, whether things will change involves a lot of guesswork and this is nowhere near as effective as ‘following’ them as we did and recording whether things have actually changed or not.

There is another great advantage that comes from following people as we have done and that is we obtain a much greater understanding and clarification of all the topics we are asking about. This is because: a) we have a greater time to question ECRs (around 2 hours per ECR); b) ECRs have much longer time to reflect on issues; c) ECRs opened out to us the second time around (perhaps trusting us more); d) we have tweaked a few questions, previously reported on to extract better quality data. This means that we have obtained more realistic and nuanced answers to questions and this is a change, too. This greater understanding obtained, which will give us an unparalleled understanding of scholarly behaviour, will not be the subject of this report, but carried forward to year 3 of the project and consolidated with year 1 and 3 data.

Now that we have obtained robust change data we have also started to look at the data beyond the national viewpoint. Thus, we present here some exploratory analyses of the data also by age/status, gender and discipline. More substantial analyses will be undertaken in year 3 when we have a complete set of data.

New questions, whose purpose is to understand better various scholarly activities, have been introduced at the request of the PRC and analysed in this report. These are:

- a) *Would a more formalised automated system for sharing be helpful? If so, should publishers be involved?*

¹ <http://publishingresearchconsortium.com>

² <http://ciber-research.eu/harbingers.html>

- b) *Have you any ideas about ways in which the results described in your publications might be made easier for other researchers to reproduce?*
- c) *What are your views of mega-journals? Would you publish in them?*

3.0 Population of ECRs

We began in 2016 with 116 ECRs ‘over recruiting’ deliberately on our initial target of 100 in order to allow for ECRs dropping out over the three-year period. It is good to report that we have had only 6 ECRs ‘dropping out’, because they have either left the field altogether and/or are not contactable. See Table 1 for full details and Table 4 to see a breakdown of the age/status, discipline and gender of the new panel.

Table 1: ECR numbers 2016 - 2017

Country	Number of ECRs 2016	Numbers of ECRs 2017	Change
China	13	14	1 transferred from UK
France	14	14	1 transferred from UK, but unavailable in Namibia
Malaysia	12	12	1 transferred to UK; 1 transferred to UAE; All remained as participants
Poland	10	10	
Spain	18	17	1 left research altogether
UK	21	18	1 transferred to France and another to China and 1 uncontactable
USA	28	24	Uncontactable
Total	116	109	

While we only cover ECRs from 7 countries a Scopus analysis³ shows that, in fact they do account for 50% of all papers published in 2016 (Table 2). The seven are, of course are not of equal size and the Table also shows their estimated market share of papers and this should help in weighting our country conclusions.

³ Conducted by Mayur Amin of the PRC Steering Group

Table 2: Article share of case study countries in 2016
(analysis based on Scopus)

Country	%
USA	20%
China	15%
UK	6%
France	4%
Spain	3%
Poland	1%
Malaysia	1%
Total	50%

4.0 Results

There are two things to be aware of when reading the results: 1) some sections are still being built; 2) the country analyses that are a feature are uneven in terms of analysis and detail. This is because there is much more data to be had in the cases of the UK and USA because of the higher numbers of ECRs involved (nearly 40% come from these two countries) and, also, because we are chiefly talking about change here and, for some countries (Poland and Spain, for instance) there have been relatively small amounts of change.

4.1 Changes in jobs, attitude and behaviour

In 2016, we described a scholarly environment in which the behaviour and attitudes of ECRs was very traditional and conservative and ascribed that largely to the fact to a strict scholarly system that prioritised journal article publication above all else. However, one year on, things now look somewhat different and this can be attributed to both changes in behaviour and attitude and to now having a more informed panel of ECRs. This section amounts to a big and complex aspect of our work and what is provided here constitutes an early take on the data. Over the coming months, with the help of the PRC Steering Group, we shall standardise, refine and plug any holes in the data.

Table 2 broadly summarises the extent and significance of the year-to-year scholarly changes. It can be seen that in all countries change has occurred. It is mainly small (in pockets or more widespread), although, in the case of China, the change is more dramatic, which raises the question whether Chinese ECRs are the harbingers of ECR change or whether certain circumstances prevail that explain this (we shall pick this-up later). The data in Table 2 needs to be treated with a little caution because of three things. First, we are not exactly comparing like with like because this time around we have not needed to go back to questions about career history and to a lesser extent practices, so we have had more time to concentrate, not only on the new questions, but on some of the other significant questions particularly towards the end of the list, which we could not probe too much last year because of time and fatigue

constraints. Second, what Table 3 does not show is that there are some general trends continuing and some that seem to have stalled, and this information can be obtained from the country reports that follow. Thirdly, not a great deal of time (12 months) has elapsed since the questions were first asked and one might expect changes to show up more in the third year.

Table 3: Summarising the extent/significance of change in jobs, scholarly communications attitudes and practice (2016 to 2017)

	China	France	Malaysia	Poland	Spain	UK	USA
Widespread and significant changes from last year							
Some significant changes from last year	√						
Widespread, small changes from last year		√	√				
Some small changes from last year				√	√	√	√
Appears to be very little or no changes from last year							

Table 4 takes the change analysis much further by showing the places where things have changed, how much change there has been and where there have been no changes (quite important in itself). These categorisations are only approximate and, possibly, subjective because while national interviewers were given guidance as to what ‘significant’, ‘minor’, ‘widespread’ and ‘some’ meant (see the key to the Table), inevitably, we left this with the interviewers on the ground to judge. The key findings are:

- The areas where things have changed the most are in regard to: a) the jobs and work of ECRs; b) career aims and objectives; c) authorship/publishing policies and practices; c) open access publishing; d) open science;
- The areas that have changed the least are: a) mentoring and training; b) libraries (use and role); c) unethical behaviours; d) research impact;
- While all countries have seen change, as mentioned earlier, China has seen the most. Interestingly, another Asian country, Malaysia saw the second greatest change. There are differences between the changes in these two countries. In Malaysia, many scholarly areas are seeing significant change, but it is not happening for everybody. In the case of China, changes are being felt by more people, but not in all areas. Spain and Poland show the least change. The UK/US seem in the middle and this might,

partly, be because there is less left to change in these countries as it has already happened to them.

Table 4: Areas of change: how widespread and significant

Areas	China	France	Malaysia	Poland	Spain	UK	USA
Jobs/projects	SSC	WSC	SMC	VLC	SSC	SMC	SMC/SSC
Mentoring & training	VLC	VLC	SMC	VLC	SMC	VLC	VLC
Career aims	SSC	SSC	VLC	VLC	SMC	VLC	SSC
General communication behaviour	SMC	VLC	SMC	SMC	SMC	VLC	VLC
Discovery and access	VLC	SSC	SMC	SMC	SMC	SSC	WMC
Libraries (usage/role)	VLC	VLC	SMC	VLC	VLC	SC	SC
Smartphones (use in academic context)	SMC	WMC	VLC	WMC	VLC	SMC	VLC
Social media and online communities	SMC	SSC	SMC	WMC	WMC	SMC	SMC
Authorship/publishing practices and policies	SSC	VLC	SSC	WMC	SMC	SC/SSC	SMC
Open access publishing	WSC	SMC	SSC	SMC	WMC	SMC/SSC	VLC
Data	SMC	SC	SC	VLC	SMC	SMC	VLC
Peer review	WSC	VLC	SSC	SMC	SMC	SC	VLC
Reputation	WMC	WMC	SMC	SMC	VLC	VLC	SSC
Open science	SC	SMC	SMC	VLC	SMC	SMC	SMC
Sharing and collaboration	SC	SC	SSC	WMC	SMC	SMC	SSC
Metrics and altmetrics	VLC	SMC	SSC	SC	SC	SC	SSC
Unethical behaviours (knowledge of)	VLC	WMC	SSC	VLC	VLC	VLC	VLC
Impact	VLC	SMC	SMC	VLC	VLC	VLC	SC
Transformations	VLC	VLC	SC	SMC	SMC	SMC	SC/WMC

Key

Scale of change	Explanation	CODE
Widespread and significant changes	Most (over half) ECRs have made big changes	WSC
Some significant changes	Small proportion (less than half) of ECRs have made big changes	SSC (light brown)
Widespread, minor changes	Most (over half) ECRs have changed a little (e.g. change is incremental)	WMC (yellow)
Some minor changes	Less than half of ECRs have changed a little	SMC (green)
Stirrings of change	Change not happening yet, but there is a mood change	SC (blue)
Very little or no change	Same or very similar to last year	VLC (white)

4.1.1 China

China is the really interesting case because change is at a different level than elsewhere. Starting with the really significant change detected:

1) *Job changes and pressures*

A large number (11 out of 14) of ECRs saw job changes. Two left their jobs as university researchers and started working for commercial enterprises; 2 have been officially tenured as associate professor; two has left the university (Wuhan University) for research positions in the USA and UK as visiting scholars; 3 have changed research groups/centres; 2 of them have changed the direction of their research; and the other two have become mothers, which as one of the latter said *is the greatest change in my life so far*.

According to the assessment policies in most Chinese universities, ECRs have to meet a set of requirements in a 3 - 6-year time period; otherwise, they face the risk of job transfer or becoming unemployed. So, this year they are generally under greater pressure because they are getting closer to those time limits. As one physicist said: *One more year has passed and the assessment is approaching, I am very stressed, I haven't published enough papers*

Careers are progressing and ECRs climb the ladder. Ten out of 14 of them are now leading at least one national level research project, which is progress, indeed. The number last year was just 6. They are not only multi-tasking more, but also managing small groups/centres. Besides researching and teaching, they also mentor graduate students, allocate financial resources, hire research assistants and invite open tenders for the supply of the equipment. As one said: *Sometimes I feel like I am running a small company*. They don't seem like ECRs anymore.

2) *Open access publishing*

A major change here, with 8 ECRs (57%) saying that their research teams had published articles in OA journals. Last year the number was just 3. Also, as compared to last year, all Chinese ECRs now have a very clear understanding of what OA is, and they exhibit a more neutral and objective attitude towards OA journals, whereas last year, they thought them to be of low quality and predatory.

3) *Peer review*

Another big change, with Chinese ECRs discernibly more negative about peer review. Last year 11 out of 13 said peer review is generally fair, but the numbers have fallen considerably to 7 out of 14 this year. It is thought that the big retraction of Springer Nature (<http://www.nature.com/nbt/journal/vaop/ncurrent/full/nbt.3938.html>) and other similar ones have influenced the opinions of ECRs as the retraction(s) provoked extensive discussion among scholars on the social media.

Less significant changes

4) *Authorship/publishing policies and practices*

Two universities have changed their authorship policies a lot. Sichuan University (four ECRs are based there) put forward a new policy, which means that the corresponding author no longer obtains any additional reputational credit; thus, only being the first author makes real sense for ECRs. This policy has been widely criticized because researchers think it could become a big barrier to collaborating and make it more difficult for ECRs to meet the requirements for obtaining tenure. Take the situation of a ECR from Sichuan University, for instance. Before, if they published a paper together with colleagues/students as a corresponding author, they would be rewarded by the university. But now, according to the new policy, they will not be credited as a corresponding author. So, they will not collaborate with other researchers unless they can be the first author. If things continue like this, multi-authored papers from Sichuan University will be much reduced. Wuhan University has also changed things, and in order to count towards tenure, ECRs need to publish as least one Q2 (or Q1) paper to be promoted. The reputational game has been upped and this adds considerably to the pressures described earlier.

ECRs are driven by evaluation policies, thus, they exhibit more pragmatism in publishing practices as time moves on. An ECR spoke for many when they said: *I used to think about whether my work is worth publishing? But now I will publish them anyway as long as I write them down. Good papers I will submit to good journals, inferior papers I will find a second-rate journal to publish with.* Nevertheless, at the same time, publishing in a high JIF journal is becoming a bigger goal and, for reasons alluded to earlier, having a high level of peer reviewing counts less (of, course it is likely that high JIF journals have tougher levels of peer review). Last year, they said a journal being indexed in WoS is the most important factor when deciding where to publish, but this year, 12 out of 14 said it is the JIF that counts most, perhaps, a sign of a maturing workforce.

5) *Career aims*

ECRs' career aims appear to be clearer and sharper. Those ECRs who had previously decided to be university researchers are more determined to continue their academic career, while those who were hesitant last year have given up.

Minor changes:

6) *Smartphones, social media and online communities*

Smartphones and social media are more frequently used in an academic context. All 14 participants mentioned WeChat in this context as compared to 11 out of 13 in 2016. Also, this year, 10 ECRs mentioned they used ResearchGate and that compares to 6 last year. Of the others, 3 had heard of it, only 1 had no idea what RG is about, but they used ScholarMate, a Chinese equivalent of RG.

7) Data

This year, ECRs talked more about data, such as open data, producing data and publishing data for credit. Three of them said they had produced data (last year, two) and wish to be credited for publishing the data (last year just one). Two said they are building their own datasets for personal research use and they would consider to make them public as long as they obtained credit. Last year they did say much at all about data.

4.1.2 France

Apart from job changes, the most significant change in France occurred in regard to the ways and means of keeping researchers linked and informed of what is happening in their discipline and their community.

