Report on Unintended Consequences Workshop 1

Scholarly publishing and the lay reader

BACKGROUND TO WORKSHOP

The workshop considered the needs, concerns, and current and potential practices of the scientific publishing industry, regarding sharing knowledge with non-specialist readers, and readers from other disciplines. It was conducted under the Chatham House Rule, and was designed to foster open dialogue among a small group of individuals from the research and research publishing ecosystem.

The eleven participants comprised senior executives and representatives from the scholarly publishing industry, key not-for-profit knowledge brokers, senior academics with expertise in open access and public engagement with science, and the *Unintended Consequences* research team.

Insights reported here will be used to refine the aims and methodology of the *Unintended Consequences* research project, and future related projects, to ensure they meet the needs of the scholarly publishing industry.

* indicates that additional research has been conducted to fill out details.

A. 30-SECOND FEEDBACK ON PROPOSED CASE STUDY INVESTIGATING USE OF THE SCIENTIFIC LITERATURE BY HOME USERS OF BRAIN STIMULATION TECHNOLOGY

Participants were not aware of similar studies. This observation is supported by the *Unintended Consequences* preliminary literature review, and confirms that the study will address an existing gap in knowledge.

All participants said that they would be interested in reading the results of the study. Suggestions on how to improve the study, and to align it with industry interests (for example, by extending to a broader range of lay readers than the current case study), are detailed below at D.

Research translation comes in many forms. Mary Shelley wrote Frankenstein after reading Galvani's work on nerve function and 'animal electricity'. (Image from 'Brain research is at a tipping point', an animation from The Brain Dialogue and the ARC Centre of Excellence for Integrative Brain Function.

B. SCHOLARLY PUBLISHING ECOSYSTEM

Industry snapshot - raison d'être, customers and culture

The overarching mission of the publishing industry is to communicate and disseminate new research findings to facilitate research. This includes growing commercially-viable businesses, and supporting sustainable philanthropic programs, such as Research4Life, which provides developing countries with free or low-cost access to academic peer-reviewed content online.

Scholarly publishing has been agile in terms of both adapting to, and driving, digital publication technologies. Indeed, journals have thrived in the Internet era — in stark contrast to another knowledge-sharing product, the newspaper for example. Journal publishing remains a dynamic industry, and publishers need to continue to adapt in times of what one participant called "transformative change on a moving machine". The scholarly publishing industry faces the same challenges as other industries in predicting new technologies or ideas that will affect it, either positively or negatively. Examples are the emergence of social networking platforms and Napster-style search engines like SciHub.

Adhering to "best practice", and upholding ethics and integrity in research and in the research publication process, is essential for scholarly publishers, indeed all stakeholders in the research ecosystem. There is a legal risk associated with malpractice and mitigating that risk is important for all stakeholders. It is considered that risks are not significantly increased by increasing public access to the literature. Indeed, in the UK, visitors to public libraries have access to more than 15 million articles provided by more than 20 participating academic publishers through a pilot project called Access to Research.

Publishing is moving from a business-to-business model (publisher to institution/library) towards business-to-consumer model (publisher to researcher/funder), driven in part by gold open access publishing.

Customer diversity - different subjects, subcultures, learned societies - is a challenge to the industry. Publishers have to be extremely agile when it comes to extending their customer base as funders start to look at measures of impact or "public good". This means that publishers are increasingly looking to reach out to lay readers, and to maximise engagement through social media platforms such as *Twitter* and *Facebook.* However, there are challenges in making content written for specialists and researchers available to lay people. As one participant noted, there is a distinction between "availability" and "accessibility", since accessibility depends on the ability to understand and interpret the literature, and to know how to apply it in practice.

Scholarly publishing has a history of both industry-driven, cross-company collaborative innovation to respond to market needs (e.g. development of ORCID), and user-driven innovation (e.g. social-networking and file sharing via platforms such as ResearchGate).

Unusually, the industry's suppliers are also its primary customers — the researchers. However, increasingly, groups outside the research ecosystem are interested in its outputs, and there are now many examples of journals that are designed to meet the needs of both academics and practitioners, such as journals in educational research that are designed for educators as well as researchers. Outside of the industry, not-for-profit knowledge brokers such as Cochrane and the UK's Education Endowment Foundation shift knowledge from academia to patients and clinicians, and educators, for informed decision-making.

