

Scholarly activities and reputation in the digital age: A conceptual framework

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Abstract

The paper, which should be seen as a work in progress, provides a conceptual framework of the tasks and activities that comprise the present-day scholarly undertaking and their potentially reputation building, maintaining and enhancing components. Guided by Boyer's (1990) categorisation of scholarly activities, the framework was derived from an analytical literature review and takes cognizance of the rise of Web 2.0, and the collaboration and sharing paradigm it has brought with it. The resulting schema lays down a blueprint for the assessment of scholarly reputation, consisting, as it does, of the range of traditional and novel, offline and online activities typically undertaken by scholars as they go about their pursuits in an increasingly open-values based digital and networked environment.

Introduction

A good scholarly reputation¹ is a central hallmark of success in the scientific endeavour on both the individual and the institutional level, indeed, one of its principal enablers (Merton, 1973). As Becher (1989, p. 52), contends, "the main currency for the academic is not power, as it is for the politician, or wealth, as it is for the businessman, but reputation". Only to be expected, of course: with scholarly contributions subjected to communal evaluation, and scholarly rewards allocated communally, reputation is translated into many concrete consequences for the scientist (Reif, 1961). Even today, when the digital scholarly enterprise is in a state of flux, the vital importance accorded to reputation is just as much its defining feature. What is less clear is how today's scholars go about accruing prestige². After all, they have at their disposal a host of innovative, social media based platforms, techniques and metrics that can be utilised interchangeably or complementarily with long-established ways of boosting their academic profile.

Traditionally, scholarly reputation has been related exclusively to narrowly defined research achievements: the volume of papers published in high-ranking journals and the number of citations they obtain (Harley et al., 2010; Housewright et al., 2013; Meadows, 1998; Meho, 2006; Mulligan and Mabe, 2011; Mulligan et al., 2013; RIN 2009; Rowlands et al., 2004; Van Dalen and Henkens, 2012; Ware, 2008). This state of affairs, long regarded as untenable because it does not take into account the great diversity of scholars' undertakings (Boyer, 1990), nevertheless holds sway, as a recent international study of nearly 4,000 academic researchers confirms (Nicholas et al., 2015a). Perhaps unsurprisingly then, an activity may be a major component of a scholar's work-life, but if it cannot be readily translated into conventional, potentially reputation enhancing research outputs, it is inevitably rendered quite marginal, as the case of teaching clearly exemplifies.

However, there are changes in the air. The emerging paradigms of Science 2.0, with its collaboration-centred, web-based socio-technical systems (Shneiderman, 2008) and open, increasingly democratised practices of scholarship (Veletsianos and Kimmons, 2012), both call for and enable taking a much more wide-ranging, inclusive and representative view of reputation-building scholarly achievement. No less importantly, today's changing societal priorities, which see the future in a globalised knowledge society as hinging not only on research and innovation, but also on education for all (Altbach et al., 2009), also necessitate a re-definition and expansion of what is seen as a reputation-accruing scholarly accomplishment.

Proceeding from these premises, the European Commission, through its Joint Research Centre, commissioned an exploratory study (Nicholas et al., 2015c; 2015d) to gather evidence on emerging reputation building scholarly practices in Science 2.0. An important part of this study was the provision of a comprehensive, literature-based, analytical review and audit of scholarly activities in today's Web 2.0/Science 2.0 driven realities, which has at its heart the unexplored component of their reputation building potentials (Nicholas et al., 2015b).

Aims

The overarching aim of the study was establishing how digital scholars build, sustain and enhance their reputation, with a focus on the emerging reputation building practices and platforms. The stage of the study reported here set out to construct the conceptual framework for the investigation by identifying on the basis of literature-based evidence the various, traditional and novel, offline and online activities, which comprise the present-day scholarly undertaking, and their potentially reputation building, maintaining and enhancing components.

Methodology

Data were mainly collected via an extensive literature review and analysis. The point of departure for the literature-based exploration of current and emerging scholarly activities and their reputation building purposes and mechanisms was Boyer's (1990) seminal mapping of the broad territory of scholarly activity, which, although a product of the last century, remains valid in its basic observations and contentions³. Using Boyer's model was appropriate because its definition of scholarship, capturing as it does the whole range of scholarly activities in an attempt to present "a more exclusive view of what it means to be a scholar" (p. 24), can serve, as a number of recent studies demonstrate (Garnett and Ecclesfield, 2012; Greenhow and Gleason, 2014; Heap and Minocha, 2012; Pearce et al., 2010; Scanlon, 2014; Weller, 2011), as a sound basis for exploring scholarly behaviours. However, any consideration of contemporary scholarly practices needs to address their digitally changed and fluctuating nature. Indeed, Boyer's (1990) model could not have served the study's purposes, were it not recently updated and extended to reflect the

realities of the digital age. Thus, the contextual basis for examining scholars' changing activities was Boyer's well-established, four-dimensional model of scholarship, updated by Garnett and Ecclesfield (2012) to include a fifth facet (co-creation):

- **The scholarship of research** (discovery), the individual or collaborative creation of new knowledge;
- **The scholarship of integration**, the arraying of extant knowledge into larger intellectual patterns, often within a wider, cross-disciplinary context;
- **The scholarship of application**, the application of disciplinary knowledge and skill to societal/practical problems;
- **The scholarship of teaching**, the conveying of the human store of knowledge to new generations;
- **The scholarship of co-creation**, the participation of teachers, students and practitioners in the increasingly converging processes of knowledge production and transmission.

Using this classification as a benchmark against which present-day scholarly practices could be compared, as suggested by Scanlon (2014) and Weller (2011), the study continued in six stages, each one feeding into the next:

- (1) The published literature was searched in order to compile a comprehensive list of the range of scholarly activities, both online and offline, which comprise the work-life of scholars⁴.
- (2) Each activity identified was defined/described to denote its precise nature and procedures.
- (3) Each of the activities was then analysed to discern its scientific purposes. This enabled the classification of the various activities, by the main scientific purpose they serve, into the five scholarly categories.
- (4) Each of the activities was further analysed to determine its reputational purposes (if any). It is important to note here that whilst the literature provided a wealth of information as to the specific practices encompassing the scholarly undertaking, very little had been examined from a reputational approach. The exception were discussions of the reputational effects of research, and even that without entering into detail.
- (5) Each activity that had been found to have reputational purposes was evaluated to discern the specific fit for purpose reputational mechanism(s) it utilised. This, on the basis of our literature-based awareness of the ways and means at the disposal of scholars for achieving visibility and obtaining peer recognition and esteem, which allowed for 'matching' the processes and mechanisms that could be useful in each case with the hoped-for reputational outcome.

- (6) The picture that had emerged from steps 1-5 was further analysed in an attempt to compare the overall reputational potential of the five categories of scholarly activities.

Plainly then, many the findings presented in this study are based on a careful analysis of the literature on how things work in academe, rather than specific evidence on scholarly reputational building practices (which do not seem to exist yet). Take, for example, the mundane activity of requesting/providing help in locating research literature. It is certainly an activity that scholars often undertake as part and parcel of their work. However, can it possibly have reputation building potential?

There appears to be no concrete evidence in existence as to how this activity may be of help in reputation building. Nevertheless, having established from the literature that visibility is conducive to enhanced reputation and realising that online sharing/accepting of help affords visibility, led to the conclusion that the activity has reputational potential. By the same token, we were able to determine from the literature that sharing research literature peer-to-peer or through social media based scholarly platforms was the appropriate mechanism to facilitate the achieving of both the scientific purpose of the activity (providing the evidence for anchoring a research undertaking in its theoretical base) and its reputational purpose (achieving visibility among one's peers). Thus, we could safely suggest that in the specific instance of a scholar providing his/her colleague with help in obtaining some needed scholarly information achieves reputation enhancing visibility via the specific, fit for purpose mechanism of sharing information peer-to-peer or by crowd-sourcing.

The framework which ensued from the above described effort was then aired with 400 academics from a wide-range of European countries, who were questioned about scholarly reputation at interviews, focus groups and in a questionnaire and also about what they thought of the framework we had developed. More information on these data collection methods can be found in Nicholas et al. (2015c; 2015d) and Jamali et al. (2015).