The areas of most significant change, then, were:

1) Job changes and career progression

Out of the 14 ECRs on the French panel, the large majority of ECRs changed positions: 5 have been recruited for a tenured job, 3 left academia after finishing a professional diploma, which provided them with the opportunity to work in professions and industry and 5 obtained a new Post Doc contract. Among the new Post Doc contracts, 4 are abroad (Japan, USA, Germany and Switzerland). The number of ECRs intending to have a university career (11 in 2016) have dropped to 6 this year (including those who had obtained tenure) - 2 are aiming a career industry, 2 definitively dropped out and 4 are still uncertain. Industry is considered as an “exit” option as one ECR points out: *I did not have much luck for competitions, it was very negative. I'm still hesitating. Industry might be a solution because I want to have children, to build a family. The university career expects a 110% availability, which is not compatible with a balanced personal life.*

Except for one ECR, they do not feel they are progressing in their careers, even those who are in tenured positions because their salaries are lower than their earlier Post Doc salary. Those who are doing their Post Docs abroad are satisfied with longer contracts that let them to develop a better strategy for developing their career. Another change of note is that compared to the 11 ECRs who in 2016 said they were slaves or under the pressure to publish, there are now 13 ECRs who have developed a very different mindset regarding publication pressure, their discourse is more resilient and they are happy to keep “playing with the rules”.

2) Discovery and access

Altogether there are wide-ranging changes here. Thus, Google Scholar, which was used daily by 11 ECRs last year, is used daily by all ECRs this year. ResearchGate use went up dramatically, with 13 participants using it daily compared to only 4 in 2016. The Google search engine itself, used by 7 ECRs daily in 2016, is now used daily by nearly all (13) ECRs. Sci-Hub mentioned by 4 ECRs in 2016 has doubled its popularity in 2017 with 8 ECRs using it daily. Even YouTube has joined the throng. Non-existent as a source in 2016, it is now a

daily resource for 3 ECRs to search for scholarly information, especially on new and unusual topics. The other interesting change that should be mentioned is that ECRs are focusing on a "short list" of resources (Google, Google Scholar and ResearchGate) to do their daily bibliographical searches and 6 include Sci-Hub in that list.

3) Smartphones

Smartphones are more commonly used for professional activities. While only 2 were using their Smartphones for professional purposes in 2016, five now do so, mainly for searching and reading articles. In the meantime, those who have a smartphone and do not use it yet for their research are clearly struggling to keep a "safe frontier" between their personal and their professional life. Greater future usage can be expected in France.

4) Online communities

ResearchGate is becoming the dominant platform, as it is elsewhere. While they were only 5 ECRs using RG in 2016, largely to find and disseminate articles, now all the panel use it for a wider range of purpose: a) joining a research community; b) as a source of information; c) to ask questions; d) to locate job announcements; e) to demonstrate reputation. In fact, so central to the needs of many ECRs (8) RG has become a kind of "home page" for their scholarly activities.

Minor changes:

5) Metrics and Impact

Peers are still seen to be the population on which ECRs seek to impact (14 ECRs said so in 2016 versus 13 in 2017). But at the same time, citizens and society are mentioned more often and considered more by participants (3 in 2016 versus 8 in 2017). Last year, nobody was interested in altmetrics, but this year 7 ECRs mentioned RG statistics (usage) and scores, which are partly formed from altmetrics (followers and questions answered). They are using RG scores/statistics to observe and measure the impact of their research articles and are very curious about where and to what extent their articles are read and downloaded, especially abroad.

6) Unethical behaviours

The change here is not demonstrated by the numbers, as there are as many ECRs (13 out of the panel) in 2016 and 2017 having a good understanding of unethical behavior. The change here is in the way in which ECRs understand unethical issues in scholarly publishing: it is less about plagiarism and more about the integrity of research (for instance publishing untruthful results and misleading the research community). They refer to them as "undetected problems" because, while there are tools to detect them, they are not necessarily successful. It is worth noting that the changes described here are driven by both ECRs aiming for an academic career as well as by those who are not sure. Whatever their vision of their future, they are trying to keep up with the pace of change.

4.1.3 Malaysia

Quite widespread change has occurred to the Malaysian panel. Of the 19 sectors in Table 3 just three are marked up as showing very little change. We appear to have a group of ECRs becoming more mature and well-informed.

The areas of significant change were:

1) Job changes (research orientation)

Unlike the first year, where most scientists reported working on 3 to 7 funded research (as principal investigator, co-principal investigator and/or collaborator), all ECRs now complain that national and university research funding is increasingly limited and they need to work on new proposals, which put more emphasis on research “engagement” and “impact”. Scientists say that they have to look for funding elsewhere and work closely with the private sector to explore how their research discoveries can be patented or commercialized.

2) Authorship/publishing policies and practices

ECRs are more thoughtful and certain about who should be included in the authorship statement; emphasizing that the order of authorship should be a joint decision of the co-authors. The policy about giving credit for intellectual work remains the same, but there are more mentions this time around about: the reprint author (12, up from 9); description of roles and contribution of authors (8 up from 6); and the sequence of authors (7, up from 3). Deciding who the corresponding author is still a live issue. Being corresponding author has more weight in promotion and research assessment and they are happy that some journals allow more than one corresponding author.

Criteria for choosing where to publish is changing, most probably due to the initiatives of the Malaysian Citation Centre (MCC) and the universities (especially research universities, in the context of the sampled ECRs) through various workshops and training on scholarly publishing, conducted at the local or national levels. MCC helps locally published journals get global exposure and in time to be indexed in Scopus, WoS and, of late, the Emerging Source Citation Index (ESCI) by Clarivate Analytics. The workshops also expose (and encourage) researchers to publication in core journals that would boost the university ranking and help their research be seen internationally and publish quality submissions from Malaysia. The following criteria are more important this year:

- a) Having an online first presence with time-stamp data (10 ECRs, up from 3).
- b) Being listed by Scopus (9 ECRs, up from 5)
- c) Opting for journals approved by the Ministry and/or University (12 ECRs, up from 3)

A new factor which drives their choice of a journal is being indexed in ESCI and this was mentioned particularly by the social science ECRs. Three non-science ECRs mentioned they

would publish in ESCI-indexed journals, which they felt is a mark of quality. One ECR equated ESCI as being indexed in WoS – *More Malaysian journals are indexed by ESCI, it has the credential and reputation like ISI (Web of Science)*. A plausible reason for its emergence is the commitment of the MCC to provide a comprehensive coverage of Malaysian scholarly journals in the national indexing systems (MyCite) that meet the international journal selection criteria on par with Elsevier's Scopus, which also make the journals eligible to be indexed in ESCI. Indexation status matters to the social scientists, although the ESCI journals are not issued with an impact factor. Another new factor and big change is the quality or robustness of the journal's peer review processes (10 responses, up from none). As one ECR said *I don't expect journals to have fast acceptance in one month and take less time for peer-review. Why bother to write for a journal which can accept manuscript in 24 hours? It means no peer review, no impact factor, no readers.*

Generally speaking, ECRs are more conversant about the various factors to consider when selecting an outlet for their papers.

3) Reputation and online visibility

Obtaining online visibility is a universal requirement now. All ECRs now have either a web CV (12, up from 9) or an online presence through ResearcherID (10, up from 8), OrchidID (12, up from 10) and ScopusID (12 up from 10). ECRs continue to use ResearchGate for visibility and impact assessment. One mentioned that *ResearchGate provides... an alternative online profile that will show up when someone searches for you*. More ECRs have started using Kudos in this context (6, up from 4). And for the first time, 1 ECR has joined Impactstory: *When I came across Impactstory I was super excited about the feature, how useful and very straightforward, easy to understand the altmetrics, it is attractive too!*

5) Peer review

All ECRs have had experience reviewing papers (no change from 2016), but their comments indicate that they are now becoming more proactive and selective in respect to the papers that they are invited to review. They acknowledged that they: *look out for opportunities to show their knowledge through peer review or look forward to receiving invitations for peer review*. Three ECRs have taken the proactive step of approaching editors and expressing their interest in reviewing articles when attending conferences. One even wrote to a chief editor explaining his intention to serve as a reviewer: *I think editors prefer to take in early career researchers, we are more likely to accept, and we provide honest review. Because we want to prove ourselves, so we are more thorough in our review*. Only one ECR has tried out post-publication peer-review on platforms, such as F1000Research and PubMed Common, and said *I think it is a cool platform for novice reviewer to practise reviewing skills, and the important thing is that we can decide to reveal our details or remain anonymous*.

6) Metrics and Impact

ECRs are more interested in the article-level usage scores on WoS and Scopus, and even Google Scholar. Thirteen sources were mentioned altogether. The ResearchGate score, not mentioned last year, is now checked by 7 researchers. This increased interest may be put down to ECRs' attendances at workshops and being affiliated to Malaysian Scopus-indexed journals as editorial members. Even though ECRs are interested in metrics, they have not really embarked on improving/extending the impact of their research. Blogging still has only 1 disciple. The focus appears to be very much on scholarly impact and all ECRs have a veritable arsenal of tools to enable them to help them: Web of Science, Scopus, Almetrics, Google Scholar, Impact Story, Kudos and ResearchGate.

7) Unethical behaviours

ECRs have a lot to say about this this time around, most probably due – as in the case of China - to the rising frequency of retractions of Malaysian papers and this was reported on Retraction Watch (<http://retractionwatch.com/category/by-country/malaysia/>). One ECR blew the whistle: *It is happening here, people are doing it, unspoken at meetings, but people are talking about it.* A big change this year is fake peer review, unheard of last year, is now mentioned by 9 ECRs. The number of ECRs mentioning salami slicing doubled and this could be the flavour of the coming times as paper productivity becomes ever more important.

8) Transformations

Despite the changes chronicled above, all 12 ECRs now feel that in 5 years' time academics will still be typically recruited, promoted and obtain funding solely on the basis of their publication record and citation scores based accumulated reputation. This is up from 5 last year. Perhaps, the reason is that they have witnessed cases where the contracts of their peers have expired because they have not met their paper/citation based KPI and neither had they contributed towards the university goal to be in the top 200 global universities. As one ECR remarked: *As the shift is certainly trending toward research, all of those who hope one day to get a position for tenure or promotion, will keep churning out articles.*

Minor changes:

9) Libraries

Surprisingly, perhaps this year slightly more ECRs (10, 8 in 2016) thought the library would have a central role in the future, largely because librarians appear to becoming more proactive:

The librarians are more proactive, they go out to the faculty and ask us for our research outputs, we do not have to send to them.

The library now has research librarian, they provide customized solutions to research group! He helps searching literature, analysing, scoping or summarizing literature, and maintaining current awareness for our research group.

10) Sharing and collaborating

ECRs are a little more familiar with academic social networks and using them more, mostly to disseminate and share their publications. Although the platforms used are much the same, the number of mentions for each has increased slightly. ResearchGate is most mentioned (10, up from 8) and an ECR remarked that *preprint sharing in ResearchGate is significant enough for authors to take it seriously*. Still, real-time open collaborative science tool, such as ThinkLab and F1000Workspace, were mentioned by only one ECR. All are now using messaging services, such as WhatsApp (previously 9 used it) for academic and research, such as sharing information with their peers and colleagues (PDFs of articles and link to articles / websites).

11) Smartphones

Smartphone use was already endemic and still is, but increased usage is being driven by the social media platforms, such as WhatsApp, and there is more downloading/reading going on (up to 8 ECRs from 5) and increasing numbers are using them to organise their work activities (now 10 ECRs, up from 4).

12) Social media, social networks and collaboration

The changes here are not so much in the numbers using them, as they remain the same - all ECRs. The change is more to do with the fact that social media is so embedded in the scholarly enterprise. All ECRs now report using social media (frequently mentioned is Facebook) to connect with other scholars and believe that online scholarly networks lead to greater collaboration and/or connectivity, and helps build reputation. One mentioned using Instagram, and another three now have a Twitter account to *monitor what is being talked about in my areas of interest*; *“network”* and *“share online content*. Others said: *My own use of Twitter helps me keep informed about progress in my field, which I can then pass on. Twitter is great for academic networking, it can be an awesome way for people like me, who aren't in close proximity with the people I want to talk with to start collaboration*”. However, still none use Twitter to promote their scholarly works or content, to inform the wider research community of their activities, or to engage with their peers.

13) Open Science

ECRs are more informed, if not active proponents of open science. Thus, the terms “Open Access” (12 up from 11) and “Open Data” (6 up from 4) are more familiar, but similar to last year, only one ECR is familiar with the concept “Open Peer Review”.

4.1.4 Poland

Poland is less changing and more unbending than most other countries, and in Poland it is a case of minor changes all round. However, of these, the biggest changes that have taken place are the increased focus on publication in a government list of accredited top ranked journals based on the Web of Science and the greater interest shown in ResearchGate for all purpose. What is interesting about this, and shows the situation ECRs are in is that these two changes are occurring at almost opposite ends of the scholarly spectrum. ECRs in Poland, as elsewhere, maybe, live in a parallel scholarly universe.

1) *Dissemination and online communities*

Polish ECRs are more conscious about the need for disseminating research results especially via ResearchGate and the social media. As one said *All my articles are on RG*. This year **6** ECRs used online communities/social media for dissemination purposes as compared to just 3 last year.

2) *Discovery and social media.*

ECRs use social media more for searching and obtaining bibliographic alerts, especially using ResearchGate in this connection. A broader variety of platforms are now also used, for instance, 2 ECRs mentioned Mendeley and 1 Academia, LinkedIn and YouTube, as well as RG. This year only **2** ECRs did not use social media for finding information as compared to 4 last year.