The science research knowledge landscape is in seismic flux

Participants named many disruptors, including:

- open access — green and gold
- layering with services such as Kudos (which enables authors to tell their impact story through plain language summaries)
- predatory publishing, particularly its impact on quality
- uncertainty about the best form of peer-review
- established knowledge brokers have grown (Cochrane) and moved online (eXtension) to create collaborative learning networks. New brokers have emerged, particularly around disease interest groups (e.g American Diabetes Association provides Patient Inform, which breaks down recent research, as well as providing targeted literature reviews for specific ethnic groups)
- emergence of open science movement, requesting accessible, curated data, and best-practice metadata protocols
- recognition of need to build infrastructure for integrated data management, and cross-referencing, across journals and publishing companies
- recognition of need for more curation (collections for a specific purpose, such as Cochrane or Medline Plus), data repositories, and provenance recording

- emergence of new consumers of knowledge enabled by digital technology. Those socio-digital communities are still poorly understood

But some things have endured:

- "summarisers", such as *Australian Doctor*, or, as noted by *The Unintended Consequences* team, *Spectrum* (autism-related news)

The industry is (somewhat) interested in lay readers and the general public…

Scholarly publishing — in keeping with mores of the wider science enterprise — "would like to drive up interest and understanding of science across the broader community," said one participant. Driving lay traffic to journal articles is an opportunity to increase downloads and improve usage (and usage metrics). There has also been a shift towards encouraging editors to use lay summaries, impact statements, etc. This is driven by pressure from funders to show the relevance and impact of publicly-funded research, and, hence, increasing competition between journals and individual researchers to do likewise.

"Knowledge is power. Everyone deserves to have access to knowledge," said another participant. But participants also acknowledged that — despite programs such as Research4Life and Access to Research mentioned above — their efforts to share knowledge more widely are limited as the general public is not the core business.

…and the public is (somewhat) interested in accessing new findings

Niche "extreme interest groups", are very interested in new findings — take the *Unintended Consequences* cohort, people who use brains stimulation devices at home; Emerge Australia, a Chronic Fatigue Syndrome interest group, which provides summaries of research papers, and links to the original article; and the American Diabetes Association.

*Since 2014, participating British public libraries have provided electronic access to many journals. The Access to Research pilot came out of a recommendation by the Finch Group, a committee convened by the UK government, to explore expanding access to publicly-funded research. It is a collaboration between the Publishers Association and libraries. Participants suggested that interest in the service has been low. However, the service has been granted permission to continue, subject to annual review, "on the back of a successful two year pilot". We are investigating further.

There are grave concerns about the readability of literature…

Science is a victim of its own success. Progress brings more specialisation, more jargon, and raises barriers between even closely-related disciplines. A century ago, papers in Science and Nature were as easy to read as the front page of The New York Times. No longer.

Participants agreed that improved readability by increasing transparency can help tackle issues such as redundant publications, illegitimate authorship, and below-standard or unethical research practice, as well as improve the efficiency of the scholarly publishing production cycle.

*After the workshop, one of the *Unintended Consequences team* spoke with an expert in machine text mining. She confirmed that improving readability for humans would also improve readability for machines, facilitating text mining of scientific publications to extract knowledge and concepts.

Existing initiatives to address concerns about readability, include….

- plain-language summaries (see section C)
- professional intermediaries and knowledge brokers, such as Cochrane, and agricultural extension.
- educating scientists and introducing article standards, and guidelines, such as the Equator Network. But participants pointed out that guidelines are not popular, and opaque writing is still favoured by many disciplines. The Code for the Responsible Conduct of Research does not address readability. It is currently under review
- in-article tools and annotations, such as plain language titles; "Significance Statements" (PNAS); lay summaries (several journals, notably PLOS journals); and * short boxes entitled "Trends", "Glossary", and "Outstanding Questions" (*Trends In…* journals)
- press releases. But it was noted that if these are aimed at working journalists, dissemination of their content will be limited by the space available for science news, and how well they fit the news values of different outlets

C. EXTENDED DISCUSSION OF PLAIN-LANGUAGE SUMMARIES

Depending on the results of the current study, the* Unintended Consequences *team may be interested in working with scholarly publishers to develop and test innovative ways to improve the usability of the scientific literature for different audiences (lay, cross discipline etc.). We have started to think about ways this may be done, hence the discussion of plain-language or lay summaries was of particular interest to us.