The framework

The framework is represented and summarised in eight tables, delineating the activities that comprise the scholarly undertaking in each of the above-noted categories of scholarship: research, integration, application, teaching and co-creation. Each category is summarised separately, although in point of fact the entire range of research associated activities is dispersed amongst three categories (research, integration and application). This, because all three have as their aim the creation of new knowledge, albeit with a different focus. Inevitably, then, some of the research activities are typically undertaken in all of these categories. In an attempt to avoid

redundancy, the first four tables, summarising the scholarship of research, offer a full description of the different research activities typically undertaken in a scholarly investigation. The tables summarising the two remaining research categories focus, therefore, only on the activities unique to the scholarships of integration and application, respectively.

For each broad category, the following data are provided:

- **Specific activities:** practices performed either online or offline by scholars for work-related purposes. Thus, for example, a major research activity in the work-life of scholars is the producing of research output.
- **Scientific purpose:** the anticipated contribution of a scholarly activity towards the advancement of science and the achievement of its goals for benefiting humankind. Thus, for example, the expected contribution of producing a research output is advancing science via discovering new knowledge and/or achieving enhanced understanding in order to solve a theoretical or practical problem for the public good.
- **Reputational purpose:** the anticipated contribution of a scholarly activity towards building/ maintaining/ enhancing a scholar's standing among their peers and, at times, the general public. Thus, for example, producing a research output has as its reputational purpose the obtaining of peer recognition and esteem.
- **Fit for purpose reputational mechanism:** the specific purpose-relevant process used to build reputation. Thus, for example, in order to achieve the reputational purpose of producing a research output the results of a scientific investigation need to be formally-written up in a manner suitable for presenting to peers for their evaluation and use.

The scholarship of research (discovery)

As mentioned, the scholarship of research, the pursuit of knowledge for its own sake and the benefit of humankind, is universally held to be the principal professional endeavour and focal point of the scholarly enterprise. Indeed, as the study's findings re-affirm yet again, there can be little doubt that in these days, too, as Boyer (1990, p.2) said quarter of a century ago, "to be a scholar is to be a researcher". The evident primacy of the scholarship of research over other dimensions of the scientific undertaking is obviously associated with the importance accorded to its stated goal of extending the stock of human knowledge. Still, the centrality of research, 'disinterested' a pursuit as it should be (Merton, 1973), undeniably stems to a considerable extent from its aforementioned reputation building capacities, too, for research achievements are used as the yardstick by which scholarly success is measured (Boyer, 1990; Dewett and Denisi, 2004; Ponte and Simon, 2011). Thus, scholars are greatly concerned with how their research impacts upon the wealth of human knowledge, for the sake of the scholarly endeavour and society, certainly, but also for the sake of their professional prestige.

With research achievements thus seen as wholly representing scholarly success, a principal motivation for scholars to undertake research is making it known to other scholars to gain thereby standing amongst them (Akerlind, 2008). In fact, according to Brew (2001), a research project is a kind of social marketplace, where the products of research (publications, grants and networks) are exchanged for money, prestige or recognition. So much so, that Bazeley (2010) actually sees scholarly reputation as not merely a by-product of the research process but, alongside publications and impact, one of its three main outcomes.

Plainly then, the quest for reputation is literally 'built into' research work. Indeed, the portrayal of the range of traditional and novel activities comprising the scholarship of research in today's knowledge-driven era, presented below, shows them all to have a strong reputational focus alongside their scientific one. This, whether a research activity is performed individually or in collaboration with others, whether it is specifically aimed at the actual producing of an original contribution to human knowledge, the dissemination of the by-products and outputs of research work, the networking with colleagues or the evaluation of others' research outputs.

Producing research output⁵

Producing a new input to the extant body of certified knowledge is comprised of stages that follow a reliable, if not always consciously or rigorously adhered to progressive order (Garvey et al., 1974). This generic workflow is very much with us still, despite the host of societal-demands driven transformations in the scholarly environment and the technology-afforded changes in the research process itself that have taken place over the past few decades. The procedure encompasses a series of activities, each of which has been found to have reputation building potentials (for a full list see Nicholas et al., 2015b). A representative selection of the key activities is presented below in Table 1.1:

Table 1.1. Producing research output

| ACTIVITY | SCIENTIFIC PURPOSE | REPUTATIONAL PURPOSE | FIT FOR PURPOSE REPUTATIONAL MECHANISM |
|---|--|--|---|
| Identifying a researchable topic, planning the research project and obtaining funding | Finding a scientifically significant research topic and establishing its viability | Producing evidence of scholarly ability to identify the significance of the topic and conduct the research as proposed; achieving visibility for one's ideas | Constructing a proposal for interested collaborators and for persuading funders that the proposed project can yield the best research on an important topic |

| ACTIVITY | SCIENTIFIC PURPOSE | REPUTATIONAL PURPOSE | FIT FOR PURPOSE REPUTATIONAL MECHANISM |
|--|---|---|---|
| Reviewing the pertinent previous knowledge | Anchoring a research undertaking in its theoretical base | Obtaining peer recognition and esteem ⁶ | Selecting appropriate research content and presenting it as an analytic review of the literature |
| Requesting/providing help for locating pertinent previous knowledge | Same as above | Achieving disciplinary and trans-disciplinary visibility | Sharing literature peer-to-peer or via social media based scholarly platforms |
| Producing a research output individually or in collaboration with peers or even amateur experts ⁷ | Discovering new knowledge and/or achieving enhanced understanding | Obtaining peer recognition and esteem; achieving visibility among one's peers | Presenting the results of a scientific investigation in a manner suitable for peer use and evaluation |

Having seen how an activity aimed at producing a research output can contribute towards enhancing scholarly reputation, it is important to single out one activity that plays an especially vital role in the process: applying for external research funding. This, because beyond providing scholars with the essential financial resources to conduct research, grants are also purveyors of prestige and the ensuing further career opportunities (Bloch et al., 2014a; Bloch et al., 2014b; Van Arensbergen et al., 2014). The decision of a grant-giving agency to fund a research, based as it is on peer review, represents a vote of confidence in a scholar by their peers, and, of course, the more competitive the grant, and the more rigorous the peer review system of the funder, the higher it is weighted (Laudel, 2005). Indeed, studies spanning the past two decades attest to the importance accorded in academe to the acquisition of research grants as a measure of successful research performance, which, therefore, is inevitably rendered a reputation enhancing achievement (Monahan, 1993; Boyer and Cockriel, 2001; Walden and Bryan, 2010). So much so, that for quite some time now the rigorous directives of the 'publish-or-perish' mentality in academe have been joined by the no less compelling behavioural rules stemming from the distinct, if closely interconnected ideology of 'get-grants-or-perish' (Vannini, 2006).

Another activity of especially far-fetching reputational ramifications is the collaborative producing of a research output⁸. Apparently, the veritable paradigm shift that scientific research has undergone from a singular enterprise into a collaborative endeavour (Hsieh, 2013; Wuchty et al., 2007) is especially beneficial from a reputational angle. This, for two main reasons. Firstly, there can be a kind of 'reflected glory' to be gained from working in a research group, especially

if it is considered prestigious (Becher and Trowler, 2001; Kling and McKim, 1999; Lindgren, 2011; Van Dalen and Henkens, 2001). Secondly, the enhanced scholarly success resulting from collaborative work in terms of manuscript quality, scientific output, citation numbers, and rates of manuscript acceptance (Bozeman et al., 2013; Hsieh, 2013; Tacke, 2011; Wuchty et al., 2007), entails reputational benefits, too.

Communicating, sharing and networking

If there is a recurrent theme that emerges from the discussion so far, it is the importance accorded in the scholarly world to communicating with likeminded scholars and hence, building a network of connections. It has always been so, of course, for the cultivation of science is a highly communal enterprise (Hagstrom, 1965; Merton, 1973), which involves both intellectual exchanges and social relations. Indeed, as Becher (1989, p. 77) points out, both the promotion of knowledge (the main cognitive concern) and the establishment of reputation (the key social consideration) are necessarily dependent on communication. No wonder then that networking thus becomes a purpose in itself for a scholar.

These days, courtesy of the Web 2.0-enabled possibilities for scholars to congregate virtually in order to share their work, ideas and experiences, the common-interests based bonds among scholars are more easily forged (White and Le Cornu, 2011). Promising as they do greater visibility, they are potentially more effective for reputation building, too. Indeed, all the communication/networking activities scholars undertake in their research work have been found to possess reputation building capabilities (Nicholas et al., 2015b), as the selective list of the main activities in Table 1.2, demonstrates.