3) *Publishing practices*

There is a bigger focus on publishing articles in journals from the governmental list A (journals with an Impact Factor, which is based on Web of Science). As 1 ECR said: *There is in my university a big pressure [to publish in list A] - everybody counts scores*. Last year 54% of journal articles published by Polish ECRs were indexed by WoS, the figure this year is 61%. In addition, 100% of Polish ECRs say they feel pressure to publish in top-ranked journals, whereas last year it was 90%.

4) *Digital visibility and reputation*

Polish ECRs are increasingly aware of how useful ResearchGate is regard to building the image and reputation of the researcher, with around 70% saying so (last year just 40%) with statements, such as this one: *If you are concerned user of social media and you put proper information about you, your research work and your institution, it may enhance your professional status*.

5) *Policies on social media.*

What may explain the above is that there is a little more encouragement to use social media coming from the university (now 50% say they are encouraged, as compared to 40% last year).

6) Smartphones

Usage is on the increase, and more significant than numbers show because this is happening in a very traditional environment. Now only 4 ECRs are not using them for scholarly purposes, last year the number was 7.

7) Collaboration and connecting

More Polish ECRs (70%) use social media for connecting with colleagues and collaborating, last year only 50% did so. This kind of use was illustrated by 1 ECR: *I receive requests and questions via RG about my work and I discuss (...). I am in current project because of my contributions in RG - researchers from other academia found me and wanted to cooperate with me.*

Slightly more minor changes:

8) Libraries

Last year Polish ECRs were more optimistic about the future of libraries, but this year their optimism is down with only 3 being optimistic, as compared to 8 last year. Quite a shift in sentiment it would seem but this might be partly explained by the fact that last year the ECRs indulged the interviewer who they knew was an information scientist and this year they no longer feel obliged. The following gives a good flavour of the comments made:

However, I would like libraries to have the central role, I realise each day their role comes down.

Libraries may lose their position (libraries do not have financial support for new databases). I think that Internet is much more important than library. Only students go there.

9) Open access publishing

Polish ECRs are more informed and interested in OA publishing than last year because they are becoming more conscious of the alleged outreach and enhanced citation advantages. Thus, last year 50% said that OA publishing advances science and this year 70% said so. But only if the OA journals have an IF count and, ideally there is no fee.

10) Peer review

ECRs are now a little more experienced: 5 ECRs in comparison now have experience of being peer reviewed compared to 4 last year. Poor reviewers and the need for better training for them is an increasing complaint. Moreover, more of them are reviewers: now 5 (last year 3) and they feel they benefit from this experience: *I often receive article from journal with high IF for review. I learn a lot during reviewing. I write my articles more careful.*

4.1.5 Spain

As with Poland, changes in Spain were not very many or great, but in the case of Spain there was one very significant change and that was to do with jobs. ECRs in Spain are willing to change attitude and behaviour, but, because of the extremely precarious position they find themselves in, as a consequence of 8 years or low investment in higher education, they feel they need to focus on producing publications, so that they are best able to obtain the very few permanent positions available in research. The situation is starting to change now, but there are a lot of people in the queue.

1) *Jobs and career ambitions*

There was a great deal of churn here. All ECRs, but four, are doctors now and the new doctors feel a great deal more contented and relaxed than a year before. Two ECRs left research, one before the interviews and another afterwards. Another one changed job as an embedded librarian, but still does some independent research and collaborates with others in the research centre where she is now working. Two ECRs are now working as a Post Doc at universities in UK and think conditions are better there. Another researcher is working on a new and better grant and is now a senior postdoc. Another is waiting for the resolution of their next Post Doc grant.

Three ECRs feel as they have come to the end of the line in terms of career advancement. They are among the oldest ECRs. The youngest among them is very pessimistic about the future and says he is burnt out. Another, a woman, has left after presenting her dissertation and final one wants to leave university when her current contract finished.

Minor changes:

2) *General scholarly communication behavior*

While ECRs are still very focused on publishing Q1 papers and, in some cases, even in the first ten journals of Q1, they have become more generally conscious about the need for disseminating science results and recognize the usefulness of social media in doing this. When asked specifically about how they access contents they mention free resources, such Sci-Hub and Library Genesis and resources subscribed by libraries. Neither of which got a mention last year, but in regard to the latter there was more prompting this year.

3) *Social media*

As mentioned above, the scholarly value of social media is being appreciated more. In addition, they also use social media platforms for searching purposes and for discovery through alerts. A broader variety of platforms are now used. Thus, 3 people are now using twitter for these purposes. It seems that institutions are now encouraging the use of social media and the number is up to 4 in Spain.

As last year, ECRs do not cite the social media. They do not think that social media data counts as robust or trusted data, but new this year, a quarter of them can see the point of doing so because that way it is easier to see what researchers are up to.

4) *Authorship and publishing practices*

This year, ECR were asked more specifically what criteria they use for choosing a journal for publication or as a second option if they were rejected by the first one. ECRs told us that they choose journals mainly on scope and their IF. Last year they only mentioned IF. In this year's new publications 80% of ECRs have been first author or corresponding author. This means 4 more ECRs than last year were first author; three of them because the papers were based on their dissertations their dissertation and in the case of another experienced ECR their research group supported their case for first author.

5) *Open access publishing*

This time around, ECRs are more informed and trusting when it comes to open access. Last year four of them thought that all OA journal were predatory or downgraded variants. No one thinks the same in 2017. This is partly because all but one of them are more conscious of the outreach and the citations advantages they obtain. In 2016 the interviewer had to point this advantage to more than 60 per cent of them. We now have a situation where 11 out of 17 have had experience of publishing in OA journals, three more than last year.

6) *Peer review*

Spanish ECRs are a little more experienced this year. One more acted as referee and another one answered reviewers' comments. Acknowledgement and training for reviewers were both mentioned this year as means to improve the peer review system, but not mentioned last year. In 2017, they focused even more in the importance of selecting good referees. Last year the importance of the reviewers for the success of their papers was highlighted by 60 per cent of them. This year it was a concern of all ECRs. Whether the type of system is blind or open, is not that important at all.

7) *Sharing and Collaboration*

Half of them, that is to say three more than last year, show more interest in collaboration and, again, in the possibilities of using social media to collaborate. They know that contacts through the social media can lead to new projects and interesting collaboration and that collaboration may bring better publications, more citations, etc. Only one of the more experienced ECRs saw drawbacks in collaboration and that is *you lose positions in paper's signing*".

8) *Metrics*

None use altmetrics in their CVs, a question asked this year by the interviewer, however, 90 per cent, 20 per cent more than last year, now consider them *rewarding*, providing

satisfaction and helping them know something about impact and dissemination. The ResearchGate score is now obtaining interest with 30 per cent of ECRs acknowledging they look at it. However, data on downloads and reads are considered more of a curiosity. Nevertheless, they reckon that altmetrics can be of some importance for assessment in the future and 30 per cent of ECRs pointed out the importance of taking care of their profile in social media as well as in Google Scholar.

9) Transformations

One quarter of Spanish ECRs are more positive this year in respect to the possibilities of ECRs as change players. Two introduced, for the first time, the idea of establishing a global, free and open access data base that can substitute for Web of Science and Scopus.

4.1.6 UK

Some significant changes were registered concerning discovery and access, authorship/publishing practices and policies, open access and transformations.

1) Discovery and access

There have been changes as to how scholarly content is found and, in particular, where it is found, but also more clarity has been obtained as to what the content is used for and to what purpose. Google Scholar remains the norm for discovery. The percentage using Google Scholar has increased significantly (48% to 61%). Twenty-two per cent used PubMed first and it is still preferred by those in medical-related jobs. The use of Google was the same – not usually first, but 33% used it. Once again, 22% used World of Science, but one has started using it first who did not use it before. Only one ECR started with ResearchGate sometimes. There were fewer mentions of specialized searching mechanisms, but the names of SciFinder (1) and Psychinfo (1) did come up. However, this may be hidden by the fact that, in most cases, we asked if practices were much the same as when interviewed previously.

ECRs were also more specific about what they used particular search engines for. Here is an example of the kind of replies obtained, which also shows how difficult it is to generalise about this activity. Firstly, here is a reply of a geologist: *I always use Google scholar first and then click straight through or to the PDF link on the RHS. I very rarely go via the university website directly although obviously I use our subscription access when I click the paper from Google scholar.*

In 2017, interviewees were pressed to be more specific about where they found what they had been searching for. This revealed that, in the UK, which by international standards has well stocked libraries, they obtained most of content they wanted via the library. ResearchGate was very much a less used alternative for this purpose. Only one mentioned SciHub and they were no longer in a university, which could provide the explanation. For a discussion of smartphone use to access content see the section on smartphones.

2) Authorship and publishing policies/practices

Interestingly, there was no evidence of increased pressure on ECRs to adopt particular publishing policies from 2016 to 2017, which is particularly interesting finding in view of the Research Excellence Framework (REF). Indeed, only one ECR mentioned the REF!

Unlike as in China, there is no signs of an increased impact of authorship policies on ECRs. Institutional policies tend not to be known any more than they were in 2016 and there is no increased evidence of special group policies, but there is evidence of increased confidence showing itself in claims to have more influence on choice of journal. There is a significant difference between individual influence on choice of journal between 2016 and 2017 for those who do not control such decisions themselves. In 2016 in the UK (n = 21) 5 of the total had no or little influence and 5 (21%) had considerable influence. In 2017 (n = 18) 5 claimed to have little or no influence but 11 (61%) claimed to have considerable influence.

In regards to publishing strategies there is an undercurrent of change here, but not serious changes to the numbers. There is a lot of evidence of careful thought in the answers to the newly phrased question on criteria for choosing journals, which either shows a lot of independent thinking among ECRs or an internalization of what senior people decide. The replies to this question explain the sort of discussions that go on within groups and the thinking of those outside groups which is very illuminating. There is not much difference between the answers to the question about having a conscious strategy in 2017 from 2016. However, there does seem to be a difference between what ECRs know they need to do as far as publications are concerned and what they would prefer to do. This is more obvious in 2017 than it was in 2016

3) Open access publishing.

No change overall here, but a lot more evidence provided plus some specific changes. The replies about open access in general do not represent much in the way of radical change, but there has undoubtedly been less posturing and more careful and quotable thought including a more nuanced thinking about whether or not to publish open access. Now nearly three-quarters of ECRs have a positive attitude towards OA. The numbers who are outwardly negative are dwindling. Nevertheless, in practice, open access is not one of the criteria used in deciding where to submit. Quality always trumps open access with quality defined by impact factor and even “relevance to the audience you want to reach”. In practice, open access does not usually come into criteria used in deciding where to submit. There was evidence of a decline in the reputation of PLOS One and see the mega-journals section for more information.

Last year there were a few more ECRs who worried about predatory publishers and quality – there has been a decline in what was a small group, anyway. Not only are almost all ECRs personally positive, but they are aware that government and funders support open access.

They also do not usually feel they are under pressure to publish open access. As, 1 sociologist told us: *There is no pressure to publish open access but it is the way people are thinking. You can put things in institutional repositories for Green Open Access.* This is, probably, the only mention of Green Open Access and in 2017 there is very little more interest in depositing in repositories than there had been in 2016, in spite of the progress made by the IR movement.

4) Transformations

In 2016 16 of the 21 (76%) who answered the question: *Do you think that five years from now academics will still be typically recruited, promoted and obtain funding solely on the basis of their publication record and citation scores based accumulated reputation* answered yes. A much higher proportion (89%) felt the same in 2017. Interesting this, because despite the changes we have seen in the UK and elsewhere everybody seems to believe the fundamentals will not change. As in 2016 the majority (67%) of ECRs felt that their generation has a role in transforming scholarly communication, although the percentage was slightly down on 2016 (70%).

Minor changes:

5) Job changes

In the UK three of those who were taking doctorates in 2016 are now outside the academic life in banking, in industry (returning) and in government. All these three were interviewed in 2017 in the UK and an additional who returned to industry in China was interviewed from Wuhan. At present, but not necessarily permanently 17% of those interviewed in 2017 are now outside the academic system but in all three cases this might be temporary. The big change is the promotion of three of the ECRs to tenure track (probationary lecturers) within the system. There is surprisingly no evidence of more confident ECRs in the UK leading more projects or indeed in taking part in more projects compared with 2016.

6) Libraries

There was a small (5%) increase in the proportion of ECRs in the UK seeing a current and continuing role for libraries. This is not a big percentage increase, but the increased recognition of the role of the library as the place where articles searched for are found should also be taken into account when assessing change.

7) Smartphones

Small changes here, but, perhaps, a trend is unfolding with the proportion using smartphones for scholarly purposes increasing from 12/21 (57%) to 13/18 (72%). However, only a few say they use smartphones for preference with most saying they use it only in certain circumstances (away from PC or travelling for example).

8) Peer Review

There was a small change here, but, possibly some evidence of a trend, too. The change occurred in respect to the fairness of the process. In 2016 13 (62%) of those who answered said it was a fair process. One year later, the number and proportion of ECRs is down to 9 (50%). It is possible that the decline in the numbers of those certain of the fairness of the current peer review process may be significant, although the numbers who were definitely negative towards the system in 2017 were also down. Finally, the fact that such a large percentage in 2017 see a need for improvement and have ideas of what should be done however uncertain is surely significant.

Researchers were asked whether publishers, the present incumbents, should do it. In 2016 (67%) Fourteen (n = 21) said they should do it, although some not with a great deal of conviction. A further 2 said they did not know. There was a sense that there really was no alternative and as one researcher said, publishers are independent. A slightly higher proportion thought so in 2017 (17, 70%), but it might be a trend.

