Authorship, Patents, Citations, Acknowledgments, Tweets, Reader Counts and the Multifaceted Reward System of Science

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ABSTRACT

Building upon well-established paradigms brought forth by such theorists as Robert K. Merton, Pierre Bourdieu, and Blaise Cronin, the panel will span the full cycle of academic production to show, through various bibliometric measures and other quantitative and qualitative analyses, how the reward system of science is evolving. While there is strong evidence to suggest that such forms of dissemination as social media output and blogging are being incorporated into scientific practices, scientific impact still remains principally assessed using measures such as authorship and citations, whilst other elements, such as acknowledgements, have received varying levels of regard at various times. Disciplinary considerations also arise. Using a wide range of approaches, measures, and datasets, the panelists will establish links between their individual research to create an empirically driven picture of the reward system of science and its indicators. Through the use of the Polldaddy application, audience members will answer questions and create an overview of their perception of the reward system of science.

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Keywords

scientific impact, reward system of science, sociology of science, scholarly communication, authorship, patents, citations, acknowledgments, social media, inventorship

INTRODUCTION

The *illusio* is the set of rules that defines a given field, legitimizes its existence as well as the rules themselves, and identifies what, to its "players," is "of interest" (Bourdieu, 1996, p. 227-228). Bourdieu described the sociology of science's "particular type of symbolic capital" as "a capital built on knowledge and recognition" (2001, p. 71; our translation). The combined paradigms of Bourdieu's symbolic capital and Merton's (1973) "reward system," towards which Bourdieu (2001) admitted having been, at times, "unfair," (p. 31) have provided sociologists with a *Weltanschauung* which still pervades the academic *illusio* today. Blaise Cronin, who, in some of his earlier work (with Weaver-Wozniak, 1993) had introduced the "reward triangle" of science (authorship, citations, acknowledgments), expanded on these frameworks and brought them into the age of hyperauthorship, or "massive levels of coauthorship" (2001, p. 558). In April 2015, *Nature* published "The Leiden Manifesto for research metrics" (Hicks, Wouters, Waltman, de Rijcke & Rafols, 2015), which presented 10 principles as a "distillation of best practice in metrics-based research assessment" (p. 430) and a plea for the contextualization and more responsible use of quantitative measures of productivity and impact.

Indeed, if production and recognition are still the pillars of academic impact, the proliferation of social media and other potential indicators is causing a shift in the *illusio*. Panelists will not only discuss results and data from their respective research, but also come together in pairs or groups in order to compare and combine their perspectives on authorship, inventorship, citations, acknowledgements, and social media use, thereby covering the full cycle of scientific production. After each section is presented, the audience will be asked to answer one or two questions (Q) through the Polldaddy polling application (polldaddy.com). The results will help to further address the panel's overarching questions: "What are the various meanings given to 'having an impact'?" "How do the various ways of acquiring symbolic capital impact a scientific career?"

AUTHORSHIP

Authors and contributors

Authorship is at the core of the reward system of science as the "undisputed coin of the realm in academia; it embodies the enterprise of scholarship" (Cronin, 2001, p. 559). Authorship provides credit, but also assigns responsibility (Biagioli, 1998). The functions of authorship determine the attribution of credit and ownership for specific contributions to the advancement of knowledge, and thus enable an economy of reputation (Birnholtz, 2006), but do not entail intellectual property or copyright. Moreover, authorship is not only tied to the act of writing but also to multiple types of intellectual and technical contributions (Pontille, 2006), for an increasing variety of research products (e.g., journal articles, but also datasets, code, presentations). Not surprisingly perhaps, practices vary greatly between and within disciplines. There seems to be no universal definition or criteria to determine the relationship between contributions and authorship. The "changing character of academic authorship" (Cronin, 2015), combined with growing editorial guidelines therefore bears the question: at what level (discipline, research team, journal) should such guidelines be established? *Q: In your publications with other authors, do you discuss the order of authorship?*

Inventorship

Inventorship is reserved for patents and technological innovations. Patents operate within the economic and legal realms and may therefore go against the Mertonian norm of disinterestedness. Patenting is an activity by which academic researchers acquire recognition, yet the attribution of inventorship differs greatly from that of authorship and contributorship (Haeussler and Sauermann, 2013). We must then understand what determines the value (in scientific or symbolic capital) of a patent for the inventor, knowing that it can also incite researchers to reduce or slow down the dissemination of knowledge and brings new sets of governing principles and agents (Packer & Webster, 1996). *Q: Should patents be considered at the same level as publications in terms of scientific capital?*

CITATIONS

Impact through usage

The history of citation analysis cannot be distinguished from the history of the Science Citation Index (SCI), created by Eugene Garfield in 1963. Starting with the basic idea that linkages between documents, based on their cited references, mark an association of ideas and content—and hence, allow for more efficient literature searches—the SCI evolved into a tool for assessing the scientific impact of researchers, institutions and countries, as citations could also be considered as markers of usage by the scientific community. Over the last 50 years, bibliometricians have developed hundreds of various scientific impact indicators, spanning from absolute numbers of citations and impact factor to dozens of variations of the (in)famous H-Index (Hirsch, 2005), which are increasingly used by universities and various governmental agencies to assess the scientific impact of research. This use can have adverse effects on researchers' publication practices (Haustein and Larivière, 2015). *Q: Do citations measure scientific excellence?*