Table 1.2. Communicating, sharing and networking

| ACTIVITY | SCIENTIFIC PURPOSE | REPUTATIONAL PURPOSE | FIT FOR PURPOSE REPUTATIONAL MECHANISM |
|--|---|--|--|
| Sharing research data with the scholarly community | Enabling other researchers to use extant data for discovering new knowledge faster; inviting collaboration | Achieving disciplinary and trans-disciplinary visibility; obtaining peer recognition and esteem; networking; enhancing one's digital identity ⁹ | Disseminating data sets – peer to peer or via institutional websites, data centres or repositories |
| Sharing methodologies, research tools and protocols with the scholarly community | Enabling other researchers to use tried and proven methods for discovering new knowledge; promoting scholarly rigour and scrutiny | Same as above | Making one's working practices transparent and accessible over the web |

| ACTIVITY | SCIENTIFIC PURPOSE | REPUTATIONAL PURPOSE | FIT FOR PURPOSE REPUTATIONAL MECHANISM |
|--|---|---|--|
| Providing help for solving problems arising in the course of others' research | Enabling other researchers to discover new knowledge | Achieving disciplinary visibility; obtaining peer recognition and esteem; networking; enhancing one's digital identity | Disseminating information, 'tips', resources etc., peer-to-peer or on social media based scholarly platforms |
| Sharing research ideas, opinions and interim research findings with disciplinary peers and the wider scholarly community | Obtaining peer feedback and review of one's work, both explicit and implicit ¹⁰ ; influencing scholarly thinking | Achieving disciplinary and trans-disciplinary visibility; obtaining peer recognition and esteem; networking; enhancing one's digital identity | Interacting with peers in conferences or on social media based scholarly platforms; live tweeting from conferences; blogging |

The prestige-enhancing capabilities of today's scholarly communication practices, as they emerge from the above examples, certainly seem to be greatly enriched by Web 2.0 facilitated innovative opportunities. Traditional communication opportunities, such as face-to-face meetings in a conference, perhaps telephone conversations or email exchanges, will all do to support researchers' reputation building efforts, provided that they mainly target for the purpose their colleagues. However, how much more effective could it be, reputation-wise, if the net is spread wider, with the procedure taking place openly and transparently on the web, helped to completion by continuous peer or even amateur-expert participation¹¹. After all, visibility among likeminded people is an essential prerequisite for attaining reputation, for reputation measures the value of the work of a person in terms of how prepared those capable of understanding it are to pay attention to it (Franck, 1999).

Indeed, as Esposito (2013) and Veletsianos (2010) suggest, scholars are likely to be more successful if they turn the web into a crucial component of their research undertakings and opt for participatory and social ways of working. This is especially true when researchers make projects and processes digitally visible, whilst inviting ongoing feedback of the work done and secondary uses of any or all parts of it (Burton, 2009). The scholarly gains to be had from conducting research openly in this way may lead, according to Veletsianos (2013), to enhanced visibility-associated reputation, alongside a more effective research process, an expanded definition of 'expert' to include amateur contributors to the discovering of new knowledge and a democratised access to expertise.

Take, for example, the specific case of data sharing. The advantages of publicly sharing research data with other researchers, a growing priority of policy makers in Europe and the US (Greenhow and Gleason, 2014; RIN, 2008; Whyte and Pryor, 2011), go beyond the scientific realm to

encompass the reputational one. As Borgman (2007) notes, data sets are more widely being listed on curriculum vitae, which must be in hopeful recognition of the credit-accruing, and therefore reputation building potential of data sharing. In fact, there is concrete evidence to believe that this is indeed the case: Piwowar and Vision (2013) examined 10,555 studies to find robust citation benefit to those that made data publicly available, compared to those that did not. This, when 'getting cited' has long been shown to be a major factor in scholarly reputation building (Meho, 2006; Moed, 2005).

Undeniably, communicating and networking online are increasingly held to be important for reputational purposes, too, as a *Nature* survey of academic networks and research-profiling sites indicates (Van Noorden, 2014). The evidence from 3,500 respondents from 95 countries suggests that many researchers regard their profiles as a way to boost their professional presence online: the most-selected activity on two major platforms, ResearchGate and Academia.edu, was simply maintaining a profile, in case someone wanted to get in touch, and another popular activity was the discovering of related peers.

It seems then that harnessing the web to engage more effectively and in different ways with individuals and interested community groups is by now seen as conducive to researchers' becoming and remaining visible and prestigious – at least in theory. Practice, however, seems to lag (far) behind theory, as our findings demonstrate: the large majority of our participants did think that social media based scholarly platforms are here to stay and will become increasingly important, but for the time being the actual utilisation of the reputation building opportunities they have on offer was rather patchy and light.

Disseminating and publishing research findings

The dissemination of research findings is accorded a critical role in the scholarly enterprise, for, as David et al. (2010) put it, it lays the essential foundations for the cooperative, cumulative generation of eventually reliable additions to the stock of human knowledge. Indeed, the norm calling for the open disclosure of the outcomes of a scientific enquiry is one of the basic tenets of the scientific ethos (Merton, 1973). Just as importantly, given the above-noted primacy of research achievements amongst the measures of scholarly success, the dissemination of the results of a scientific investigation has key reputation building roles, too, for it effectively showcases one's accomplishments. Indeed, dissemination activities, as identified in the literature, have all been found in this study to possess reputation-building purposes and potentials, as the representative selection of the key activities, presented below in Table 1.3, exemplifies (for a full list see Nicholas et al., 2015b).

Table 1.3. Disseminating and publishing research findings

| ACTIVITY | SCIENTIFIC PURPOSE | REPUTATIONAL PURPOSE | FIT FOR PURPOSE REPUTATIONAL MECHANISM |
|---|--|--|---|
| Disseminating research results formally ¹² | Reporting the results of research for scholarly peers to verify/critique and use | Securing priority for a new contribution; achieving visibility; obtaining recognition and esteem; achieving scholarly impact ¹³ | Publishing research articles in peer reviewed and highly regarded scholarly journals; publishing books with well-regarded publishing houses |
| Disseminating research results informally ¹⁴ to colleagues and disciplinary peers | Same as above | Establishing priority of a new contribution; achieving visibility and obtaining peer recognition and esteem; networking | Disseminating manuscripts, pre- or post-prints; giving a talk/paper/ poster in a conference; blogging; live tweeting from a conference |
| Disseminating research findings informally to both the disciplinary and the wider scholarly community | Same as above | Same as above; additionally, reaching multiple audiences; enhancing one's digital identity | Making research findings openly accessible in repositories, on social media based scholarly platforms, personal websites |
| Disseminating research findings informally to the public | Popularising science | Achieving public visibility; reaching multiple audiences; enhancing one's digital identity | Posting recorded lectures, pictures or video trailers on popular social media (i.e. Facebook); blogging |

As the above analysis demonstrates, now that research findings in digital form are so conveniently shared and made visible, realising the reputation building potential of disseminating activities is easier than ever. However, whilst scholars are increasingly cognisant of the potential benefits of opting for novel ways of working (Gu and Widén-Wulff, 2011; Ponte and Simon, 2011; Procter et al., 2010; Rowlands et al., 2011) and ever more aware of the need to build up their digital identities and relationships (Van Noorden, 2014), they still opt for 'the proven and tried' in their formal disseminating behaviours (Acord and Harley, 2013; CICS/CIBER, 2013; Nandez and Borrego, 2013; Nicholas et al., 2014; Tenopir et al., 2015). Perhaps unsurprisingly, for scholars, faced as they are with the greater competition resulting from the truly massive explosion of content and players characterising the present-day scholarly scene, need to tread ever-more carefully where reputation building is concerned. Well aware that it is traditional dissemination norms and practices that have already proven their reputational strengths, they distrust any dissemination venue but the established, formal ones (CICS/CIBER, 2013; Nicholas et al., 2014; Tenopir et al., 2015).

Evaluating research

With research based on trusted sources, channels and metrics that serve as widely-accepted proxies of research quality and reliability, evaluative activities by necessity form an essential part of its processes. This is especially true in today's overly abundant, disintermediated, dynamic and challenging digital scholarly information environment. Thus, as producers of information, intent upon making sure that their message is the one attended to, researchers are well-aware that their contributions must first pass muster with their peers. As keen consumers of information, they are well-aware of the need to assess carefully others' research outputs in order to sift out the wheat from the chaff in the discovery process, in the information management process, and in the citation process. However, being pursuers of prestige, they are particularly cognizant of the importance of monitoring how they perform against their colleagues. Indeed, the evaluative practices that form such an inseparable part of scholarly work have all been found in this study to possess reputational conferring potential (Table 1.4).