9) Social media

There is more use of social media in the research context though not much more. Use of scholarly networks, such as (almost exclusively) ResearchGate) was mentioned in connection with collaboration, but this is only one of the uses of ResearchGate. Twitter and ResearchGate were mentioned in regard to connecting with researchers by 3 ECRs, but in both years, they did not play a major role and it is clear that for most ECRs email is the main way of connecting with collaborators or networks. Skype was also mentioned.

In general, there does seem to be a trend towards using social media in finding and disseminating information about scholarly outputs. ResearchGate and Twitter are mentioned most. There is an increasing use of Twitter (4 more users) meaning there are 9 users this year, but there are still some who eschew it very definitely. There are no increases in the use of Facebook for professional purposes. Ten ECRs 16 mentioned ResearchGate in regards to building profiles and obtaining digital visibility.

There are a few changes in attitude with those ECRs who have starting working with social media (2) are very keen to tell you and those who are using it less (2) are a little less so.

No-one in 2017 cited social media in publications and one who mentioned citing social media in his blog last year did not mention the blog this year.

10) Open science

There were small changes in familiarity with the concept of Open Science as a whole and aspects of the overall agenda are now broadly familiar. In 2016 one UK ECR only had heard the term and knew what it meant. Five in 2017 now do know, but they did not offer any further comment on the concept. However, as it became clear in other parts of the interview

all were familiar with open access, and the majority were familiar with open data and open peer review, as they had been in 2016.

11) Data

This was not a topic that attracted much interest. However, more researchers were keen on recognition and credit for data produced (up 18% to 94%) and also obtaining greater visibility/availability (up 11% to 93%). These changes might not be as important as might appear from the percentages because of the qualifications in the answers. Most ECRs appeared to see data as not standalone, but part of the publication. What was interesting for ECR data management thinking was in the answers to the new question on reproducibility: there was a definite preference of supplemental/supplementary materials as the place where you put your datasets. It worth comparing these percentages with those in the USA which show a different pattern, but not a dramatic difference.

12) Collaboration and reputation

It is even more the case that ECRs do not use online scholarly networks to collaborate. In 2016 two-thirds were of this opinion, one year on they are all of this opinion. Nevertheless, they do use social networks to connect with people, with 4 ECRs having either started to use twitter to initiate a conversation with researcher they have not met face to face or have (also) used LinkedIn or Facebook or ResearchGate to find people of interest. At least 2 ECRs mentioned the visibility benefits social networks offered.

When it comes to helping build reputation the proportion thinking social platforms helped actually fell 10% to 57%, but the figures underestimate the recognition in 2017 that any sort of visibility is likely to be useful to the ECR.

Puzzlingly perhaps, because one might have assumed that ECRs might see that interacting with a social network enables them to see more of what others in your field are doing so bound to get some research ideas, there was a decrease in the number of ECRs believing that these platforms help generate original research thinking.

13) Career Aims

No change here this year, but the comparison with the USA where there is a greater interest in careers outside academe, is interesting. The UK sample are consistent in definitely aiming for an academic career with alternative careers only being envisaged if there is no way of continuing to be paid to do research. Sixteen (89%) still want a career at university. This is consistent with 2016 and attitudes do not seem to have been shaken by Brexit.

14) Metrics

Answers were much the same as in 2016 with the exception that there was a little more interest in and respect for altmetrics, with 4 ECRs believing them to be useful. There is no need to explain what altmetrics are in 2017. A lot of ECRs have seen “doughnuts”. The

evidence lies in their comments. Here is one example which may represent the beginnings of a trend: *I think there is something in this because for example I use twitter and it does lead to discovery by a wider medical audience.*

Maybe, there was more consciousness of the pressure for outreach than there had been a year earlier, but the REF, which encouraged this, was not mentioned in this regard specifically.

4.1.7 USA

1) Job changes and pressures

The biggest difference here is that so many ECRs have changed jobs - yet none of them have left the USA and the changes in attitudes that might result are relatively speaking minor, as we shall see. Eleven (46%) changed or are changing jobs, but the impact of these changes on the whole is not yet clear enough to make any generalisations about - mainly because the changes/moves are too recent. The exceptions are the experiences of the 4 who will no longer be likely to or allowed to publish research and who are already recognising this fact. They may/have also no longer access to university libraries.

Of the 11 who changed jobs only 6 moved physically. Out of those 3 moved to tenure track positions and 1 to a similar approach as research assistant professor. All four had just moved or were in the process of moving and, thus, the changed nature of their academic position did not yet impact fully on their way of working (experience and attitudes) Additionally one took a government job, which turned out to be rather different to a university position – less publishing, one returned full time to an industrial position – he had been doing a part time doctorate which he was just finishing, one post-doctoral moved into a pharmaceutical company which turned out to be very different from her university position – no contact with former research group and no publishing, one was promoted in his industrial (academic support) position, one became full time again in his military scientist post having finished his doctorate, and one obtained his doctorate and was going into a community college where teaching will initially take up all his time. Finally, one left his doctoral programme temporarily for personal reasons and became an independent researcher for the year. None left the USA. The impact of academic promotion will not make itself felt until 2018 interviews and of the four-tenure track ECRs one will by now be a mother. Out of the others three are unlikely to do publishable research in the foreseeable future and one will definitely do less.

US ECRs did not refer to any increase of pressure with a small number of exceptions, so there is no evidence of significant change from 2016 to 2017 – the pressure is there, but it is much the same. The exceptions are that: a) 2 have cut down on their use of social media because they needed to concentrate on their research and research outputs in order to get a permanent job; b) at least three ECRs have gone to jobs where there is less pressure – in a community college, as an independent software expert and as a government scientist with a clear and restricted role.

There is no evidence of ECRs taking a larger number of leading roles in more projects. However, it is important to recall the nature of the US sample and recall that many of the researchers (a small majority) are not climbing the academic ladder as traditionally understood, working as they do in government and industry or with government/industry.

2) *Career Aims*

The majority are no longer as optimistic about having an academic career than they were in 2016, but this is not only a recognition of the odds stacked against them but also what can only be described as the 'Trump' factor which comes out clearly in interviews especially with those whose career started outside the USA. At least 9 ECRs (37%) have either moved out of the university sector or have changed their priorities. Two have realised that the skills they have acquired (knowledge of machine intelligence for example) qualify them better for a (better paid?) industrial post. Three have been put off the university sector by experiences which include poor mentoring and exploitation as a researcher. Notice that there was overwhelming evidence from the ECRs of good mentoring in 2016. Some also make the point that the training they have received is for academic life and not for the world outside the university sector. Almost all want to continue to do research. One in industry is sorry that he has to drop out of the research he had hoped to maintain with his former colleagues. One who moved to a pharmaceutical company from a prestigious university post-doctoral appointment considers that she is now able to do more research and research directed at immediate solutions. It is interesting that in spite of complaints both about the political situation and about (associated) potential cuts in funding none of them has left the US. This generalization includes those (at least nine) who have started their university education from other countries excluding Canada. Those who do not have a green card (permission to work and stay in the USA) are worried about having to leave and those who have (in one case) made much of the fact that they have a green card on their CV. None want to go "home" in spite of their problems and the perception in some cases that they are at a disadvantage in looking for jobs.

3) *Libraries*

Libraries might be upping their game in the USA. Here are some changes. Mentions that libraries are only for students and to handle print are now minimal. It is not primarily a matter of changes from a negative to a positive answer to the question, which asks about a central role in five years' time. Thus, in 2016 78% answered Yes and in 2017 83%. It is more a matter of actual recognition of libraries do and not just the espousal of the curious belief that online journals do not have to be paid for - now only two seem to think this. A chemist, for instance, writes that: *He now has new experiences with libraries and now sees that they could be more important and that they should take the role of data and access not just handling subscriptions. At his new university, there is an impressive data science group.*

4) Publishing Strategy

In 2016 the question about having a conscious strategy was answered positively by 18 ECRs (64%) with 3 feeling unable to answer and 7 negatives. In 2017 18 still answered (75%), but much more positively on the whole (see below) and there were only 5 negatives and the same interviewee who felt they were too inexperienced to answer. These changes are mainly down to greater experience and confidence. The question about criteria in deciding which journal should be approached first and what should be the second choice if the first rejected exhibited more independence on the part of the ECR. The leading criteria cited were topic (7), impact factor (8), and knowing the editor (2).

As to making public research available in less formal ways, more ECRs thought this to be beneficial, with three quarters saying so, as compared to just 64% in 2016. Only two appear to be currently blogging. One is doing less blogging and more tweeting.

5) Open access publishing

During the last year there has been less OA publishing than in 2016. In 2017 18 (75%) had published in OA journals and 6 had not (25%). The bottom line, though, is that there has been no change, or almost no change, in the attitudes of the sample over the last year which is, maybe, surprising. Open access journals do not attract ECRs to submit unless their quality (reputation or impact factor) is high. Quality (however defined) is more important than open access – 85% of those who answered said this. There is a real gulf here between attitudes and practice, but it is not a change - rather a confirmation. In general, one can say that all or almost all ECRs are positive about open access journals because they are open and open is important to their generation, but they do not accept they have to pay to publish any more than they did a year ago. Their views are independent of mandate or policies.

In 2016 the “reality” of dilution in quality as a consequence of OA publishing was accepted by about half but many of those who answer No to the question have the same concerns. In 2017 more (61%) thought it would lead to dilution.

There is, if anything, more stridency about costs of publishing in OA journals (APCs), even from those who have the money to pay. One ECR referred to the costs of publishing as a paywall and several seem not to have bought in to the publisher position that someone has to pay. You might argue, that as the pressure to publish in high impact journals gets greater and as many of those interviewed are further advanced in their careers the need to deliver the publications they need for their next job ECRs are torn between the general belief that open access is the way to publish and the realities of their situation.

5) Smartphones, social media and online communities

As a generalization, there is no real trend toward using social media more or even finding new uses for social media, but there seems to be a slight increase in use. Smartphone use for work has reached 79% of ECRs use smartphones for their work. This includes 2 who did not do so

before. However, 85% of these smartphone users do not make the use of smartphones a regular part of their professional interactions. It is for use when they are travelling or at home or at conferences.

On balance ResearchGate is used more, but not much more - though it is certainly used more than other social media. There is a little more use of Twitter. There is likely to be more nuanced interpretations when we look at age, and disciplines.

6) Online Collaboration Networks and Reputation

Answers to the questions, which provide results for this section provide a clear indication that more exposure to collaborative networks tends to lead to a belief that use brings benefits in terms of reputation in particular. This means ResearchGate for all practical purposes. Is it being used more and for purposes of collaboration? Well, in 2016 four US ECRs had projects up on ResearchGate and a further two have been added.

In terms of using social networks for collaboration 4 more ECRs use them now for that purpose. One psychologist actually said that they use ResearchGate now more than email and Skype to maintain contacts. What about their role in reputation building, well in 2016 58% were negative about the opportunities and 42% positive, compared to 39% negative and 61% positive in 2017, so a reversal of attitudes here.? It does seem obvious to an outside observer that presence on ResearchGate should lead to visibility and therefore reputation.

7) Metrics

A lot more ECRs now know about altmetrics. Their comments show a more positive attitude particularly towards the use of altmetrics than in 2016, in fact greater than the Yes/No evidence. Changes in the question this year means differences are difficult to detect, but over one third now believe that altmetrics can be useful for reputation and demonstrating impact.

8) Impact

There is not much real change here, but there are stirrings of interest and ECRs are more realistic about reaching out to policy formers and the general public, but the political situation in the USA has led ECRs to recognise that they must do more, but what? The large number of US ECRs in the health area (broadly interpreted) look particularly to the general public as well, but they do not have time and sometimes do not have the facility. Some see such activity as a different thing. A medical scientist is clear that the *best way is to make information accessible through open access and demonstrating the direct benefit.*

One way of interpreting changes since last year is that there is a growing sense of realism. Thus, one computer science has changed his views. He did want to reach out to all the audiences listed, but now sees his mission as reaching out only to his peers. Another says: *doing more research is the best bet.* Some who had ideas of blogging are now realising that they just do not have the time or (in some cases) the ability. One has moved away from blogs to more networking.

9) Transformations

More ECRs (now 91%) continue to see their generation as having a chance to change the system, quite a bit higher than in 2016 (79%). Arguments presented are much the same as in 2016 and the basic feeling is one of mission, something needs to be done, but not sure what on the whole. What is perhaps surprising is that the ECRs mostly see themselves as taking responsibility for change – more than in 2016. ECRs really do have a continuing mission. More in 2017 see changes in scholarly communication already happening. One ECR asserts in 2017 that, yes, it is happening *naturally, but not his responsibility per se*. It is also the case that even those doing well under the terms of the current are so positive about change.

More ECRs in 2017 felt that *in five years from now academics will still be typically recruited on the basis of their publication record and citation scores based accumulated reputation?* 83% felt this to be the case as compared to 79% in 2016.

4.18 Topics being monitored

Two findings from last year are being specially monitored because they produced data that went against the established or publicized views and they were the importance of libraries and altmetrics.

