Efficient Usage and Augmentation of Scientific Knowledge in a Global Digital Network

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Abstract: - Gender and racial diversity are generally not the type of diversity that most evaluators are concerned with. A greater proportion of evaluators are more concerned with institutional and disciplinary diversity than they are with ethno-racial or gender diversity when they discuss how they went about evaluating proposals. Lamont found that many panelists are aware of the literature on bias, and that they value diversity as means to redress past injustices, level the playing field, and shape the academic pipeline. Evaluators want to insure that fellowships get distributed across a range of institutions. Panelists practice institutional affirmative action because they believe that private, elite, and research universities are privileged in the competition process.
Key-Words: efficient usage, augmentation, scientific knowledge, digital network

1 Introduction

Lamont shows that many contenders for prestigious fellowships are selected because of a combination of excellence and diversity considerations. Lamont conducted more than eighty interviews with individuals charged with distributing various fellowships to graduate students and other academics, and found that very good but not perfect proposals are pushed above the proverbial line because of diversity consideration and that diversity is often a tiebreaker between two somewhat faulty proposals. Lamont holds that combining excellence and various kinds of diversity criteria is valued as an intrinsic good that contributes to the overall quality of the research environment. Panelists want to insure that scholars from a range of fields get funding. In promoting greater diversity among awardees, some panelists purposefully aim to break down the opposition between "standards of excellence" and "diversity standards." According to Lamont, that panelists deploy so much energy to elaborate positions with regard to diversity that are nuanced and compatible indicates how aware they are of the sheer complexity of the academic world they inhabit.

2 Problem formulation and solving

Peer-reviewed grants and fellowships provide Lamont a way into national evaluation. Her research is a sustained argument for the multiplicity of disciplinary practices. The organizations Lamont studied set criteria for awards (like originality or significance), establish safeguards against anyone imposing their own interests (rules of participation), and seek out top and knowledgeable reviewers. Decision makers generally want money to be spread across many universities and research disciplines. Lamont interviews panelists before and after project review meetings, observes some panels, and inspect the notes of screeners in order to understand how funding decisions are made. There are many complexities involved in making sure participants perceive the system as equitable to all involved. Lamont notes that responses ranged from the highly developed and coherent to the off-the-cuff, unreflective, and inchoate. "Participant's frank appraisals of their own and others' fields offer a unique window into what academics (and academia) are all about. My analysis uncovers a world that is understood only partially and generally imperfectly, even by most members of the academic community, let alone the general public."[1] Expertise, personal taste, and the perspective of the evaluator play into the decision-making process. Evaluation is subjective because it always occurs in context. Academics often combine criteria of diversity with criteria of excellence in their evaluation. How professors judge the quality and significance of scholarship depends upon disciplinary standards not always consistent with one another.

Finkin and Post claim that no university currently deals with its faculty as if academic freedom of research and publication were an individual right to be fully free from all institutional restraint. "Universities instead hire, promote, grant tenure to, and support faculty on the basis of criteria of academic merit that purport to apply professional standards. Individual faculty have no right of immunity from such judgments."[2] Finkin and Post say that it is important to distinguish between respect for person and respect for ideas: faculty must respect students as persons, but they need not respect

ideas, even ideas held by students. "In higher education no idea is immune from potentially scathing criticism. […] Academic freedom is not the freedom to speak or to teach just as one wishes. It is the freedom to pursue the scholarly profession, inside and outside the classroom, according to the norms and standards of the profession."[3] Campanario and Acedo note that all leading journals use a peer review system to evaluate and select contributions: manuscripts are reviewed by members of the editorial staff or by one or more external referees (experts in their fields), and remark that having a paper published does not imply that it will receive attention from the scientific community. The papers that show the phenomenon of delayed recognition are usually published in widely read journals. In many instances the peer review system helps improve papers that are submitted to journals. Campanario and Acedo identify strategies used by researchers to overcome initial resistance and lack of recognition from the rest of the academic community. The first audience the researcher needs to convince consists of participants in the science communication system. Campanario and Acedo classify the reasons that led to initial rejection by referees and editors of scientific papers later shown to be influential or highly relevant. The scientists' perseverance was a fundamental factor in ensuring the new findings were communicated to their peers. Resistance to new discoveries can affect even great scientists and highly cited papers. Campanario and Acedo write that some funding agencies rarely risk money on innovative projects (and department heads are not always aware of the importance of an original paper), and that funds should be awarded to researchers with an outstanding record of professional achievement without obliging them to go through the application procedures.