Table 1.4. Evaluating research

| ACTIVITY | SCIENTIFIC PURPOSE | REPUTATIONAL PURPOSE | FIT FOR PURPOSE REPUTATIONAL MECHANISM |
|--------------------------------------|---|---|--|
| Peer reviewing | Maintaining and improving research quality and rigour | Obtaining peer recognition and esteem | Demonstrating scholarly proficiency and expertise as referee; appearing on the list of a journal's reviewers; noting reviewing experience on one's CV and personal website |
| Participating in open peer reviewing | Same as above | Same as above; additionally, achieving visibility; enhancing one's digital identity | Demonstrating scholarly proficiency and expertise via posting reviews of others' research on dedicated sites |
| Monitoring one's impact | Accruing tangible evidence that one's research work is high quality and trustworthy | Obtaining peer recognition and esteem | Showcasing (for example, on one's website) the scores achieved in: citations-based metrics; ¹⁵ usage-based metrics ¹⁶ ; ratings ¹⁷ |

As we have seen, researchers' evaluative practices all have reputation-building potentials, but the aforementioned adherence to traditional perceptions characterise them, too. Thus, for example, researchers may be more or less aware of the need for and even the existence of alternative metrics for showcasing their accomplishments, but their behaviour nevertheless continues to be guided by traditional norms (CICS/CIBER, 2013; Harley et al., 2010; Nicholas et al., 2014; Nicholas et al., 2015a; Tenopir et al., 2015). This is perhaps inevitable, given that

academics are typically recruited, promoted and obtain funding on the basis of their publication record and citation scores based reputation.

Still, researchers are curious about novel measurements of scholarly achievements, whilst, perhaps justifiably, as Wouters and Costas (2012) contend, doubting their ability to reliably reflect research quality (CICS/CIBER, 2013; Gu and Widén-Wulff, 2011; Nicholas and Rowlands, 2011; Ponte and Simon, 2011; Procter et al., 2010; RIN, 2010; Rowlands et al., 2011; Tenopir et al., 2013; Van Noorden, 2014). With good reason, too: digital tracking and social media afforded metrics, making the most of the fact that the digital makes everything visible, recordable and calculable, and that at a more granular level, do indeed provide new, more inclusive and broader mechanisms for showcasing and measuring scholarly reputation. However, plainly the jury is still very much out on this. Whilst a recent EC study has found wide agreement with the notion of taking Science 2.0 activities into account for researchers' career progression (European Commission, 2015), the present study indicates otherwise. Around 45% of our survey respondents disagreed (as opposed to 23.5% who agreed) with the idea of counting social media metrics towards one's reputation, because they deemed such metrics irrelevant to scientific activities, as well as neither credible nor reliable.

The scholarship of integration

The scholarship of integration, defined as the arraying of extant knowledge into larger intellectual patterns within a wider, often cross-disciplinary context (Boyer, 1990), sets out to combine perspectives, concepts, theories, information and data to achieve thorough explorations of complex problems from novel angles. Thus, it aims specifically at producing research outputs that critically analyse, interpret and bring new insight to bear on original research, for example, a review article surveying the recent salient developments in a field, a textbook, or an article that reports on multi-faceted investigations of a specific topic.

Thus, if in original research the question is ‘What is to be known, what is yet to be found?’ in integrative research it is rather ‘Is it possible to interpret what’s been discovered in ways that provide more comprehensive understanding?’ (Boyer, 1990). Nevertheless, the synthesising research tradition represented by the integrative mode of scholarship is just as much concerned with creating knowledge as the investigative tradition represented by the scholarship of research. Indeed, many of the research activities described in the preceding sections, inclusive of their reputation building capabilities, characterise the scholarship of integration, too. In fact, the unique features of the scholarship of integration are evident primarily in the activities aimed at the producing and disseminating of an integrative research output. These have all been found to have reputational potentials (for a full list see Nicholas et al., 2015b; for a representative selection of the key activities see below Table 2).

Table 2. Conducting integrative research

| ACTIVITY | SCIENTIFIC PURPOSE | REPUTATIONAL PURPOSE | FIT FOR PURPOSE REPUTATIONAL MECHANISM |
|--|--|---|--|
| Identifying a complex topic in need of a more wide-ranging understanding and planning the research project to investigate it | Finding a scientifically significant research question and establishing how cross-fertilization of knowledge can answer it | Producing evidence of scholarly ability to identify the significance of the problem and conduct the research as proposed | Constructing a proposal for interesting collaborators and editors/publishers |
| Producing and disseminating an integrative research output using traditional strategies | Discovering and sharing wider- and novel- perspectives afforded new knowledge | Obtaining peer recognition and esteem; achieving disciplinary and trans-disciplinary visibility; achieving scholarly impact | Presenting the results of integrative interpretation of the extant knowledge on a topic in a manner suitable for peer use and evaluation |

| ACTIVITY | SCIENTIFIC PURPOSE | REPUTATIONAL PURPOSE | FIT FOR PURPOSE REPUTATIONAL MECHANISM |
|--|--|--|--|
| Producing and disseminating an integrative research output using open and participatory strategies | Same as above; additionally, updating and complementing extant knowledge by current informed opinion | Same as above; additionally, networking; reaching multiple audiences; enhancing one's digital identity | Same as above; additionally, crowd-sourcing and interacting with peers on social media based scholarly platforms |

It seems then that engaging in the integrative mode of scholarship can certainly help to showcase a scholar's expertise and proficiency, thereby serving his/her reputation-building goals. Moreover, the intellectually challenging nature of analytically synthesising discipline-spanning knowledge may give rise to fresh theoretical insights (Conole et al., 2010; Carayol and Thi, 2005), with all the reputational implications such an achievement is bound to have. Perhaps most importantly, however, interdisciplinary research work improves researchers' visibility in the scientific community, as indicated by cumulative citation counts (Meadows, 1998; Leahey et al., 2012). This is obviously of crucial reputational importance for a researcher, given the aforementioned stature of citations as a proxy for peer recognition and esteem.

Nevertheless, integrative scholarship has its costs, too, primarily because it almost by definition necessitates taking a multi-disciplinary approach. The managing of the transition between disciplines can be challenging, as is mastering more than one discipline (Conole et al., 2010; Weller, 2011). Complicating things further, peer review, standards of validity and effective criteria of excellence in academe are essentially based on disciplinary standards (Mallard et al., 2009; Rafols et al., 2012). As a result, the traditional academic career incentives do not stimulate interdisciplinary research (Carayol and Thi, 2005), and when scholars do opt for interdisciplinary projects, it brings on a 'production penalty': scholars with greater interdisciplinary research experience have lower levels of productivity (Leahey et al., 2012). Add to this that prestigious journals tend to be strongly disciplinary (Weller, 2011), and interdisciplinary publications are seen as less prestigious (Conole et al., 2010), and it becomes obvious why researchers claim that crossing research boundaries comes at a price (Rhoten and Parker, 2004). This is nowhere truer than in its effects on a researcher's reputation, given that scholarly success is measured in terms of one's achievements in getting published and getting cited.

The scholarship of application

Setting out to meet its express aim of informing practice, the scholarship of application utilises disciplinary knowledge and skill to address societal and industrial/organisational challenges. It thus sees scholars partnering with practitioners, policymakers and community leaders to design

application oriented solutions that fruitfully bring together theory and practice¹⁸. Plainly then, the ultimate goal of this application-oriented mode of scholarship is also the creation of new knowledge, which is why, as it has already been noted, quite a few of the activities comprising the research enterprise are typical of it, too. There are, of course, activities that more uniquely characterise the scholarship of application, as exemplified in the representative list of the key ones among them, presented in Table 3 (for a full list see Nicholas et al., 2015b). These have all been found to have potential for enhancing a scholar's reputation.