Last year libraries either were not mentioned at all, or when they were, this was largely in negative terms. Indeed, this was the finding that that the THES ran on when they reviewed our work (*Libraries becoming 'invisible' to junior scholars*⁴) and we received some criticism for what we said about libraries. This year we probed a little more, not directly, but in the context of various scholarly activities, most notably about access and discovery. What we found is that ECRs are conscious of the library's role in providing access to discovery tools, but sentiments towards the library and its future role are much the same, although it has to be said it is marginally more positive in the social sciences and this could be because of a greater interest in monographs. The exception is largely in the USA, where there are stirrings of interest in the role of libraries and this came largely unprompted. In this country, ECRs are now more conscious of what libraries are doing. A quote from a US ECR shows this: *The thing is that libraries are also evolving to be more modern, more electronic, and more interactive*. In Malaysia, too, there was a slight increase in sentiment, but on the whole no general ringing endorsements or changes in the fortunes of libraries and the French data is more disturbing. Thus, most French ECRs think that the library is not useful anymore for them. The change this year is that even those who said last year that the library was important for subscriptions, said that they have now doubts about them because RG and Sci Hub and the easy access to content afforded. For undergraduates, they are fine though.

Despite much conference and commercial interest in altmetrics, last year ECRs showed very little interest in the topic and we wanted to know why there was this disparity. Generally

⁴ <https://www.timeshighereducation.com/news/libraries-becoming-invisible-junior-scholars>

speaking, this year, ECRs were a little more conscious of what they are, but this did not translate into much interest or use. However, there are two exceptions: a) in France, a big interest in ResearchGate has manifested itself in a wider interest in social media indicators and scores, which abound in RG, but they are not seen as valuable in assessment or for reputation; b) in the UK and USA (and elsewhere), there are stirrings of interest in altmetrics because of the increasing pressure to conduct outreach activities and influence practitioners (from the REF in the case of the UK). Interestingly, no ECRs mentioned the social media metrics present on the publisher's platforms. Some did not even notice that publishers are starting to present social media metrics on their platform.

Finally, something new, we have noticed in most countries there are super-ECRs who not only, for instance, publish much more than all their colleagues (in one case more than all of them combined) but also appear to perform more highly than their tenured peers. We shall be trying to establish who they are, what makes them super in the coming year and do they have anything in common.

4.2 Demographic and disciplinary differences

These important analyses are still being conducted so this section is very much a work in progress. To date we have analysed our findings primarily by country, which generally equates with nationality. We did this in the belief that differences in geography, language, economic development and cultural factors made such a division sensible. It also was the principle means by which we collected our data. We have obtained plenty of evidence to suggest that this was a wise move, especially since governments have been shown to have such a strong influence on scholarly systems in many of our case study countries importance of governments and China stands out in this regard. Nevertheless, it is also evident that other factors shape scholarly behaviour and attitudes and now we have assembled two years' worth of data it becomes possible to begin to look at the impact of age, subject and gender. Table 5 provides the make-up of national samples by discipline, gender, age and status.

Table 5: Characteristics of the ECR panel in 2017

Country	No.	Discipline	Gender	Age	Status (PhD/Postdoc)
China	14	Science: 64% Soc.Sci.:36%	Female: 43% Male:57%	Thirties: 100%	100% Postdocs
France	14	Science: 82% Soc.Sci.: 18%	Female: 36% Male: 64%	Twenties: 65% Thirties: 35%	100% Postdocs
Malaysia	12	Science: 58% Soc.Sci.: 42%	Female: 50% Male: 50%	Thirties: 100%	100% Postdocs
Poland	10	Science: 80% Soc.Sci.: 20%	Female: 40% Male: 60%	Twenties: 40%: Thirties: 60%:	50% Doctoral students
Spain	17	Science: 76% Soc.Sci.: 24%	Female: 47% Male: 53%	Twenties: 18% Thirties: 53% Forties 29%	24% Doctoral students
UK	21 (18)	Science: 67% Soc.Sci.: 33%	Female: 33% Male: 67%	Twenties: 22% Thirties: 78%	28% Doctoral students
USA	28 (24)	Science: 75% Soc.Sci.: 25%	Female: 38% Male: 62%	Twenties: 17% Thirties: 83%	21% Doctoral students

4.2.1 Age/status

One year down the line and our panel has inevitably aged and around three-quarters of the ECR population are now in their thirties, and even some in the forties (in Spain chiefly). Because of a number of factors, most notably that to obtain a job you have to be relatively experienced (in China many start an ECR career at 29) and that when one gets a job it takes an increasingly longer time to get tenure, because of strong competition for jobs. A shrinking pot of researchers in their twenties and the complicating fact that a high proportion of doctoral students are in their twenties means comparisons are difficult and will be pursued more strongly in the final year when we will also have analyses by status. So, the main differences that emerge are really between the most and the less experienced researchers.

For the present we can say that the main differences that emerge are really between the most and the less experienced researchers. Also, older ECRs feel more disaffected because they did not have tenure and being more informed generally about scholarly matters and young ones feeling pressured to succeed in a precarious and competitive environment and, therefore, sometimes more active. Lastly, some younger researchers are noticeably taking an independent look at the scholarly system.

China

All Chinese ECRs are now in their thirties. There were 6 in their twenties last year but they all started their ECR careers at 29 and have now turned 30. It is quite normal for Chinese researchers to start their career at 29, after 3 years postgraduate study and 4 or 5 years doctorate study. So, with all ECRs in their thirties and the oldest at 35 age it is not possible to detect any age differences.

France

The French sample of 14 ECRs is a comparatively young one with nearly two thirds (64.3%) being aged 30 or under. While no impact of the age behaviour/attitudes has been detected age has become a more sensitive issue regarding recruitment. Thus, last year, two ECRs mentioned that being younger than 30 years old is considered by recruitment commissions as too young to enter the system. This year, this age issue has been raised by almost all the ECRs with them either saying that they are considered as too young or that getting older in the job reduces their prospect of entering the system.

Malaysia

Malaysian ECRs are the oldest of all our ECRs country panels with all being in their thirties and half of them in their late thirties, so age comparisons are restricted. The main difference detected is that the 30-34 years age group are more productive (84 papers) compared to the 35-39 group (34 papers) during the period 2016-2017. However, this is more a reflection on the subject composition of the groups because there are more scientists in the 30-34 group and one particular ECR (science, male, 30-34) is very productive and influences the findings. Not surprisingly then Malaysia is also unusual in that the ECRs are all post docs and

the sampled participants are all from 5 research universities that appear in the top 10 universities in ASEAN.

Poland

No age differences in behaviour or attitude were discernible. While Poland does not have the youngest population of ECRs (Spain had that honour) it did have the highest proportion of doctoral students (half of them had this status) and, of course, they tend to be at the younger age of the spectrum. And it was this difference in status that coloured their behaviour because they had to work outside of the academy to pay their way. PhD students feel more pressure, and have greater uncertainty about the future, but they try to publish, attend conferences, apply for grants, are on RG etc. They do the same things that have a PhD status because they want to emulate them and get a job at the university.

Spain

ECRs in Spain are getting older. Just 3 out of the 17 are now under 30 years of age. Indeed, almost half of them are 35 or over, with 5 (29%) being 40 or over. Three of these are 41 and two of them are 40. The reason they are relatively old is the Spanish government has been unable or unwilling to provide money for research in during the past 8 years.

There are differences in behaviour between the age groups and also between doctoral students and Post Docs. The still doctoral students are 30 and under.

The oldest group, of which half could be considered high-profile researchers, are not unexpectedly more learned about the scholarly communication system and know their way around it. They are becoming more practical and help people applying for a new position and readily let others share the first author position in the papers. ECRs over 35 are, again not unexpectedly, more pessimistic about the scholarly world as they cannot see a clear future ahead. They think that they might lose their job before reaching a tenured position. Three of them feel they have come to a full stop and will never be promoted.

The youngest in some cases are more optimistic, but this is not always the case. They complain about the difficulty of completing the transition between doctoral student and Post Doc. They point out that when they finished their dissertation they might not find a job because competition is so strong. In this way both older and younger ECRs have the same destabilising fears.

UK

There are just four ECRs in their twenties in 2017 so we can discuss them in more detail. One is a social scientist who had graduated during 2016 and now had a career in government. One is a life scientist working on a post-doctoral project at a prestigious institute. There is another life scientist working in a prestigious university as a post-doctoral, but who has very recently come back into the laboratory after maternity leave. Lastly, there is still studying for her doctorate in the social sciences and expecting to complete next year. She has significant research experience before starting her doctorate, an example why we extended the ECR

definition to cover such people. Yes, they do seem slightly less aware and learning about the scholarly communications environment, but the upside of this is that all four have noticeably seemed able to take an independent look at the system.

There is nothing cohesive that can be said about the ECRs in their 30s. Note that in the UK none are older than 36 even in the second year. Three are still working for their doctorate – for one it is a second doctorate. They look like finishing, but are much engaged in research not necessarily connected directly with their dissertation, which gives them a special research angle. 3 are probationary lecturers, 2 of them scientists who are exercised with setting up their groups. 2 are in the world outside the academy after completing their doctorate and who may or may be continuing with their research. One has a senior teaching post which involves an obligation to do some research. The remaining four have typical post-doctoral appointment – the sort of person most people would recognise as a “ECR” but a minority in our sample.

USA

As in the UK, there are only 4 ECRs in their 20s. One is a post-doctoral in an engineering department. One is a bioinformatics group leader who is jointly appointed by a school of medicine and a school of engineering, one is a post-doctoral chemist in a government laboratory, and the final one health scientist is working for a doctorate. It should be noted that there are seven doctoral students all of whom had some level of research before enrolling. There is no obvious similarity in the knowledge of the scholarly communications environment within this disparate group and only one of these four could be described as relatively unfamiliar with scholarly practices.

There is no way of making any generalisations about the remaining 20 ECRs as a group. None are older than 36. Three are still doing doctorates. As far as their academic status is concerned there are five assistant professors all woman bar one who have either just started or will be starting their groups. Particularly interesting is one ECR postdoc now in government and particularly two now in industry. One computer scientist appears to be dropping out of the Academy not entirely by choice and the one now in a pharmaceutical company has consciously cut herself off from her academic ties. They both provide an outside view of the problems with academic research as they see it. Another drop out (in practice) is a sociologist about to start as a professor at a community college, but he did not previously seem to have much interest in research. There are others (5) either from and still in corporate life or in government or are more less combining a dual role. There is thus a relatively small number (5) of any age working within a group in a classic postdoc position – other than the group leaders already mentioned. It is probable that the US insights may be different taken as a whole from those cohorts of ECRs in other countries.

4.2.2 Gender

The published literature contains very little on gender differences in scholarly behaviour, the exception being the use of online communities, where studies, albeit based on US college/university students suggest that women are more active in these communities⁵, but these studies do not strictly cover scholarly activities. In general, we detected concerns about the status and position of women in the workplace, a few differences in actual scholarly behaviour and nothing to support the view that women are more active on online communities. Women seem to be as productive as men in terms of papers published and are as likely to be described as high-flyers.

China

The Chinese sample consists of 43% females, the second highest representation after Malaysia. Male ECRs seem to have more pressures on them in respect to career development than females. Male ECRs seem more intense, strategic and more likely to seek quick success and instant benefits. As a consequence, they all had very pragmatic publishing strategies. Men's main motivation for doing scientific research is to be promoted and to increase income, while female researchers tend to do research more for personal satisfaction. The reason may be that in Chinese society, men are considered to be the ones who should bear the burden of supporting the family.

France

Just over one-third (36%) of the French sample was comprised of females, which made the French sample the least representative in terms of women. As a general issue gender was hardly raised last year, but this year 5 females and 4 males expressed opinions on gender. Typical of the comments are:

I realized that there are so many things that can be said to women, without any consciousness that it is sexist or macho. For instance, say something like "when you wear high heels, you cannot be credible as a researcher.

The system is mainly there for men, who do not carry children.

If I fail entering the system, industry could be an exit. It is a very masculine world, much than academia, everything is harder for women (...) sometimes, I hear the tic-tac watch noise saying that one day, I will not be able to be pregnant because I have become too old waiting for a job.

No gender differences were found in regard scholarly behaviour or attitudes.

⁵ Mike Thelwall and Kayvan Kousha. Academia.edu: Social Network or Academic Network? Journal of the association for information science and technology, 65(4):721–731, 2014

Malaysia

With half of the sample being women, Malaysia had the highest proportion of female ECRs. Nevertheless, there were no discernible differences in scholarly behaviour between men and women. Thus, there were no gender differences in terms of paper productivity, both males and females having about the same average performance. Except for one male ECR who publishes more papers than the rest, the rest of the men publish more or less similar number of journal articles than the female ECRs. No effect either of gender on internationality mobility and career progression.

Poland

Forty per cent of the Polish sample are women and while differences in behaviour between them and men are not statistically meaningful it is clear that an ECR female with a child has to work harder than non-mothers or men. Three Polish female ECRs have children, they all have PhD and work very hard as a consequence and are very successful, all having publications in list A, have their own grants and finance for their research. In fact, they (two biologists and one a technologist/engineer) are the high-flyers of the group.

Spain

There are 9 males and 8 (47%) females among the Spanish group so numbers are quite evenly balanced. It is not possible though to spot any differences in behaviour. There are the same numbers of high flyers among women as men. However, two ECRs - one a man and one women - pointed to a bias against women in the peer review system. Finally, a salutary reminder of the dangers of gender stereotyping, one male ECR said they he cannot move to another university for a job because he has a family in the city where he lives and that his wife is the breadwinner.

UK

There are six women in the 2017 sample. Two of the three who did not transfer from 2016 were women, but this is unlikely to be gender-linked: they are both large animal zoologists and have been in the field all summer. One of the others is a high-flier and another has just finished maternity leave. Perhaps, the one common thread is that all of the women are in university life (still). There is no common trait to distinguish the men. None of them appear to have what used to be called "family obligations" except one in industry.