Use and limitations of citation indexes

The validity of bibliometric analyses lies in great part on the databases' coverage of the scientific activity being studied or evaluated. However, Web of Science and Scopus focus mainly on journals rather than books, conference proceedings, or other forms of scientific dissemination. This introduces biases that favor Natural Sciences and Engineering as well as Biomedical research to the detriment of Social Sciences and Arts and Humanities (Hicks & Wang, 2011). Similarly, English-language journals are favored to the detriment of other languages (Archambault, Vignola-Gagné, Côté, Larivière, & Gingras, 2006). *Q: Do*

you think that citation counts are the best indicators for the assessment of research?

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The impact of gratitude

In the 1990s, Cronin and his collaborators paved the way for the consideration of acknowledgments as bibliometric measures (Cronin, 1995). Prior to this and in the decades that followed, acknowledgments were studied and assessed in a variety of disciplines, such as sociology (e.g., Mackintosh, 1972), linguistics (e.g., Ali, 2010), or bioinformetrics (Weber & Thomer, 2014), and approaches spanned the full range of quantitative and qualitative methods. An analysis of the literature produced in the last decades (Desrochers, Paul-Hus, & Pecoskie, accepted for publication) reveals persistent tensions between the perceptions of acknowledgments as genuine thanks or lip-service, sites of academic expression or carefully worded requirements, consolation prizes for denying authorship or symbolic capital granted for task-related support. Understanding these issues will contextualize the potential of acknowledgments as indicators. *Q: Do you want to be asked for permission if you are to be thanked in a scientific publication?*

SOCIAL MEDIA

Social media metrics

Scientists are increasingly incorporating social media and networking tools into their daily work (Tenopir, Volentine & King, 2013) and research blogs have developed as a new genre in scholarly communication. Facebook, Wikipedia, Google Scholar, and LinkedIn are among the most popular platforms. About 10% of researchers use Twitter for work, while tools built for researchers (e. g. Mendeley, Slideshare, Academia.edu) are used less (for an overview see Haustein, Sugimoto & Larivière, 2015).

It has been proposed that events on social media capture more diverse forms of scholarly outputs (e.g., blog posts, peer review reports, or software code), as well as scientific impact (e.g., mentions on Twitter, expert recommendations, saves in social reference managers). Metrics based on these events, coined as "altmetrics" in 2010, were predicted to gain in popularity by Cronin and his colleagues and are assumed to make research evaluation fairer and peer review more transparent (Priem et al., 2010). Current research, focusing mainly on social media metrics related to peer-reviewed journal articles through coverage, mean events per paper, as well as correlations with citations, finds that metrics are homogeneous and vary between scientific disciplines. For example, while Mendeley has been shown to provide the largest amount of activity and moderate positive correlations with citations, tweets link to a much lower share of scientific documents and correlate poorly with citations (for an overview see Haustein, Sugimoto & Larivière, 2015). *Q: Do you distribute scholarly papers via social media?*

Personal/professional communication blurring boundaries

Technological advances and access to information have created an environment where a scholar's publications are no longer enough to determine productivity, impact, and overall value. This adds enormous pressure, and certain scholars have had their social media communications misframed in a way that has led to serious consequences for both the individual and the organization (Herman, 2014). Universities and other organizations may then create social media use policies for their employees (Sugimoto, Hank, Bowman, & Pomerantz, 2015). This has led some scholars to create separate social media accounts, to quit social media, or to set their social media activity to private in order to prevent their communications from being potentially misframed, not to mention replicated or stored. *Q: Have you read your current employer's social media use policy?*

Popularization of science

TED ranks amongst the most popular science dissemination venues, with talks distilling knowledge from a variety of experts, professionals, and academics into easily digestible 18-20 minute videos. 21% of talks made available to the general public on TED's website were given by academics (Sugimoto et al., 2013), indicating that TED is a useful bridge between academe and the lay public, something that is not easily measured by academe's current rewards system. It has even been suggested that academics might wish to reconsider their teaching methods based on the popular success of the TED model (Romanelli, Cain, & McNamara, 2014), and TED Talks have been used in medical universities (Nicolle, Britton, Janakarim, & Robichaud, 2014). *Q: Do you think TED Talks should be considered at the same level as publications in terms of scientific capital?*

CONCLUSION

While it seems that symbolic capital remains the foundation upon which the reward system of science is built, this system is multifaceted and extremely complex. Through a variety of quantitative and qualitative approaches, the panelists will present traditional components of productivity and impact, contrasting them with less studied and more public facets of the scholarly communication continuum. Needless to say, such complexity brings challenges that can only affect how impact will be defined, measured, and perhaps most importantly, contextualized in the ever-evolving academic field. The feedback from the audience will help fuel this ongoing assessment of scientific evaluation.

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