Table 3. Engaging in application-aimed scholarship

| ACTIVITY | SCIENTIFIC PURPOSE | REPUTATIONAL PURPOSE | FIT FOR PURPOSE REPUTATIONAL MECHANISM |
|--|--|--|--|
| Identifying a societal/ industrial challenge in need of a theory-based practical solution, planning the research project and obtaining funding | Finding a scientifically significant application-oriented research question and establishing its viability | Producing evidence of scholarly ability to identify the significance of the topic and conduct the research as proposed; achieving visibility for one's ideas | Constructing a proposal for interesting peer and practitioner collaborators and for persuading funders that the proposed project can yield the best research on an important topic |
| Producing and disseminating an application oriented research output | Discovering new knowledge that offers solutions to a practical problem | Achieving scholarly and public visibility; obtaining peer and public recognition and esteem; achieving scholarly and societal impact | Presenting the results of an application-aimed investigation both in a manner suitable for peer use and evaluation and as a societal publication ¹⁹ |
| Serving government or industry as an external consultant | Devising scholarly expertise afforded solutions to societal/ industrial problems | Same as above | Reporting the solutions both in a manner suitable for peer use and evaluation and as a societal publication |
| Serving the scholarly community (i.e., sitting on committees, fulfilling editorial roles, heading professional organisations) | Furthering the aims of one's professional community to better enable the pursuit of scientific goals | Same as above; additionally, networking | Demonstrating scholarly proficiency and expertise in leadership roles and noting them on one's CV and personal website; reporting achievements in community functions and publications |

Linking research-based insights to practice through dynamic interaction, the scholarship of application thus "opens up the boundaries between academia and the real world" (Pearce et al., 2010). Indeed, in these days of Science 2.0 supported initiatives that "break down traditional binaries like research/ practice, scholar/ participant, inside/ outside and contributor/ user" (Greenhow and Gleason, 2014), application-oriented undertakings are increasingly becoming joint, rather than individual ventures (see also the forthcoming section on the scholarship of co-

creation). The ensuing dialogue between scholars and representatives of practitioner/public interests can prove to be advantageous for both parties. For the former, it is the opportunities to open up fresh interconnections between public, scientific, institutional, political and ethical visions of change. For the latter, it is the opportunities for 'sustained dialogue' among groups normally excluded from decision making (Irwin, 2008).

From a reputational point of view the great strength of taking on application-aimed scholarly projects is the public visibility and societal impact they afford, both of which can enhance scholarly prestige, too. To be sure, in a recent survey amongst 3,748 U.S.-based members of the American Association for the Advancement of Science (AAAS), the vast majority (87%) supported the idea that participation in policy debates and engagement with citizens was necessary to further their work and careers (Pew Research Center, 2015).

Not that application-aimed, professional/non-professional alliances hold no problems for scholars. Rather to the contrary. They may have apprehensions about failure for lack of shared language with lay collaborators; they may be concerned about time taken away from 'real' research work; they may be worried that publicly transparent undertakings may lead to their being 'scooped' (Jensen et al., 2008). However, perhaps above all, a major discourager for scholars to take on community-interest driven, application oriented projects are that the outcomes may remain unpublished (Braxton et al., 2002). In the scholarly world, where success is measured by publications in top journals, such a project is likely to be regarded as much too costly in reputational terms.

The scholarship of teaching

Readily understood to refer to the conveying of the human store of knowledge to new generations, the scholarship of teaching, as Boyer (1990) sees it, is a more expansive concept than its commonly held perceptions would have us believe. It requires that scientists take a studied approach to their pedagogy in order to achieve evidence-based, 'best' teaching practices that can transform, extend and enhance students' learning (Greenhow and Gleason, 2014). These days this vision of the scholarship of teaching seems realisable at long last: it is wholly in line with current pedagogical thinking, which puts the student at the heart of the teaching/learning process (Brew, 2003), and readily facilitated by Science 2.0 afforded participatory strategies.

Bolstering further developments in this direction, the prestige enhancing potentials of teaching seem to be realisable, too, now that recent policy-level decisions call for a sharper focus on teaching and for granting teachers the same professional recognition and opportunities that researchers get (European Parliament, 2012; Johnson, 2015). It is possible then that the disproportionate reputational weight given to research above teaching will become a thing of

the past, and rightly so. Scholarly teaching activities, especially those fueled by novel approaches, have all been found in our study to possess reputational potentials (for a representative list of the key activities see Table 4 below; for a full list see Nicholas, 2015b).

Table 4. Engaging in the scholarship of teaching

| ACTIVITY | SCIENTIFIC PURPOSE | REPUTATIONAL PURPOSE | FIT FOR PURPOSE REPUTATIONAL MECHANISM |
|---|---|--|--|
| Designing a course/learning programme ²⁰ | Establishing how extant knowledge may best be transmitted/shared to promote and support an effective learning process | Producing evidence of disciplinary and pedagogical ability to teach the course/programme as proposed | Constructing a proposal for peer evaluation of its potential effectiveness and for attracting students |
| Producing and delivering a course using traditional strategies ²¹ | Achieving effective learning | Obtaining peer and student recognition and esteem | Demonstrating scholarly and pedagogical proficiency and expertise as teacher; excelling in peer monitoring/student ratings of teaching quality |
| Producing and delivering a course using open and participatory strategies ²² | Same as above | Achieving scholarly and public visibility; obtaining peer, student and public recognition and esteem; enhancing one's digital identity | Same as above; additionally, excelling in public feedback on teaching quality |
| Engaging in classroom research to advance learning theory ²³ | Discovering new pedagogical knowledge and/or achieving enhanced understandings of instructional design | Obtaining peer recognition and esteem | Presenting the results of a scientific investigation in a manner suitable for peer use and evaluation |

This exploration of the potential reputational benefits of the activities comprising the scholarship of teaching shows them all to be rewarding for the scholars. Indeed, the opportunities for reaping the prestige-accruing rewards of excelling as a teacher have grown immeasurably now that open participatory courses are becoming increasingly prevalent. This is demonstrated most eloquently by MOOCs (massive open online courses) – social networks based, crowd-sourcing technologies enabled, participatory online courses. As Daniel (2012) argues, institutions that place their MOOCs in the public domain for a worldwide audience inevitably will have to do more than pay lip service to the importance of teaching and put it at the core of their missions. If so, scholars conducting MOOCs stand to gain twice: their teaching achievements will be taken into career-related consideration, whilst the massive, globe-spanning visibility, which is an inherent feature of MOOCs, will contribute significantly to their scholarly and public visibility driven prestige.

The scholarship of co-creation

Taking the notions driving much of the current discourse on the nature of contemporary scholarship one step further, Garnett and Ecclesfield (2012) update Boyer's (1990) model by proposing the addition of a fifth dimension, the scholarship of co-creation. This, because Boyer's framework, which considers research and teaching as two distinct spheres of activity, and sees the producing of knowledge as a linear process, no longer wholly reflect today's realities. The dimension of co-creation thus refers to the increasingly converging processes of knowledge discovery and knowledge transmission and the resultant blurring of the distinction between the roles of researcher and teacher. Perhaps not surprisingly then, given that scholars' various activities in the course of both their research and teaching undertakings have all been found in the analysis of the pertinent literature to have reputation-accruing goals and potentials, co-creative activities, too, can be beneficial for enhancing scholarly prestige (for representative examples of such activities see Table 5; for full list see Nicholas et al., 2015b).

Table 5. Engaging in the scholarship of co-creation

| ACTIVITY | SCIENTIFIC PURPOSE | REPUTATIONAL PURPOSE | FIT FOR PURPOSE REPUTATIONAL MECHANISM |
|---|--|--|---|
| Collaborating in a PPSR (public participation in scientific research) project ²⁴ | Discovering new knowledge that can resolve local concerns; promoting learning about science concepts and processes | Achieving scholarly and public visibility; obtaining peer and public recognition and esteem; achieving scholarly and societal impact | Presenting the results of a PPSR investigation both in a manner suitable for peer use and evaluation and as a societal publication |
| Leading a PPSR project in a course/learning programme | Same as above; additionally, achieving effective learning about science concepts and processes | Achieving scholarly and public visibility; obtaining peer, student and public recognition and esteem | Same as above; additionally, demonstrating scholarly and pedagogical proficiency and expertise as teacher; excelling in peer monitoring/student ratings of teaching quality |

Looking at these co-creative activities from the specific angle of reputation building demonstrates their strengths in this area. Take what seems to be the most obvious instance of co-creation, the increasingly widespread trend of public participation in scientific research (Williamson et al., 2015). As it has already been noted in the section on the scholarship of application, professional/non-professional alliances can certainly prove to be advantageous for scholars in their quest for reputation. Indeed, PPSR projects, inviting as they do amateur experts and informed citizens to join the scholarly net and opening the entire process of research to the

scrutiny of public collaborators and audiences, can certainly bring about increased visibility afforded prestige for the scholar. No less importantly, since such projects may yield both conventional scientific papers and societal publications, the scholar stands to gain both peer recognition and esteem and reputation-enhancing societal impact.