USA

The four who dropped out between 2016 and the end of the 2017 interviewing are women. Why? There are no other similarities and no difficulties relating to the interviewing process in 2016. There are now 9 women out of 24 interviewees. Whereas in the UK children were not mentioned, with one exception who had just come back from maternity leave, several of the women interviewed in the US did explain moves by reference to their families. Actually, several men did the same. Four of these women held or were going to hold tenure track or

similar appointments as mentioned above. One in particular was extremely helpful explaining how she is beginning to run her group and one of those moving very soon has been very open about her plans. It is also not possible to associate total or partial moves in to industry or industrial posts returned to full time.

There were no gender differences in scholarly behaviour or attitude that we could tell.

4.2.3 Discipline and subject differences

Just less than three-quarters (72%) of the ECR population are scientists and this was because the PRC's interest lay mostly in this area and, also, that the majority of ECRs are found in scientific disciplines. In the third year, when we have more data, we shall look more closely at specific subject differences, where numbers allow (medicine/health, computer science, biological sciences, physics and engineering are the fields where we have 10 or more ECRs), but for now we will present some illustrative material, mainly at the discipline level. Always allowing for the fact that social scientists are not as well represented as scientists in our samples there do appear to be differences in behaviour between these disciplines best summed up as; a) social scientists are not as paper productive as their counterparts in science; b) scientists are more concerned with publishing in high impact factor journals; c) scientists are more familiar and knowledgeable about scholarly communications; d) scientists collaborate more and work more in groups; e) competition is greater in the sciences.

In last year's analyses and even in this year's analyses, Malaysia and France often appear to be contrarians and this could well be down to the fact that the former has the highest representation of social scientists (42%) and France the highest proportion of scientists (82%). This is something we shall explore in the coming year.

China

Social scientists consisted of 36% of the sample and some differences in behaviour were evident as we shall see. ECRs from Medicine & Health and LIS were more familiar with OA, mega-journals, Open Science, and other 'hot' topics related to scholarly communication. It follows that they are also more experienced in publishing in OA journals and mega journals, and they seemed have deep knowledge about scholarly communication system. Other differences:

- Scientists mainly publish in WoS indexed English journals or conferences, while social scientists publish more in Chinese journals although they also need to publish in SSCI journals.
- Scientists are more likely to share and collaborate with their peers and colleagues during their research. Social scientists tend to do things on their own.
- Scientists believe that research results should be reproduced, but social scientists do not hold this opinion.
- Scientists produce more papers, with one producing 41 in the last year.

France

The French sample is the most scientific with 82% of them being scientists. This means it is difficult to make comparisons between scientists and social scientists, but the following more subject-specific ones can be made:

Biology and Chemistry are disciplines where there is the biggest pressure to publish and where there is the largest number of Post Doc contracts are available. Competition is fierce and links with industry do not always allow for openness and sharing in scholarly behavior. Those who left or are leaving academia come from these disciplines.

Physics and Computer Science experience the same pressure to publish and are expected to undertake Post Docs abroad. ECRs in these disciplines are familiar with openness and sharing. ECRs in Computer Science have been successful in getting a tenured position at the University. An ECR from Physics obtained a tenured position at CNRS.

Mathematics is close to Computer Science and Physics, but has developed an older, stronger, and imbedded culture of openness and sharing. Open Repositories play an important role here and open access is better known. The pressure to publish is less strong and publications requirements are more focused on what the community consider as a good journal (even their IF is not very high). The authorship culture is also different; authors of articles rarely exceed 3 and the alphabetical order is a rule.

Malaysia

The balance of scientists (58%) to social scientists (42%) was more even in Malaysia, so the opportunities for comparison was greater. Scientists differed from social scientists in these respects they:

- a) are more ambitious in their career aims;
- b) are much more productive in terms of papers produced. Thus, the scientists produced 13 papers per ECR in 2016/7 or 6.5 papers per year. By contrast, the social scientists produced just 5.4 papers per ECR or 2.7 papers per year;
- c) prioritize much more publishing in WoS-indexed journals;
- d) are more collaborative and in this they use the social media tools and platforms more than the non-sciences;
- e) have much more experience in publishing in OA and mega-journals and depositing in institutional repositories;
- f) are more familiar with Open Science;
- g) are more conscious about their web presence and impact;
- h) know more about unethical behaviour.

Poland

Just two ECRs (20%) are from the social sciences, so not a great deal can be made of the differences observed. In fact, there were few clear differences between social sciences and

sciences. The main differences found were that: a) sole authorship only exists amongst social scientists; b) monographs are only important for social scientists; c) both social science ECRs changed their minds about peer review going from fair to mixed and no scientists changed their minds; d) Despite the importance of publishing in listed journals to career development social scientists appearing in list A are rare phenomenon nowadays in Poland.

Spain

Some surprising subject differences in paper productivity are probably the feature of the Spanish analysis. Thus, Spanish ECRs published 57 papers in 2017 at an average of 3.35 papers per researcher. However. There are very big differences between subjects. Thus, the social scientists produced 1.75 papers per researcher, but just one researcher published all but one of the papers and two of them did not publish any. On the other hand, in Computers Science and Physics ECRs published 8.33 papers per researcher, but, again, just one researcher published 19 papers and in Biology, Medicine and Chemistry, surprisingly, perhaps ECRs published 2.5 papers per researcher, with 3 not publishing anything at all.

There were 4 social scientists among the Spanish ECR population, meaning that three quarters were scientists. They suffer from the same competition as their scientific colleagues, but only one of them, the oldest, is really productive in terms of paper publishing. Standards and requirements of publications are not as high as they are in the biological sciences and there is generally not requirement to publish in Q1 journals. In the social sciences, too, books and chapters are still important for assessment and reputation and the authorship order of is less fixed. There are also, typically, smaller research groups and lower number of co-authors. OA publishing is popular and attractive among all the social scientists as too is the social media, repositories and libraries and the fact that two of the ECRs are from the LIS field might explain this.

For comparative purposes, the same subject breakdowns adopted for French ECRs were adopted for the Spanish analysis. Physics and computer science form a natural grouping. They suffer the competition of the academic system but only in Physics are standards and requirements for publications as high as in biological sciences. They do not talk about *decil 1*. This group were not very interested in social media or smartphones, conversely though, they know a lot about open data, open peer review and they do publish in open access journals more.

Biology, medicine and chemistry form another natural group. The competition is hard for people in these disciplines and standards and requirements are very high and difficult to achieve. They need publications in Q1, better in first decil, and they need to be first or corresponding author. They complain about the difficulty of obtaining projects in their position. Members of this group are very learned about scientific communication and collaborate in research. The pressure to publish does not allow them to develop much in the way of sharing behaviour, but they are interested in increasing their citations so they are

interested in the alleged benefits of dissemination through social media and open access publishing in this regard.

As some of the researchers in biology and medicine point out, to work with plants is less complicated than with animals, and experiments with animals less complicated than with humans. More complicated means also more time consuming, so it takes longer to publish results.

UK

There are six social scientists in the 2017 sample. One is now in government. He researchers on the border between health and the social sciences, but is now best seen as a social scientist. The others come from a wide range and have little in common. In their publishing practices, they do (like the scientists) tend to see the article as the unit of publication though they (like the engineers) do publish book chapters. The biggest obvious difference from the scientists is that none of the social scientists are “typical” ECRs in that they do not work in groups. Two are totally independent in their work, but have large networks outside their institutions – they all do. Some of the questions in the interview about groups did not really work for them.

The UK sample contains, which limits the analysis. The one engineer is now back in industry and the scientists are mostly biological and chemical. There is an earth scientist and a materials scientist whose work and approach are related to biologists and chemists. There are in the same place as a whole with a range of similar attitudes to scholarly communication issues but different positions on the academic ladder. Two of the tenure track ECRs is in this category and they have to make policy decisions. The medical doctoral candidate is in a medical-support position already and his position and attitudes are much more similar to the larger UK contingent in the same frame. Another researcher now classified as medical was previous in a veterinary hospital. She is unusually not part of a group.

An analysis by subject of scholarly communication is not straightforward because the divisions are more complex particularly in the USA, but also in the UK, because of the numbers of ECRs either in industry or combining academic roles (doing a doctorate) with full time work in another job – for example cytogenetic support for a faculty. There are also post doctorates who work for companies. There appear to be very different attitudes, for instance, between a life scientist entirely on the academic ladder, one in the military who is doing lots of small projects, one in a government (FDA) who is doing one a post doctorate in a university while working in a university group in environmental sciences. We are exploring this further

USA

Twenty-five per cent of the US ECRs are from the social sciences and they do not form a group in any sense. Four are psychologist who are working in a medical context and can best science as part of medical support – see below. The public health environment leads to a lot of interdisciplinary working. There is an outlier sociologist and an outlier anthropologist.

The ECRs who have doctorates fall in to a couple of groups with a number of outliers. There is a significant group who are in what might be termed jobs involving support for or research with university clinical practitioners or in public health including three psychologists but who do not have clinical qualifications. Two are military scientists and 2 work with companies, either part time or full time. Most of these ECRs have been in jobs or are in jobs which are reasonably secure. In many cases there is a distinction between their university research and what they are doing for clients of various sorts. They are often under not so much pressure to climb the academic ladder as they have jobs. They have a lot of experience which enables them to have a wider view of Academe. They also tend to publish quite promiscuously in less highly ranked journals.

In addition to the young engineer who has already been mentioned there are three other engineers, one of whom has moved early in 2016 into industry and who is less involved in academic research and those scholarly practices relating to it. For them the conference proceedings are as important as journal publication in terms of usefulness though they usually emphasise the latter.

It should be possible to build profiles for both these groups of ECRs. There are only three biomedical scientists (plus one now outside the Academy and perhaps including a military microbiologist) who might make another group to look into and there are two chemists (plus perhaps two chemical engineers) who again might make for a profile.

See comments in UK section on difficulties of further analysis.

4.2.4 Other differences

Selected analyses only shown here.

Nature of research processed (France and Spain only)

If we look at their research subjects, we observe that 6 participants are involved in conceptual research while the 8 other participants are involved in experimental research. Very interestingly, we observe that 5 of the 6 participants processing conceptual research are on tenured positions. It seems that - excluding the number of their publications (which is high comparing the others) and excluding their discipline - the nature of research they are processing is a common denominator to their success in publishing many articles and in getting a job.

In Spain, it was found that the more experimental the research undertaken the greater the difficulty of coping with competition, publishing their results and/or getting a position in a university. Those who have left or are going to leave academia were performing experimental research and that is not surprising.

University Rank [China only for illustration and will be investigated for other countries later in the year]

ECRs in top ranked universities suffer much more pressure in regards to career development than those from medium and low-ranked universities. The competition for jobs is fiercer in top universities thus the requirement for tenure (publications, for instance, is higher). There is a time limitation for career progression in top universities, but no such harsh rules in lower level universities, so ECRs can take their time. In lower level universities, although the evaluation system still can be demanding, ECRs felt less stressed.

This may also be applicable to Malaysia, since all ECRs sampled are from research universities and the tenure requirement is higher; and 8 of them are from University of Malaya – the tenure and promotion requirement for the sciences is only publication WoS-indexed journals.

Overseas experience [China only for illustration and will be investigated for other countries later in the year]

As might be expected, those ECRs who have overseas study/visiting scholar experience collaborate more widely with their foreign peers/mentors/colleagues. Publishing papers together is the main form of collaboration. Overseas educated ECRs rely more on Google Scholar, Facebook and other international social media, and have a clearer view of research misconduct.

4.3 New questions

4.3.1 Mega-journals

A new question was introduced to the publishing practices section of the questionnaire, which was: *What are your views of mega-journals? Would you publish in them?* According to Wikipedia (https://en.wikipedia.org/wiki/Mega_journal) mega-journals are scholarly peer reviewed, open access journals which are much larger and broader in subject than traditional journals and exert low selectivity among accepted articles. *PLOS ONE* was the first and was soon emulated by other publishers, who could see the financial potential of such journals and now there are around two dozen mega-journals (megajournals.info), although this is disputed by Pinfield (<https://www.sheffield.ac.uk/is/research/projects/openaccessmegajournals>) who thinks the figure is closer to 11. The former figure includes many smaller journals ECRs might not be aware of. This is a tangled field anyway and especially so for our ECRs Typically, mega-journals accept articles for publication based on whether they are technically sound rather than selecting for perceived importance. They also claim to be quick because they are not asking referees to judge on everything. Table 6 shows whether ECRs knew about them, publish in them and what they think of them. Just over half of ECRs said they were familiar with mega-journals, with Chinese ECRs most familiar with them (more than 70%). Much fewer (19.3%) had actually published in one, although a much higher proportion of Malaysian ECRs had (42%). Most ECRs who published in mega journals were scientists, thus, in the case of French ECRs all those that had published in a mega journal were all biologists. It should be born in mind that those who are familiar with the concept of the mega journal are not necessarily the same ones who have published in a mega journal. *PLOS ONE* was mentioned most by ECRs, but also attracted some criticism and there is a sense that it has lost some of its esteem. The main attractions of mega journals are seen by ECRs to be their higher acceptance rates, the fact most are ranked highly by WoS and Scopus and their quickness in publishing. The biggest criticism is their perceived low standards of acceptance and processing, meaning for one British science ECR, *that quality is very variable*.