Plain-language summaries are written in standard English, and tend to contextualise the research, concentrating on the why, rather than the how. Some journals, such as Nature, and PLOS journals, provide them or are experimenting with them.

Informed by workshop discussions, the* Unintended Consequences *team believe that lay summaries are a good idea for…

- earning trust: in a journal, a researcher or a publishing company. This was considered especially critical in the face of information overload
- ease of use of product: also critical in face of information overload
- informed decision-making: by practitioners, policy makers, etc.
- helping bridge the gap between research and industry: to play a role in global impact agenda. (Kudos has won awards from the UK government's Innovate UK)
- facilitating innovation and cross-disciplinary research: including through "intersect" journals such as GeoHealth and Environmental Chemistry
- providing a resource to researchers: plain language summaries can be reworked for grant applications, press releases, etc., and to help researchers articulate their worth. "Scientists have to be able to justify their existence," said one participant
- helping boost Altmetric scores, and other metrics

Informed by workshop discussions, the* Unintended Consequences *team also consider that there are barriers to uptake, including…

- cost ($0.5 - 1k per paper)
- no single player (journals, researchers, institutions, funders) has seized responsibility or found a way to monetise plain language summaries. Kudos provides a platform for authors to add their own plain language summary. We are currently investigating how many authors use this option, and whether the summaries are adding value
- no business model — "in the online world, for example, flatmate.com, 80% of the offering is free, a premium is paid for the other 20%," pointed out one participant. Are lay summaries premium content or free? Could lay summary production piggyback on services such as Edanz?

Use and production of lay summaries is being actively researched by the Norwegian Knowledge Centre for the Health Sciences in Oslo – which is part of a research project called DECIDE (2011-2015) or Develop and Evaluation Communication strategies to support Informed Decisions and practice based on Evidence – and others. One participant noted that studies of the US National Science Foundation Broader Impacts Criterion suggest that the public are not interested in lay summaries. We are currently looking in to this.

And plain-language summaries may not be enough…lay people (and some scientists and practitioners) often don't understand evidence hierarchies, reliability, and uncertainty

"The early days of evidence-based medicine took two routes — get good evidence into source material, and get people to look for good evidence," said one participant.

Participants also discussed the need — and, hence, potential opportunity — for training or education (commercial or altruistic) that supports understanding of evidence. Research4Life, for example, provides training in information literacy.

They also suggested papers could include strength-of-the-evidence tools or annotations, for example, traffic light red, means single paper needs replicating; traffic light green, means systematic review, high-level evidence.

D. REFINING THE *UNINTENDED CONSEQUENCES* RESEARCH PROJECT

Participants suggested extending the study to other lay or non-specialist readers of research literature - for example, people pursuing stem cell therapies, or people who use marijuana to treat severe epilepsy in children, as well as scientists working across traditional discipline boundaries (chemistry-environmental science or geography-health). This is an option the *Unintended Consequences* team has considered, and intend to pursue following the current study.

***Informed by the workshop discussions, the* Unintended Consequences *team consider it important to pursue the following lines of enquiry*:**

- Motivations: why do home users want to access the research literature?
- Needs: finding out what lay readers need — for example summaries, curation, etc — this would be essential to making a case for government funding, pointed out one participant
- Search: how do home users find research papers? — through university repositories? Which ones? Direct to journal websites? Via Sci-Hub?
- Categorisation: what do home users consider a "scientific article"?
- Beliefs and expectations: regarding the purpose of research papers: how do these beliefs and expectations differ between scientists and non-scientists
- Authentication: how do home users authenticate research papers — how do they decide that a journal is reliable or trustworthy (e.g. institutional affiliation; journal name; etc.)? Can they spot a "predatory" journal?
- Influencers 1: regarding Reddit, find out how moderators ("mods" akin to senior editors) influence research paper use
- Influencers 2: more generally, what role does social media (Twitter, Facebook, Reddit etc.) play in finding and validating scientific articles?

Participants also suggested that we access Pew Research Centre Internet, Science and Tech studies, and studies related to the US National Science Foundation Broader Impacts Criterion. This has commenced.

— October 4th, 2016

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