The reputation building potential of co-creation aimed activities may be further bolstered if the recent innovation of the digital badge is taken up in earnest. A seemingly playful alternative to traditional diplomas, as Young (2012) puts it, the digital badge offers the ability to measure and assess real learning and skills acquisition in a virtual environment (Schrage, 2012). While it is meant to serve as a valid and verifiable means of accreditation, the fact that a click on the badge reveals to all interested parties anywhere in the world its 'history', renders it a recognition and esteem granting device for its originator. This is obviously a most welcome by-product of investing time and effort in relatively underappreciated scholarly activities, such as citizen science projects.

Conclusions

It clearly emerges from the research that scholarly reputation is still very much associated with research activities. Hardly surprisingly, of course, with recruitment of staff, their career advancements and their further work opportunities widely seen as contingent on proven research achievements, most notably as measured by the quantity of papers published in high-ranking journals and the number of citations they obtain. Thus, although the reputation building component of the scholarly undertaking is potentially very well-supported indeed in this era of Web/Science 2.0, it seems to be facing more challenges, too. The scholar may have strong incentives to embrace more inclusive scholarly goals and to pursue them via open and participatory ways and means of working, which can provide more encompassing means of achieving and showcasing scholarly reputation, but the price to be paid may arguably be too high.

Take, for example, the greater visibility afforded by Science 2.0 afforded transparent, open and participatory practices. As visibility is the obvious prerequisite for obtaining peer recognition and esteem, the vital key for scholarly success, it is, of course, crucially important for the scholar. The opening of the processes of the scholarly endeavour to peer and public collaborators and audiences can indeed contribute significantly to attaining both scholarly and public visibility and to achieving scholarly as well as societal impact. However, with all their obvious advantages for reputation building through open approaches enabled, more wide-ranging scholarly practices, these may occasionally prove to be a two-edged sword for the scholar. This is perhaps best exemplified in those instances where the activity cannot be readily translated into conventional research outputs, as it sometimes seems to be in integration and application-oriented projects, but most notably in the case of teaching.

In conclusion, hopefully this literature-based analysis of the reputation-building potential of scholarly practices can begin to fill a somewhat surprising gap in what we know about this truly vital aspect of the scholarly undertaking. Indeed, taking a reputational approach to the examination of the literature-provided wealth of information on the specific practices encompassing the scholarly work-life yielded evidence on both their prestige building potential and how this potential might be realised. The 'matching' of the hoped-for reputational outcome of an activity with the ways and means at the disposal of scholars for achieving visibility and obtaining peer recognition and esteem, as these emerge from the literature, thus resulted in a move towards untangling the complex picture of scholarly reputation building, on which little previous data seem to exist.

Endnotes

¹ For in-depth explorations of the concept of scholarly reputation, defined as the overall judgment of a scholar's standing as determined by experts in his/her field, see Andersen, 2000; Dewett and Denisi, 2004; O'Loughlin et al., 2013.

² Scholarly prestige, often operationalised in bibliometric studies as expert appreciation based peer esteem (Bollen et al., 2006), plainly has everything in common with scholarly reputation.

³ For example, *IEEE Transactions on Education* accepts manuscript submissions under three areas of scholarship, based on Boyer's categories.

⁴ Scholars' work-life may include activities that form a part of their holding academic managerial leadership positions. Whilst success in management roles is widely considered a reputation enhancing achievement, the activities involved are not strictly scholarly. Thus, these activities were thought beyond the scope of this study (for the reputational strengths of fulfilling leadership positions in academe see Nicholas et al., 2015c).

⁵ While the focus on traditional research outputs (articles, monographs) is likely to remain, there is increasing recognition of the importance of other research outputs, such as research datasets, blogs.

⁶ Demonstrating scholarly expertise and proficiency can lead to peer recognition and esteem, which are then translated into many concrete consequences for the scholar, most notably career-related rewards and research opportunities.

⁷ Committed non-credentialed experts, helping out or working on their own, as exemplified by amateur astronomers.

⁸ Collaborating is the action of working with someone to produce/create something; it is cooperation for the sake of achieving something together, whereas networking (see below) is the cultivation of relationships in order to enable the ongoing exchange of useful information or services.

⁹ A person's digital identity contains data and information that uniquely describe him/her and his/her relationship to other digital entities (Windley, 2005).

¹⁰ Explicit review is the process whereby work is made openly accessible and the audience is invited to scrutinise, comment on or rate it. Implicit review is the capturing and integrating of usage metadata (page views and downloads, Twitter counts, Facebook comments, science blog postings, bookmarkings and reference sharing), to provide immediate feedback about the performance of a journal, an author or an article.

¹¹ See Tacke's (2011) and Veletsianos's (2013) accounts of their experiences with novel working methods, such as tweeting and open discussion, and Conole's blog posts on the open process of writing a book - www.e4innovation.com

¹² Formal scholarly channels, most notably journals and monographs, carry information that is public and remains in permanent storage (based on Garvey and Griffith, 1972). Scholars have at their disposal traditional, for fee, or Open Access formal scholarly venues.

¹³ Scholarly impact, as reflected in citation and/or usage based metrics, is the degree to which a scholarly investigation's findings are read, used, applied, built upon, and cited by researchers in their own further research and applications (Harnad et al., 2008).

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- ¹⁴ Informal channels, such as social media based scholarly platforms, carry information that is often for more restricted audiences and whose storage is relatively temporary (based on Garvey and Griffith, 1972).
- ¹⁵ For example, the h index and its variants.
- ¹⁶ Download/visitor/link/social network reference counts (altmetrics).
- ¹⁷ Online communities may have their own measures of value, such as ResearchGate's RG score.
- ¹⁸ This is not to say, as Boyer (1990) clarifies, that citizenship activities in themselves consist scholarship; to be considered scholarship, said activities must be tied directly to the scholar's field and research, and performed with customary rigour and accountability.
- ¹⁹ Societal publications, for example, newspaper articles, television appearances, exhibitions and social media postings do not count in the promotion and tenure processes. Still, in a study of scientists' interactions with the mass media almost 40% of the survey respondents said that enhanced personal reputation among peers was an important outcome of scholars' active involvement in public communication (Peters et al., 2008).
- ²⁰ Theory-driven, systematised units of learning, designed for a planned educational purpose.
- ²¹ Traditional teaching strategies are based on the idea of the teacher as the focal point of teaching, so that information transmission is from the expert to their audience, mainly by means of lectures delivered either face-to-face or online.
- ²² Open and participatory teaching strategies are based on the idea of the learner as the focal point of teaching, so that information transmission is via expert-facilitated dialogue and knowledge exchange among all participants.
- ²³ Gathering and analysing feedback on teaching practices, either explicit (ratings) or implicit (i.e. social analytics - data gathered from social media content via automated methods).
- ²⁴ Defined as intentional collaborative endeavors between science researchers and public participants – including but not limited to amateur experts, concerned community members and/or school students – PPSR projects set out to generate new, science-based knowledge to address real-world problems (Shirk et al. 2012). Best known as citizen science projects, PPSR projects are typically designed and led by scientists, with members of the public primarily contributing data, although at times more actively involved in the research process, too (Bonney et al., 2009).

References

- Acord S. K. & Harley D. (2013). Credit, time, and personality: The human challenges to sharing scholarly work using Web 2.0. *New Media & Society*, **15**(3), 379–397.
- Akerlind, G.S. (2008). An academic perspective on research and being a researcher: An integration of the literature. *Studies in Higher Education*, **33**(1), 17-31.
- Altbach, P.G., Reisberg, L., & Rumbley, I. (2009). *Trends in global Higher Education: Tracking an academic revolution*. Chestnut Hill, MA: Boston College Center for International Higher Education.
- Andersen, H. (2000). Influence and reputation in the social sciences-how much do researchers agree?. *Journal of Documentation*, **56**(6), 674-692.
- Bazeley, P. (2010). Conceptualising research performance. *Studies in Higher Education*, **35**(8), 889-903.
- Becher, T. (1989). *Academic tribes and territories: Intellectual enquiry and the cultures of disciplines*. Stony Stratford: Society for Research into Higher Education & Open University Press.
- Becher, T., & Trowler, P. (2001). *Academic tribes and territories: Intellectual enquiry and the culture of disciplines*. Milton Keynes : Society for Research into Higher Education & Open University Press
- Bloch, C., Graversen, E. K., & Pedersen, H. S. (2014a). Competitive research grants and their impact on career performance. *Minerva*, **52**(1), 77-96.
- Bloch, C., Sørensen, M. P., Graversen, E. K., Schneider, J. W., Schmidt, E. K., Aagaard, K., & Mejlgaard, N. (2014b). Developing a methodology to assess the impact of research grant funding: A mixed methods approach. *Evaluation and Program Planning*, **43**, 105-117.
- Bollen, J., Rodriguez, M.A., & Van de Sompel, H. (2006). Journal status. *Scientometrics*, **69**(3), 669-687.
- Bonney, R., Ballard, H., Jordan, R., McCallie, E., Phillips, T., Shirk, J., & Wilderman, C. C. (2009). *Public participation in scientific research: Defining the field and assessing its potential for informal science education*. A CAISE Inquiry Group Report. Available at: <http://files.eric.ed.gov/fulltext/ED519688.pdf>
- Borgman, C. (2007). *Scholarship in the digital age: Information, infrastructure, and the Internet*. Hong Kong: MIT Press.
- Boyer, E.L. (1990). *Scholarship Reconsidered: Priorities of the Professoriate*. A Special Report of the Carnegie Foundation for the Advancement of Teaching. San Francisco, California: Jossey-Bass.
- Boyer, P. G., & Cockriel, I. (2001). Grant performance of junior faculty across disciplines: Motivators and barriers. *Journal of Research Administration*, **2**, 19–23