In some research fields it can be hard to find a referee who is qualified to judge the science, yet is not a competitor. However, most editors seem reluctant to use 'open' peer review, i.e., to make the reviewers' names known to the authors. Anonymity is assumed to protect referees against reactions or retaliation by authors who were unable to accept negative evaluations. It is nonetheless worth noting that this fact clashes with the widely held perception of science as an altruistic activity that aims to seek the truth above and beyond any other considerations. [8]

Tomaszewski notes that there is no perfect system for prepublication review of scientific manuscripts. Critics of the blinded system of review claim that more openness would decrease biases: reviewers can have conflicts of interest that could influence their decision or promptness. In a nonblinded journal, reviewers may shy away from papers they feel may end up being rejected. A substantial number of potential reviewers may decline participation in an open-review process.[9] Neff and Olden maintain that peer review is the standard that journals and granting agencies use to ensure the scientific quality of their publications and funded projects, and use probability theory to model the peer-review process, focusing on two key components: (1) editors' prescreening of submitted manuscripts and (2) the number of referees polled. Thus, the review process can include a strong "lottery" component, independent of editor and referee integrity. Neff and Olden use a Bayesian approach and citation data from biological journals to show that top journals successfully publish suitable papers (that is, papers that a large proportion of the scientific community would deem acceptable) by using a prescreening process that involves an editorial board and three referees; even if that process is followed, about a quarter of published papers still may be unsuitable. Neff and Olden add that the element of chance is greater if journals engage only two referees and do no prescreening (or if only one editor prescreens); about half of the papers published in those journals may be unsuitable. Authors whose manuscripts were initially rejected can significantly boost their chances of being published by resubmitting their papers to other journals. Neff and Olden make three key recommendations to ensure the integrity of scientific publications in journals: (1) Use an editor or editorial board to prescreen and remove manuscripts of low suitability; (2) use a three-of-three or four-of-four decision rule when deciding on paper acceptance; and (3) use a stricter decision rule for resubmissions. [10] Kovačić and Mišak note that both journal self-citation (when articles in a journal cite previous articles in the same journal) and author self-citation may influence the journal's impact factor. A high proportion of self-citations per article cannot be taken solely as a reflection of the limited quality of a journal. A highly cited article, author or journal with a substantial proportion of self-citations is more visible than the rarely cited without any self-citations. [8] Gami et al. observe that author self-citations may misrepresent the importance of individual articles, skew the calculation of journal impact factors and bias perceptions of the importance of a publication. Author self-citation allows an author or group to expand on previous hypotheses, refer to established study designs and methods, and justify further investigations on the basis of prior results. Author self-citation may artificially inflate an article's importance to the

general scientific community. Repeated self-citation accentuates one's credibility or expertise and may perpetuate one's interpretations or opinions of specific research findings or general constructs. Self-citations, when pervasive, might falsely validate the conclusions of an author or group and could even limit scientific discovery if other investigators do not challenge what might be perceived as developing or accepted concepts. [9]

Glick state that many factors contribute to the acceptance of an article: presentation of a timely and relevant topic; the use of a well-designed and methodologically sound study; and a well-written and easily comprehended manuscript. The number of citations and the criteria used to select citations are good reflections of scientific rigor.