What is most striking about the results is that a sizeable proportion of ECRs see these journals - specifically *PLOS One* - as quick and non-selective. As one French ECR explained, dismissively, that mega-journals, like *PLOS ONE*, are a good match when you struggle publishing articles and when your data is getting older every day. US/UK ECRs when told about the mission of the *PLOS ONE* model (many did not know) said they liked it. The mission is not concerned with size but with editorial policies. The key policies being that any paper which meets rigorous technical and ethical standards is published and no paper is excluded on the basis of perceived importance or adherence to the norms of the discipline. But that is not why they have submitted when they have - it is because it is relatively easy to get into. However, the more informed ECRs have rather poor opinions of the refereeing standards. Last year mega journals were the thing of the future but it seems by 2017 they are no longer seen in this light, neither by publishers nor by researchers.

Table 6: Mega-journals and views of ECRs

	Familiar with	Published in	Reasons for publishing	Weaknesses
China (14)	10 (mentioned PLOS ONE)	3	<ul style="list-style-type: none"> • High acceptance rate • Quick review • Indexed in WoS and have an 'acceptable IF 	<ul style="list-style-type: none"> • Poor reputation & experience • Unstable IF. • Second-rate journals
France (14)	3	3	<ul style="list-style-type: none"> • Indexed in Scopus and WOS and have a high IF • High acceptance rate • Considered as a 'rescue' journal (when you fail to publish in another journal) 	<ul style="list-style-type: none"> • Not well considered by the community elite • Peer Review too fast to be done properly • Second-rate journal
Malaysia (12)	7 (mentioned PLOS ONE & Nature's scientific report)	5	<ul style="list-style-type: none"> • High acceptance rate • Indexed in WoS and have a high IF • Quick review and publication process • Boast reputable authors and editors • Attract citations 	<ul style="list-style-type: none"> • Too open, accepts previously rejected articles
Poland (10)	2 (mentioned PLOS ONE)	0	<ul style="list-style-type: none"> • Quick reviews & response • Open access • High IF 	<ul style="list-style-type: none"> • Fees too high
Spain (17)	7 (mentioned PLOS ONE; Nature Scientific reports)	3	<ul style="list-style-type: none"> • Prestigious publisher • High IFS • Visibility, albeit for a short time 	<ul style="list-style-type: none"> • Poor content organisation
UK (18)	11 (mentioned PLOS ONE and Nature Communications)	3	<ul style="list-style-type: none"> • Important • Quick reviews 	
USA (24)	15 (mentioned PLOS ONE and Nature Communications)	4	<ul style="list-style-type: none"> • Rescue or last resort journals • Enables publication of negative results 	<ul style="list-style-type: none"> • Standards too low
Total	55 (50.5%)	21 (19.3%)		

More on attractions

For some ECRs, such as this Polish one, mega-journals, in the form of PLOS ONE have many attractions: *PLOS ONE? It is very good publishing option. A lot of advantages: fast reviews and publications, open access, big Impact Factor, a lot of points.* A Malaysian ECR added another attraction: *My earlier paper was rejected by a conventional journal in my discipline, and it was accepted by Scientific Reports.* Interestingly, nobody mentioned the quality of their research or the soundness of the peer-review process that drives them to publish in mega OA journals. A Chinese ECR appreciated the fact that PLOS: *One does not care about your originality only that your paper is logical and experimental data is sound. PLOS One publishes the latest researches, so it provides good source for enlightening peers.*

A Chinese ECR also noted that mega-journals had special attractions for ECRs because of their capacity and openness:

I used to worry whether my papers are worth publishing or not. But now I have to publish for my career, so I consider mega-journals. Although we are not doing top researches, the works we are doing are still meaningful. We need quantitative changes to embrace a qualitative change. Top scientists are at the peak of a pyramid. We are the base, but we still contribute to science development and mega-journals enable us to do that.

One UK ECR thought them *a good idea because especially they bring into the literature papers which describe negative results.*

More on their unattractiveness

Ironically their size as an attraction for some was not shared by all with one British ECR scientist saying that *they are too big and lack personality.* For one British ECR the fees are too steep: *I do not see why I should pay fees [\$1500]*

Mega journals in the wider context of journal publishing

One US ECR gave a very considered and balanced view on mega-journals and what they represented and deserves quoting in full:

I prefer mega-journals in order to keep the information and the peer review process centralised. But, in fact, I cannot say that, because they are run as a business and competition must be encouraged and Monopolies are not nice. I guess mega-journals help scientists with their resumes and grant applications. It does not necessarily help reputation among peers and people do not show off their papers at conferences. I certainly do not. I never mention it. However, I would publish (again) if the quality of my research warrants it (social scientist)

Shifting fortunes of PLOS ONE

The shifting fortunes of PLOS ONE deserves commenting on separately. Thus, on the one hand, the French interviewer notes, that even those ECRs who are not familiar with the concept of mega journals, have heard about PLOS ONE, which means that they do not know that it is a mega journal. That is, it has a bigger brand than that of mega journals. On the other hand, a French ECR who had published in the journal will not do it again because of its plunging status:

It is very unlucky for me to have published a paper in a journal like that (PLOS ONE). Its IF was 4 when I published in it. One year after, it dropped to 3. I am worried that when I apply for tenure track in two years, it will have been kicked out of SCI. I will never publish in them anymore. It is humiliating. I regret for what I have done. Very much.

A Chinese ECR (a Physicist) was worried about PLOS ONE, too, but this time on the grounds of its loss of exclusivity, even status, completely because of the success of Chinese authors in publishing in it: *The quality is fine, the only problem is that it publishes too many papers from Chinese scientists. About 50% papers are from China, OMG, can you imagine that? We Chinese researchers consider these journals are lower-tier ones mainly because they publish too many Chinese authors. It is an opportunity for us, because it publishes more of us, but it also means the publishing in these journals will lower your reputation.*

There was also the sense that competition with Nature products was having a toll on its popularity: *Nature Communications is taking over the market because it is part of the Nature family* [British ECR]. Something that did not please one US ECR who felt that Nature was manipulative.

Finally, it is clear and that PLOS One continues to be a big success, but its mission actually lowers its credibility as far as some ECRs are concerned. Good mission, but let down by lack of quality and rigour in other words. The basic difficulty with the PLOS ONE model is probably that the expectation was that post publication review would make up for the minimal review before acceptance but there has not been sufficient post publication review.

4.3.2 New sharing mechanisms

A further question was added to the sharing and collaborating section of the interview schedule at the request of the PRC to the sharing and collaboration section and this was: *Would you like to see a more formal sharing mechanism (possibly with publisher involvement)?* Of course, sharing is a double-edged sword for publishers. On the one hand sharing promotes their and their journal's brand and results in greater and wider use of their articles. On the other, it represents a potential loss in revenue and subscriptions if that sharing goes on outside their pay walls and, of course, sharing is so much easier to do in these days of online communities and social media. Add in the fact that ECRs represent the born digital

and are a generation that likes to share and one can see why the question is being asked. Clearly publishers would like to be involved in the sharing platforms, which have largely evolved from outside the sector, if nothing else to ensure legitimacy. The main publishers have, in fact, proposed sharing policies and voluntary principles (<http://www.howcanishareit.com/>), but, as of writing, only one scholarly collaboration networks (SCNs) have signed up to the voluntary principles for article sharing and that is Figshare.

It should be pointed out that the question was couched in broad terms in order not to lead ECRs or raise their concerns because they could be big and nervous users of SCNs. Of course, this runs the risk of ECRs not understanding what was being asked. Not surprisingly, then, quite a high proportion (28.4%) ECRs either did not fully understand what it was they were being asked or were unsure about it (Table 7). Nevertheless, over half (53.2%) would like to see a more formal sharing mechanism. It is the Spanish who most want a formal sharing mechanism with 88.2% saying so. The explanation seems to be that in Spain there is a well-known and a well-used data base called Dialnet (<https://dialnet.unirioja.es/>) where a lot of publications, mainly written in Spain, are accessible and ECRs being appreciative of this welcomes more initiatives of the same kind. Also, two ECRs were hoping for a free and comprehensive data base for sharing research that can substitute for WoS and Scopus and thought the new mechanism might have these qualities.

The lowest proportion of ECRs wanting a formal mechanism came from the USA (29.2%) where the question also seemed least understood. This is because when asked the question ECRs immediately thought in terms of ResearchGate which they saw as a service already helping them share though they primarily used it for raising their profile. The high proportions of USA and UK ECRs not understanding the question is explained partly by the fact that they appear less familiar with the concept because national databases of the sort in mind just do not exist in these countries. It is possible, too, that access is so good they simply don't need them. In contrast, in some countries, such as China, national sharing mechanisms already exist so ECRs are more able to understand what the question was about (especially when these mechanisms were pointed out to them) and hence thinking they are a good idea. Thus, in China there are four of them:

- National Science and Technology Report Service <http://www.nstrs.cn>
- National Science and Technology Achievement Database <http://www.nstad.cn>
- National Social Science and Philosophy Research Achievement Database <http://www.npopss-cn.gov.cn/GB/221428/index.html>
- Open Repository of National Natural Science Foundation of China. <http://or.nsf.gov.cn>

Among these four sharing platforms, the Open Repository of National Natural Science Foundation of China is the most widely used, because the Foundation requires that all

research supported by the funding must be uploaded to it. But when asked do they search for literature on it, most ECRs said no.

Publisher involvement

Only a small proportion of ECRs who wanted a sharing mechanism (12.8%) did not want publishers to be involved. This translates into quite a large number of ECRs (34) who were not worried about publisher involvement and a number explained why:

[in order to have a complete, high-quality system and register]

- *Yes. I think the best solution will be a platform associating publications from all publishers. Articles should be adding automatically after publishing. [Poland]. Publishers should be involved in the system as a guarantee of high-quality content. [Poland].*

[to legitimise the practice]

- *We have such system, the Open Repository of National Natural Science Foundation of China, and publishers must be involved because permission should be obtained when we upload the post-print version of our papers. [China]. Yes, the publishers should be involved because they have the advantages of resources and copyright. [China]*
- *Yes, it would be helpful. The aim of our work is to share our research and to cite each other. Formalizing the system will bring more clear rules what can we share and what need to be secret. Publishers should be involved in this. [Poland]*

[to provide expertise]

- *Publishers can help authors to share responsibly, which version to share. They (Publishers) know the appropriate version to share. [Malaysia].*

[they have made advances in this area already]

- *Yes, I have seen this on Elsevier journals, Share links, the journals allow us to share the link for certain period. [Malaysia]. What some journals are doing now is good, give temporary access to our article, this help us to publicize our work, at least we can share through e-mails the temporary link. [Malaysia].*

[they owe us]

- *Publishers don't pay us to write, they don't pay the reviewers as well. At least they facilitate sharing of our works, and yes, I would say they should be involved. [Malaysia]. Our library can't afford to buy journals and has put a stop to important databases. Publishers can be more sympathetic in sharing and this helps to make this scholarly (communication) environment sustainable. [Malaysia].*

For one French ECRs the proviso was *that the publisher platform is open source*. Many Spanish ECRs (12) put a different spin on the question and proposed that publishers should allow them to share papers through RG as it offers a popular and easy means of doings although 5 of them understood *publishers' concerns with protecting their business and subscription model*. As one put it *the problem is that we live in a hybrid market and rules are not well fixed*.

French ECRs show the biggest antagonism towards publishers being involved in new sharing platforms, with 44% of those in favour of having a more formal mechanism being against publisher involvement. In the words of one of them *Publishers have so much power that it would be dangerous to hand them over our intermediary results*.

No need for more formal sharing initiatives

Less than 14% of ECRs felt that there was no need for a more formal sharing mechanism largely because they felt what they had already (e.g. ResearchGate, GitHub, Google Drive, Dropbox arXiv) was sufficient. The French were not only antagonistic towards publisher involvement, but also having a new formal sharing mechanism at all with 5 ECRs saying so. Reasons include: a) that they suspected that the proposed platform would not be flexible enough; b) that they already had one in the shape of arXiv. In general, though, French scientific scholars are generally unfamiliar with national initiatives and there are some, of course, with HAL and ISTEEX, being the main ones, but they are either not known to ECRs or just not thought of as a sharing platform. They remain much more familiar with 'community' initiatives, such as RG.

Ethics of sharing

All scholars see sharing as central to the progress of scholarship and the millennials see it as central. ECRs almost always want to share - that is their ethical position, but a number of factors prevents them doing so: a) they want to hold the information so that they can publish articles based on it; b) the data (in medicine) is confidential as it relates to humans and is difficult to make anonymous; c) the data is not useable by anyone else because of the way it has been collected. In terms of change, ECRs are even more conflicted because they now recognise that promiscuous sharing will interfere with their ability to use their results to write exciting new papers, but it does not undermine their basic position as far as we can tell.

Most of the information we obtained concerned the sharing of data. The ethics of sharing papers did not come up very often. However, some did and provided knowledgeable responses, for instance one US ECR said: *I understand and respect the policies. Sharing of ideas as a researcher is never discouraged. But at the same time, you have to respect proprietary information that cannot be leaked as it is a for profit company/industry*. Malaysian ECRs want more guidance from publishers on what represents safe sharing. Only a very few (mainly French) ECRs mentioned SciHub and its use.

Table 7: Would you like to see a more formal sharing mechanism (possibly with publishers)?