-
- Bozeman, B., Fay, D., & Slade, C. P. (2013). Research collaboration in universities and academic entrepreneurship: The-state-of-the-art. *The Journal of Technology Transfer*, **38**(1), 1-67.
- Braxton, J. M., Luckey, W., & Helland, P. (2002). Institutionalizing a broader view of scholarship through Boyer's four domains. ASHE-ERIC Higher Education Report, **29**(2), San Francisco: Jossey-Bass.
- Brew, A. (2001). Conceptions of research: A phenomenographic study. *Studies in Higher Education*, **26**(3), 271-285.
- Brew, A. (2003) Teaching and research: New relationships and their implications for inquiry-based teaching and learning in higher education. *Higher Education Research & Development*, **22**(1), 3-18.
- Burton, G. (2009). The open scholar. Blog entry in academic evolution. Available at: <http://www.academicrevolution.com/2009/08/the-open-scholar.html>
- Carayol, N., & Thi, T. U. N. (2005). Why do academic scientists engage in interdisciplinary research?. *Research Evaluation*, **14**(1), 70-79.
- CICS/CIBER (2013). *Trust and authority in scholarly communications in the digital era*. Available at: http://ciber-research.eu/download/20140115-Trust_Final_Report.pdf
- Conole, G., Scanlon, E., Munding, P., & Farrow, R. (2010). *Interdisciplinary research - Findings from the Technology Enhanced Learning Research Programme*. TLRP, UK. Available at: <http://www.tlrp.org/docs/TEInterdisciplinarity.pdf>.
- Daniel, J. (2012). Making sense of MOOCs: Musings in a maze of myth, paradox and possibility. *Journal of Interactive Media in Education*, **3**.
- David, P. A., den Besten, M., & Schroeder, R. (2010). Will e-Science be Open Science?. *World Wide Research: Reshaping the Sciences and Humanities*, **299**. Available at: <http://www.siepr.stanford.edu/RePEc/sip/08-010.pdf>
- Dewett, T., & Denisi, A. S. (2004). Exploring scholarly reputation: It's more than just productivity. *Scientometrics*, **60**(2), 249-272.
- Esposito, A. (2013). Neither digital or open. Just researchers: Views on digital/open scholarship practices in an Italian university. *First Monday*, **18**(1).
- European Commission (2015). *Validation of the results of the public consultation on Science 2.0: Science in Transition*. Available at: https://scienceintransition.files.wordpress.com/2014/10/science_2_0_final_report.pdf
- European Parliament (2012). *Modernising Europe's higher education systems*. Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012IP0139&rid=7>
- Franck, G. (1999). Scientific Communication--A Vanity Fair? *Science*, **286**(5437), 53-55.
- Garnett, F. & Ecclesfield, N. (2012). Towards a framework for co-creating open scholarship. *Research in Learning Technology*, **19**. ALT-C 2011 Conference Proceedings. Available at: <http://researchinlearningtechnology.net/index.php/rlt/article/view/7795>
- Garvey, W.D. & Griffith, B.C. (1972). Communication and information processing within scientific disciplines: Empirical findings for Psychology. *Information Storage and Retrieval*, **8**(3), 123-126.
- Garvey, W.D., Tomita, K. & Woolf, P. (1974). The Dynamic Scientific Information User. *Information Storage and Retrieval*, **10**(3-4), 115-131.
- Greenhow, C. & Gleason, B. (2014). Social scholarship: Reconsidering scholarly practices in the age of social media. *British Journal of Educational Technology*, **45**(3), 392-402.
- Gu, F. & Widén-Wulff, G. (2011). Scholarly communication and possible changes in the context of social media: a Finnish case study. *The Electronic Library*, **29**(6), 762-776.
- Hagstrom, W. O. (1974). Competition in science. *American Sociological Review*, **39**(1), 1-18
- Harley, D., Acord, S.K., Earl-Novell, S., Lawrence, S., & King, C.J. (2010). *Assessing the future landscape of scholarly communication: An exploration of faculty values and needs in seven disciplines*. UC Berkeley: Center for Studies in Higher Education. Available at: <https://escholarship.org/uc/item/15x7385g>.
- Harnad, S., Brody, T., Vallieres, F., Carr, L., Hitchcock, S., Gingras, Y., Oppenheim, C, Hajjem, C. & Hilf, E. R. (2008). The access/impact problem and the green and gold roads to open access: An update. *Serials review*, **34**(1), 36-40.
- Heap, T., & Minocha, S. (2012). An empirically grounded framework to guide blogging for digital scholarship. *Research in Learning Technology*, **20**(suppl.), 176-188.
- Housewright, R., Schonfeld, R. C., & Wulfson, K. (2013). *Ithaka S+ R US Faculty Survey 2012*. Available at: http://lgdata.s3-website-us-east-1.amazonaws.com/docs/923/721668/Ithaka_S_R_US_Faculty_Survey_2012_FINAL.pdf

-
- Hsieh, D. (2013). *Organization and role of international collaboration in research production* (Doctoral dissertation, The University of Arizona.).
- Irwin, A. (2008). Risk, science and public communication: Third-order thinking about scientific culture. In M. Bucchi & B. Trench (Eds.), *Handbook of public communication of science and technology*, pp. 199-212. London, England: Routledge.
- Jamali, H.R., Nicholas, D., & Herman, E. (2015). Scholarly reputation in the digital age and the role of emerging platforms and mechanisms. *Research Evaluation*. doi: 10.1093/reseval/rvv032
- Jensen, P., Rouquier, J. B., Kreimer, P., & Croissant, Y. (2008). Scientists who engage with society perform better academically. *Science and Public Policy*, **35**(7), 527-541.
- Johnson, J. (2015). University tutors must sharpen up - or else. *The Times*, July 1.
- Kling, R. & McKim, G. (1999). Scholarly communication and the continuum of electronic publishing. *Journal of the American Society for Information Science*, **50**(10), 890-906.
- Laudel, G. (2005). Is external research funding a valid indicator for research performance? *Research Evaluation*, **14**(1), 27-34.
- Leahey, E., Beckman, C. & Stanko, T. (2012). The impact of interdisciplinarity on scientists' careers. Paper presented at the annual meeting of the American Sociological Association, Denver, CO.
- Lindgren, L. (2011). If Robert Merton said it, it must be true: A citation analysis in the field of performance measurement. *Evaluation*, **17**(1), 7-19
- Mallard, G., Lamont, M., & Guetzkow, J. (2009). Fairness as appropriateness negotiating epistemological differences in peer review. *Science, Technology & Human Values*, **34**(5), 573-606.
- Meadows, A.J. (1998). *Communicating research*. London, UK: Academic Press.
- Meho, L.I. (2006). The rise and rise of citation analysis. *Physics World*, **20**(1), 32-36.
- Merton, R. K. (1968). The Matthew effect in science. *Science*, **159**(3810), 56-63.
- Merton, R.K. (1973). *The sociology of science: Theoretical and empirical investigations*. Chicago: The University of Chicago.
- Moed, H.F. (2005). *Citation analysis in research evaluation*. Dordrecht: Springer.
- Mulligan, A. & Mabe, M. (2011). The Effect of the internet on researcher motivations, behaviour and attitudes. *Journal of Documentation*, **67**(2), 290-311.
- Monahan, T. C. (1993). Barriers and inducements to grant related activity by New Jersey State College faculty. *Journal of the Society of Research Administrators*, **24** (4), 9-25.
- Nandez, G. & Borrego, A. (2013) Use of social networks for academic purposes: A case study. *The Electronic Library*, **31**(6), 781 - 791.
- Nicholas D. and Rowlands, I. (2011) Social media use in the research workflow. *Information Services and Use*, **31**(1-2), 61-83.
- Nicholas, D., Watkinson, A., Volentine, R., Allard, S., Levine, K., Tenopir, C., & Herman, E. (2014). Trust and authority in scholarly communications in the light of the digital transition: Setting the scene for a major study. *Learned Publishing*, **27**(2), 121-134.
- Nicholas, D., Watkinson, A., Jamali, H.R., Herman, E., Tenopir, C., Volentine, R., Allard, S., & Levine, K. (2015a). Peer review: Still king in the digital age. *Learned Publishing*, **28**(1), 15-21.
- Nicholas, D., Herman, E., & Jamali, H.R. (2015b). *Emerging reputation mechanisms for scholars: A literature-based theoretical framework of scholarly activities and a state-of-the-art appraisal of the social networking services used by scholars, to build, maintain and showcase their reputation*. European Commission, Joint Research Centre, Institute for Prospective Technological Studies. Available at: <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC94955/jrc94955.pdf>
- Nicholas, D., Herman, E., & Jamali, H.R. (2015c). Analysis of emerging reputation mechanisms for scholars. In: Vuorikari, R. & Punie, Y. (Eds). *Analysis of emerging reputation and funding mechanisms in the context of Open Science 2.0*. Part 1, 3-72. European Commission, Joint Research Centre, Institute for Prospective Technological Studies. Available at: <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC94952/jrc94952.pdf>.
- Nicholas, D., Herman, E., Jamali, H., Bravo, B. R., Boukacem-Zeghmouri, C., Dobrowolski, T., & Pouchot, S. (2015d). New ways of building, showcasing, and measuring scholarly reputation. *Learned Publishing*, **28**(3), 169-183.
- O'Loughlin, D., MacPhail, A., & Msetfi, R. (2013). The rhetoric and reality of research reputation: 'Fur coat and no knickers'. *Studies in Higher Education*, **8**, 1-15.