Quantification of references sometimes is used to determine the scientific impact a researcher has had on a specific discipline and academic performance the reference list should be an integral part and continuum of the rest of the article. [10] As Collins explains, intellectual products are felt by their creators and consumers "to belong to a realm which is peculiarly elevated. […] We can recognize them as sacred objects in the strongest sense; they inhabit the same realm, make the same claims to ultimate reality as religion. 'Truth' is the reigning sacred object of the scholarly community."[1] The objects of academic inquiry are "part of a realm that is higher, more valid, less constrained by particular occasions of human action than ordinary kinds of thoughts and things."[2] Haiven remarks that tenure is a process meant to protect academic freedom and that the tenure process is supposed to weed out bad scholars, not controversial scholars (those without tenure who speak out on controversial issues are very vulnerable to firing). [3] Atkinson says that the American idea of academic freedom was faculty trained in European universities who brought with them the concept to American universities: the principles upon which academic freedom is founded must be elaborated and modified in ways that are relevant to the responsibilities and circumstances of today's universities. "Faculty frequently hold strong viewpoints, many of which challenge prevailing orthodoxies. They routinely contribute to public discourse on a wide range of politically controversial subjects ranging from environmental hazards, welfare economics, and abortion policies, to human cloning, religious doctrine, and affirmative action. Academic norms require that faculty stand ready to revise their conclusions in the light of new evidence. And experience has shown that faculty members can and do combine strong commitments to a particular point of view with the highest professional standards of teaching and research."[1] According to Atkinson, academic freedom is concerned with protecting the conditions that lead to the creation of sound scholarship and good teaching. Academic freedom is afforded special protection in American universities. Faculty conduct is assessed in reference to academic values and professional norms. The key to proper governance and responsible faculty conduct lies in the careful recruitment and advancement of faculty based on academic values. Universities should rely on the values and norms that must govern faculty professional conduct (modern universities can flourish only when there is a system of shared governance in which faculty are given authority over academic matters). "Faculty governance, peer review, and academic freedom gave rise to the research university as we know it today. We would be wise to anticipate that boundaries will change between disciplines, and between the university and other institutions. How research is conducted and how education takes place will change. Sources of support will become more volatile and varied. Professional and political relationships will become more complex. The challenges facing the research university will only expand."[2]

On Morgan's reading, academic freedom is the symbol of the professorates vocational mission – the search for truth. "It represents the deepest human values of the professor's work and sanctions his claims for cultural and social authority."[3] Kliewer et al. maintain that manuscript reviewers are the essential agents of the peer review process: reviewers are charged with the task of judging whether a manuscript is important, scientifically valid, coherent and readable, and appropriate for a particular journal. Kliewer et al. hypothesize that reviewer performance might be related to a number of characteristics, including age, sex, subspecialty, number of years reviewing, academic rank, and type of practice (academic or private). The editors' subjective quality rating of peer reviews of manuscripts serves as a useful tool for monitoring reviewer performance.

Editors must ensure that every major paper—particularly one advancing complex, unexpected, or highly original interpretations—receives at least one fair and careful reading by an accomplished reviewer. They must match specific manuscripts with reviewers with particular expertise, knowledge, and skills and scrutinize the reviews for balance, persuasiveness, and clarity.[8]

Benos et al. say that that if a reviewer acts as an "author advocate," then many potential problems that may arise during the peer review process will be avoided: the purpose of peer review is to ensure

quality, checking that (i) no mistakes in procedure or logic have been made; (ii) the results presented support the conclusion drawn; (iii) no errors in citations to previous work have been made; (iv) all human and animal protocols conducted follow proper review and approval by appropriate institutional review committees; and (v) the work is original and significant. A reviewer must provide an un- biased evaluative analysis of the structural components of a manuscript in an ethical context. Benos et al. point out that (i) the reviewer should provide an honest, critical assessment of the research; (ii) the reviewer should maintain confidentiality about the existence and substance of the manuscript; (iii) the reviewer must not participate in plagiarism; (iv) the reviewer should always avoid, or disclose, any conflicts of interest; (v) the reviewer should accept manuscripts for review only in his/her areas of expertise; (vi) the reviewer should agree to review only those manuscripts that can be completed on time; (vii) the reviewer has the unpleasant responsibility of reporting suspected duplicate publication, fraud, plagiarism; and (viii) the reviewer should write reviews in a collegial, constructive manner. [9] Bailar and Patterson write that peer review improves the quality of individual manuscripts, steers research results to appropriate journals, and helps people who are not experts to decide what to believe.[3] Areen maintains that academic freedom is about much more than faculty speech: it is central to the functioning and governance of colleges and universities. Academic freedom is about faculty research and teaching, and about the freedom of faculties to govern their institutions in a way that accords with academic values whether they are approving the curriculum, hiring faculty, or establishing graduation requirements for students. In evaluating the work of other scholars, faculty are expected to judge on the basis of the quality of the research methodology employed and the arguments presented. "Making academic freedom an institutional right does not alter outcomes if the faculty and institution are aligned in opposition to an external challenge. When there is a dispute between an individual faculty member and the administration or lay governing board of an institution, however, the Court's rhetorical assignment of the right to the institution could undermine the academic freedom of all faculty. The problem of deciding how much judicial deference should be given to academic decisions made by institutions is compounded by the Court's failure to discuss the governance role of faculties."[4]