	Yes	Yes, but not with publisher involvement	Not sure or fully understood question	No
China (14)	11	1	1	2
France (14)	9	4	0	5
Malaysia (12)	8	0	4	0
Poland (10)	7	2	2	1
Spain (17)	15	5	2	0
UK (18)	6	1	9	3
USA (24)	7	1	13	4
Total (109)	58 (53.2%)	14 (12.8%)	31 (28.4%)	15 (13.8%)

4.3.3 Reproducibility

There have been concerns recently that research in science is not as reproducible as it should be (<http://www.nature.com/nbt/journal/vaop/ncurrent/full/nbt.3938.html>). The PRC were interested to find out whether ECRs are aware of the problem and had any suggestions to make their research more reproducible. Thus, a question was added to the Ethics section of the interview schedule. The question was framed as follows: *Have you any ideas about ways in which the results described in your publications might be made easier for other researchers to reproduce?* As Table 8 shows the vast majority of ECRs (87.2%) seem to have thought about the problem and are aware that, especially in science, it is essential to be able to repeat an experiment as a way to test research results. Most ECRs, even the most conservative ones, appear to be sold on reproducibility and they even worry about it. As one Chinese ECR said: *It will be a big problem if an experiment can't be reproduced.* It is interesting to note that when they think of reproducibility they do not always distinguish between methods and data.

Most ECRs had suggestions that would help ensure reproducibility (see Table 8, column 5) and they can be broadly categorised as: a) making sure the dataset and supplementary materials linked to the article are online and easily/openly accessible; b) articles and especially the methods section should be more detailed and extended; c) use videos (and conferences) to explain methodology; d) authors should (honestly) answer questions about methodology/data, maybe, at conferences. There were some interesting suggestions, too, with one Polish ECR suggesting that *You can give the possibility to publish two types of articles on the Internet: traditional papers and expanded papers with access to the data and supplementary materials.* A UK ECR suggested that part of the publishing process should be to check if it is possible to reproduce. If not, the paper should not be accepted. *Another ECR (Polish) mentioned that the problem could be partly solved by sharing our research results through scientific social media platforms and through open-access articles. It is also important to meet with people from field of your research and talk about your recent research.* While

another felt that videos were the solution: *Produce video articles would be a good idea because you cannot hide or skip any detail when to do that.* For some, however, like this French ECR it was just simply a matter of making everything available: *To be as clear as possible when you describe the protocol, provide details, references, steps, etc. Even in biology there are so much experimentations that vary according to the climate, temperature, moisture...provide all the details is the better guarantee.*

It is also clear that the whole question of supplementary materials is in a period of transition. Traditional data linked to the paper on the publisher site has been seen as an enhancement, but now it seems to be clear that for reproducibility it is absolutely essential and ECRs realise that. Very few ECRs mentioned lodging papers in subject or institutional repositories.

Table 8. ECR ideas on ways in which the results described in publications might be made easier for other researchers to reproduce

	Yes	No	Don't understand/not sure	Ideas suggested (number of mentions in brackets)
China (14)	11	2	1	<ul style="list-style-type: none"> • Journals should publish the dataset online (4) • Policy makers ensure there is an infrastructure to host datasets so they are open to all (5)
France (14)	14	0	0	<ul style="list-style-type: none"> • Provide more details in methods section (7) • Produce longer and more detailed articles (5) • Produce videos to show the processes (2) • Provide the names of the products & tools used in experiments (1) • Put data on Figshare (1)
Malaysia (12)	9	0	3	<ul style="list-style-type: none"> • More detailed description of research methods (5) • Provide supplementary materials online (1) • Journals enforce standards in the way the study is presented (2) • Make available online the computer codes and data, software, hardware, implementation details (1) • Provide detailed information on analysis, statistics and themes (2)
Poland (10)	7	3	0	<ul style="list-style-type: none"> • Provide video attachments to articles (2) • Have a data attachment to articles (2) • Make sure everything is open (1) • Answer questions about methodology (2)
Spain (17)	16	0	1	<ul style="list-style-type: none"> • Materials and methods well explained, well described (11) • Open data, but quality controlled (5) • Answer questions about methodology (3) • Explain methodology at conferences, videos (1) • Make supplementary material available online (1)

UK (18)	16	0	2	<ul style="list-style-type: none"> • Provide better/more detailed methods section. (5+) • Make data and supplementary materials (e.g. software) available online (7) • Use transparent methods (1)
USA (24)	22	1	1	<ul style="list-style-type: none"> • Good/clearly expressed/transparent/ more detailed methods section (6+) • Put data in supplemental materials (6) • Use open science framework (1) • Expose coding (1) • Deposit in GitHub (1)
Total (109)	95 (87.2%)	6 (5.5%)	8 (7.3%)	

Discipline differences

It was largely scientists who were concerned about reproducibility although a few social scientists were concerned and did make some comments. One UK ECR, for instance, said it is not really a concern for social scientists except, perhaps, quantitative researchers and, in their cases, data needs depositing and coding for models need making public. They said that *People are beginning to do this*. And this was in fact the case for a UK social science ECR who said: *My current practice is to publish my source code which helps them understand my modelling and I also make my software available*. A US ECR said they looked at the recommendations in [OSS.io](https://oss.io) for software.

Problems associated with ensuring reproducibility

Life and health sciences were a subject where a number of ECRs felt there were problems. Thus, two Polish ECRs said that in some fields it was not possible to make data available in some areas of the life sciences such as reproduction. A US neuroscientist, now in a pharma company, looking at the problem for a user perspective told us that: *To replicate you need detail which rarely provided such the body weight and age of experimental animals*. One UK ECR pointed out that *for those working in the medical and health fields in most cases there are ethical barriers regarding data sharing and ensuring patient anonymity*.

Another problematical area was thought to be providing methodological detail. For example, a UK ECR pointed out that by doing so the ECR could end up in a catch 22 situation with journals requiring sufficient detail to ensure reproducibility and also suggesting that you cut down on your methods section if the article is perceived as being too long. A French ECR in chemistry mentioned that confidentiality is a concern; linked to competition and collaborations with industry it makes reproducibility difficult, as data are rarely shared, and/or never released.

Reproducibility is not a big deal for some

Not all ECRs felt anything more had to (or could) be done about reproducibility. Thus, a French ECR acknowledged that while transparency was critical some things would have to remain secret: *The idea is to provide all the elements, all the information and all the details about the experimentations and the results. Usually, everyone keeps some secrets and it is considered as acceptable.* A Polish ECR thought that we possibly worry too much about reproducibility: *I believe all results are easy to reproduce. In our articles, we say who is the corresponding author, anybody can write and consult them.* One US ECR said that it is *pretty straightforward in my field (public health) AND we try to publish in a way that is reproducible. The traditional way is to ask questions at conferences.*

Different viewpoints and stances

As we have heard authors are concerned about how much data they can afford to expose and how much they can fit into the paper in the methods section. The user/reader on the other hand is concerned in finding out enough to enable the replication of results. In both cases they are living in a new world where readers expect more, especially if they are not in the top groups. It might be supposed that the top groups would not expect to get information about methods or data from other top groups. They would get in touch to ask, and, even, ask to send one of their workers to the other laboratory, send samples etc. A researcher of lesser status would not think of doing that because they would not know the top people and would hope to pick up what they need from the article.

Reproducibility and guidance by publishers

Some publishers do give guidance on reproducibility, but this did not come out in the interviews. ECRs could have raised this in relation to the question of open science, which is very much connected to reproducibility, but they did not. Thus, French ECRs never mentioned any publishers' guidance concerning reproducibility. It was thought to be an inner lab issue, imbedded in the researchers' behaviors and culture, with no apparent link to publishers' guidance.

5. 0 Conclusions

Our main finding is that just in the space of 12 months, there are changes happening, with a few quite significant ones and many minor ones, and change is happening everywhere, in every area and country. The evidence we that we have accumulated about change demonstrates that the strong winds of change that are buffeting scholarly communications is beginning to impact on ECR's behaviours, who are, of course, contributing to it. Also, the fact that we can find many similarities in the change observed from ECRs from the different countries, means that ECRs are behaving as a community, as a whole. Indeed, they have the same situation/status, the same goals and aspirations and they all take the same risk of spending many years of their life entirely dedicated to academia, without a guarantee that they will be employed permanently. Whether the momentum continues through to 2018 is uncertain, but it looks as though it might.

It can be no surprise that the biggest changes recorded are in the job and career areas given that ECRs have very little security and work in a precarious environment. There is a tremendous amount of churn going in which must surely have an impact on the scholarly activities of ECRs and this is what we shall be turning our attentions to in the following year.

It also seems that, because of their precarious position, ECRs are more strategic than their senior counterparts. They observe all the time on what can help them, be useful to them in their career aspirations. This means that they are positioning themselves all of the time, more likely to change their mind and behaviour if they realize that something they criticized yesterday may actually get them quicker to their primary goal. A good example of this is that, typically, many ECRs were not very enthusiastic about ResearchGate and they are now bigger fans because they saw that their community is actually resident on the platform. Another example, while they are not criticizing the importance of the impact factor and sticking to these norms, at the same time, they are keeping an eye on the other scholarly metrics. It was similar with open access publishing, which they were not fully convinced about, but it is different now since they have heard of the citation and outreach benefits.

Of course, when we are assessing changes we need to bear in mind that most ECRs are 'servants' to a reputational or assessment system and their behaviour is shaped by others and especially by government policies (most notably, perhaps, in the case of China and Poland). It is shaped most obviously towards publishing in high impact factor journals, from which most rewards flow (including direct financial reward in the case of China), and most importantly tenure. That is not to say that ECRs are necessarily alienated towards a system that essentially tries to reward good research. If ECRs want to change things by adopting new ways then all they can do is chip away at the system, and it is only governments and institutions that can ring the big changes. And things are changing in this respect. Thus, in China, for instance, the government has already taken steps to use more diversified metrics to evaluate scholars and Zhejiang University recently allowed scholars to publish articles on social media, the popular article will be counted and rewarded when evaluating.

We know from earlier studies that it takes time for researchers to change their scholarly habits and given the scale of change that has occurred in just 12 months we would regard what we are seeing as something significant. It is a little premature to make firm conclusions on the back of this; however, it is worth returning to our main research question to see where we are in answering it. Thus, the overarching research question that drives the whole research project is whether ECRs are showing signs of being the harbingers of change when it comes to scholarly communication. Each national interviewer was asked to answer this question based on two years' worth of data and the answers, provided in Table 9, show that all, bar none, think they will prove to be, but they all have qualifications about this, although China, France and Malaysia have fewer qualifications. In the cases of the UK/USA while there is clearly change happening and most ECRs believe it will continue a lot depends on whether ECRs take their millennial beliefs in sharing, openness and transparency into leadership positions. We have limited evidence so far, but we shall have more in 2018.

Table 9: Will ECRs be the harbingers of change?

Will ECRs be the harbingers of change?	An unqualified YES	A qualified YES (✓ shows strength of qualification)	NO, not as yet, but still early to tell	NO, no signs at all	Impossible to tell	Other
China		✓				
France		✓✓				
Malaysia		✓✓				
Poland		✓✓✓				
Spain		✓✓✓				
UK		✓✓✓				
USA		✓✓✓				

Appendix 1: Harbinger publications (2016 – 2017)

1. **Early career researchers: Scholarly behaviour and the prospect of change.** David Nicholas, Anthony Watkinson, Cherifa Boukacem-Zeghmouri, Blanca Rodríguez-Bravo, Jie Xu, Abdullah Abrizah, Marzena Świgoń and Eti Herman. LEARNED PUBLISHING. Volume 30, Issue 2, April 2017, Pages: 157–166, Version of Record online: 16 FEB 2017, DOI: 10.1002/leap.1098
2. **Early career researchers and their publishing and authorship practices.** David Nicholas, Blanca Rodríguez-Bravo, Anthony Watkinson, Cherifa Boukacem-Zeghmouri, Eti Herman, Jie Xu, Abdullah Abrizah and Marzena Świgoń. LEARNED PUBLISHING. Volume 30, Issue 3, July 2017, Pages: 205–217, Version of Record online: 29 MAR 2017, DOI: 10.1002/leap.1102
3. **La vie en Gold : enjeux et risques pour les chercheurs.** Cherifa Boukacem-Zeghmouri, David Nicholas. I2D - Information, Données & Documents, March 2017, Pages: 10 - 11
4. **Peer review: The experience and views of early career researchers.** Blanca Rodríguez-Bravo, David Nicholas, Eti Herman, Chérifa Boukacem-Zeghmouri, Anthony Watkinson, Jie Xu, Abdullah Abrizah and Marzena Świgoń. LEARNED PUBLISHING Version of Record online : 8 AUG 2017, DOI: 10.1002/leap.1111
5. **Publish or perish thwarts young researchers' urge to innovate.** David Nicholas, Anthony Watkinson, Eti Herman, Cherifa Boukacem-Zeghmouri, Blanca Rodríguez-Bravo, Jie Xu, Abdullah Abrizah and Marzena Świgoń. Research Europe, November 2016, Pages: 7-8
6. **A system that prioritises publications means early career researchers' scholarly attitudes and behaviours remain conservative.** David Nicholas. LSE Impact of Social Sciences Blog. May 2017
7. **Where and how early career researchers find scholarly information.** David Nicholas, Cherifa Boukacem-Zeghmouri, Blanca Rodríguez-Bravo, Jie Xu, Anthony Watkinson, A. Abrizah, Eti Herman and Marzena Świgoń. LEARNED PUBLISHING. Volume 30, Issue 1, January 2017, Pages: 19–29, Version of Record online: 3 JAN 2017, DOI: 10.1002/leap.1087

A further 2 are being reviewed at the time of writing:

8. **Early career researchers: an international study of their quest for reputation in the digital age.**
9. **How is open access publishing going down with early career researchers?**