Areen maintains that most internal disputes over academic freedom at private colleges and universities are not subject to constitutional norms because there are no public actors. Professional academic freedom standards limit the power that universities may exert over the academic freedom of individual faculty members once they are tenured. Faculty at public institutions of higher education must be protected from state censorship if they are to fulfill their mission of critical inquiry into the functioning of other parts of the government. The job of faculty is to produce and disseminate new knowledge and to encourage critical thinking. Areen contends that faculties are best used to establish policy on academic matters such as curriculum and admissions. Faculty at both private and public colleges and universities have a professional obligation to oversee core academic matters in their institutions. Jones writes that the internal threat posed by the corporate conception consists in its enabling a group to claim rights against its own members, and it lies also in its propensity to allow the moral standing of the group "to displace that of individuals and sub-groups who fall within the group's compass"[5] Jones notes that the capacity to be a right-holder turns upon the attribution of moral standing. "To violate a right is to wrong the holder of the right. It is to fail to do what is owed to the right holder. That indicates that someone or something can hold rights only if it is the sort of thing to which duties can be owed and which is capable of being wronged. In other words, moral standing is a precondition of right-holding."[6] Wilson focuses on exemplary practices in writing articles and proposals and in reviewing the articles and proposals of others: the authors of a scientific work must have participated sufficiently in the work so as to take public responsibility for its content, and they must be willing and able to respond to questions about the work. The peer review system performs a quality-control function that is essen- tial to maintaining the self-correcting character of the scientific research enterprise. Conscientious referees can provide invaluable feedback to the author on revisions that will substantially improve the clarity and readability of a paper. Wilson writes that it is desirable to guard against the tendency for reviewers to provide much more detailed comments on the negative aspects of a proposal than on the positive aspects. The proper functioning and continued advancement of the scientific enterprise depends critically on individual scientists living up to the standards of ethical conduct. Reviewing manuscripts and grant proposals is one of the most important ways in which individual researchers can contribute to the development of their discipline.

To further enhance the incentives for good reviewing, editors should provide timely feedback to referees on (a) the strengths and weaknesses of their reviews, and (b) the issues identified in other referees' reports on the same paper. As a professional courtesy, editors should include such feedback with their letters of appreciation to referees. For major journals with high rates of submission, some selectivity may be required to make this suggestion practical; in particular, editors might provide detailed editorial feedback to referees only in cases for which (i) the paper is judged to be a major contribution to the literature, or (ii) the editorial decision-making process is particularly difficult. Moreover, editors should strive to ensure that individuals who provide prompt and thorough refereeing will receive comparable service when those individuals submit their own papers for review.[11]

Banks states that publishing a peer reviewed article in a prestigious journal remains the highest validation for a work of scholarship and that peer review has enhanced the rigor and relevance of many scientific breakthroughs (the peer-reviewed article is an artifact of a print-based system). The peer-reviewed journal article must stand atop the hierarchy of evidence. Banks suggests political steps that could enhance access to materials that would often be easy to obtain if they could be identified. The scholarly communication landscape will contain some version of open access (the idea that scholars should control the publishing process is an underpinning of the open access movement). The ease of access to information is one measure of how much societies value that information. Banks reasons that institutional repositories shift the onus of preserving digital materials from individual faculty members to their institutions. Institutional repositories are containers for capturing the complete digital output of an institution.

Institutional repositories are a relatively new approach to the challenge of digital preservation of an institution's intellectual output. Disciplinary archives such as arXiv, which collects pre-prints in the fields of physics, mathematics, nonlinear sciences, computer science, and quantitative biology, are an antecedent of institutional repositories. In the United States, the Library of Congress is leading a federal digital preservation effort, the National Digital Information Infrastructure and Preservation Program. Self-archiving, the practice of archiving scholarly material on personal web sites, is the complete opposite of the federal approach to digital preservation. Although the approaches vary widely, they all point to the urgent importance of preserving digital scholarly materials. [12]

Kassirer and Campion remark that when peer review is done sloppily, journals publish research that is flawed. Some reviewers are unqualified and others, because of personal or professional rivalry, are biased. Peer review not only fails to prevent the publication of flawed research but also permits the publication of research that is fraudulent. Kassirer and Campion make a distinction between the overall process by which editors manage manuscripts (*manuscript management*) and the cognitive part of this process (*manuscript assessment*). Manuscript assessment is a special case of problem solving and the fundamental task of a manuscript reviewer (and editor) is to *detect and describe flaws*. There is a kind of *rejection threshold* involved in the assessment of manuscripts (a point at which the cumulative weight of a manuscript's faults tips the scales toward rejection). Manuscript assessment has a certain *sensitivity and specificity*. False-positive and false-negative results must occur even in the hands of the most objective reviewers. Kassirer and Campion contend that further study of the task of manuscript assessment may provide us with a more advanced theory of the cognitive basis of manuscript review and a better appreciation of factors that influence reviewers' recommendations; if we have a framework that explains manuscript assessment better, we might be able to teach it better than we do with the haphazard apprenticeship approach now in widespread use; better definition of the process should help allay the fears of critics who believe that there are no rules governing peer review and that the entire process lacks objectivity; we should be able to design studies to learn more about both manuscript assess- ment and the overall process of peer review.6

Thompson argues that there are many variables influencing the choice of journal for manuscript submission: the visibility of the journal, the focus of the journal and how well it matches the topic of the manuscript, the impact factor of the journal, the timeliness of the editorial office process and whether feedback is constructive, journal accessibility, author costs, and the governance of the journal. Publication in a peer-reviewed journal can aid career advancement, assist in winning grants and research support. Many extraneous factors that are not necessarily directly linked to the quality of the publications of a journal can influence the rating achieved.[4] Kurmis contend that direct comparison between journals on the basis of the total number of citations alone is influenced by a number of factors, such as journal format and content, appropriateness of article classification, and discipline-specific citation tendencies. Increasing the number of review

articles and technical reports per year and limiting the number of original research papers can bolster the impact factor. The use of impact factors to compare journals may be arguably possible on a qualitative level. The impact factor does not reflect the quality of the peer-review to which a journal subjects its articles. While the impact factor may provide a gross approximation of the prestige of journals, the Institute of Scientific Information does not advise using this value as the sole means of comparative evaluation. Journals with exceptionally high impact factors are among those widely considered the most prestigious.

3 Conclusion

Given the current pressure to conform to the impact factor, changing trends steering high-caliber authors away from seeking publication in their native non-English-language journals and toward larger, high-impact-factor journals are likely to contribute to the decline of many smaller journals that may have otherwise played an important role in the timely dissemination of knowledge.[12]

Lagnado holds that citation rates are an imperfect method for assessing the positive impact of a paper on the literature (some citations may refute or criticise a paper rather than support its content).[6] Lee states that there are two basic ways of going about teaching ethics: (1) the moral indoctrination approach, which is essentially a rote learning exercise; and (2) the moral engagement approach, which emphasizes listening to others in an open-minded manner and coming to carefully considered conclusions only after thoughtful reflection about differing views concerning matters of controversy. If the moral engagement approach is to work, however, it is essential that academic freedom for students in the classroom be ensured, for developing critical thinking skills is not possible if there is not freedom to think. The professor has the primary responsibility for maintaining a classroom environment in which students are comfortable giving expression to their views and for assisting students in the development of their critical thinking skills.4 Barnes claims that defense of judicial independence and academic freedom is crucial for restoration of democratic processes. Academic freedom is widely guaranteed at both public and private universities as a necessary component of higher education.

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