-
- Pearce, N., Weller, M., Scanlon, E., & Kinsley, S. (2012). Digital scholarship considered: How new technologies could transform academic work. *in education*, **16**(1). Available at: <http://ineducation.ca/ineducation/article/view/44/508>
- Peters, H. P., Brossard, D., De Cheveigné, S., Dunwoody, S., Kallfass, M., Miller, S., & Tsuchida, S. (2008). Interactions with the mass media. *Science*, **321**(5886), 204-205.
- Pew Research Center (2015). *How Scientists Engage the Public*. February 15, 2015. Available at: <http://www.pewinternet.org/2015/02/15/how-scientists-engage-public/NUMBERS, FACTS AND TRENDS SHAPING THE WORLD>.
- Piowar, H. A., & Vision, T. J. (2013). Data reuse and the open data citation advantage. *PeerJ*, **1**, e175.
- Ponte, D., & Simon, J. (2011). Scholarly communication 2.0: Exploring researchers' opinions on Web 2.0 for scientific knowledge creation, evaluation and dissemination. *Serials Review*, **37**(3), 149-156.
- Procter, R., Williams, R., Stewart, J., Poschen, M., Snee, H., Voss, A. & Asgari-Targhi, M. (2010). Adoption and use of web 2.0 in scholarly communications. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, **368**(1926), 4039-4056.
- Rafols, I., Leydesdorff, L., O'Hare, A., Nightingale, P., & Stirling, A. (2012). How journal rankings can suppress interdisciplinary research: A comparison between innovation studies and business & management. *Research Policy*, **41**(7), 1262-1282
- Reif, F. (1961). The competitive world of the pure scientist. *Science*, **134**(3494), 1957-1962.
- RIN (Research Information Network), (2008). *To share or not to share: Publication and quality assurance of research data outputs*. Available at: <http://www.rin.ac.uk/our-work/data-management-and-curation/open-science-case-studies>
- RIN (Research Information Network), (2009). *Communicating knowledge: How and why UK researchers publish and disseminate their findings*. Available at: <https://dspace.lboro.ac.uk/dspace-jspui/bitstream/2134/5465/1/Communicating-knowledge-report.pdf>
- RIN (Research Information Network), (2010). *If you build it, will they come? How researchers perceive and use Web 2.0*. Available at: http://www.rin.ac.uk/system/files/attachments/web_2.0_screen.pdf
- Rhoten, D., & Parker, A. (2004). Risks and rewards of an interdisciplinary research path. *Science*, **306**(5704), 2046.
- Rowlands, I., Nicholas, D., & Huntington, P. (2004). Scholarly communication in the digital environment: What do authors want? *Learned Publishing*, **17**(4), 261-273.
- Rowlands, I., Nicholas, D., Russell, B., Canty, N. & Watkinson, A. (2011). Social media use in the research workflow. *Learned Publishing*, **24**(3), 183-195.
- Scanlon, E. (2014). Scholarship in the digital age: Open educational resources, publication and public engagement. *British Journal of Educational Technology*, **45**(1), 12-23.
- Schrage, M. (2012). Four innovation trends to watch in 2013. *Harvard Business Review*, December 28. Available at: <https://hbr.org/2012/12/four-innovation-trends-to-watc/>
- Shirk, J. L., Ballard, H. L., Wilderman, C. C., Phillips, T., Wiggins, A., Jordan, R., McCallie, E., Minarchek, M., Lewenstein, B.V., Krasny, M.E. & Bonney, R. (2012). Public participation in scientific research: a framework for deliberate design. *Ecology and Society*, **17**(2), 29.
- Shneiderman, B. (2008). Science 2.0. *Science*, **319**(5868), 1349-1350.
- Tacke, O. (2011). Open Science 2.0: How research and education can benefit from open innovation and Web 2.0. In: *On collective intelligence*. Heidelberg: Springer, 37-48.
- Tenopir, C., Volentine, R. & King, D.W. (2013) Social media and scholarly reading. *Online Information Review*, **37**(2), 193- 216.
- Tenopir, C., Levine, K., Allard, S., Christian, L., Volentine, R., Boehm, R., Nichols, F., Nicholas, D., Jamali, H. R., Herman, E. & Watkinson, A. (2015), Trustworthiness and authority of scholarly information in a digital age: Results of an international questionnaire. *Journal of the Association for Information Science and Technology*. doi: 10.1002/asi.23598
- Van Arensbergen, P., Van der Weijden, I., & Van den Besselaar, P. (2014). Different views on scholarly talent: What are the talents we are looking for in science? *Research Evaluation*, **23**(4), 273-284.
- Van Dalen, H.P. & Henkens, K. (2001). What makes a scientific article influential? The case of demographers. *Scientometrics*, **50**(3), 455-482.
- Van Dalen, H.P. & Henkens, K. (2012). Intended and unintended consequences of a publish-or-perish culture: A worldwide survey". *Journal of the American Society for Information Science and Technology*, **63**(7), 1282-1293.

-
- Van Noorden, R. (2014). Online collaboration: Scientists and the social network. *Nature*, **512**(7513), 126-129.
- Vannini, P. (2006). Dead Poets' Society: Teaching, publish-or-perish, and professors' experiences of authenticity. *Symbolic Interaction*, **29**(2), 235-257.
- Veletsianos, G. (2010). Participatory scholars and 21st century scholarship. *ITForum Discussion Paper*, April, 12-16.
- Veletsianos, G. (2013). Open practices and identity: Evidence from researchers and educators' social media participation. *British Journal of Educational Technology*, **44**(4), 639-651.
- Veletsianos, G. & Kimmons, R. (2012). Assumptions and challenges of Open Scholarship. *The International Review of Research in Open and Distance Learning*, **13**(4), 166-189.
- Walden, P. R., & Bryan, V. C. (2010). Tenured and non-tenured college of education faculty motivators and barriers in grant writing: A public university in the south. *Journal of Research Administration*, **41**(3), 85-98.
- Ware, M. (2008). *Peer review: Benefits, perceptions and alternatives*. Publishing Research Consortium, London, UK. Available at: <http://www.publishingresearch.net>.
- Weller, M. (2011). The nature of scholarship. In: *The Digital Scholar: How technology is transforming academic practice*. A&C Black. Available at: http://www.bloomsburyacademic.com/view/DigitalScholar_9781849666275/chapter-ba-9781849666275-chapter-005.xml
- White, D. S. & Le Cornu, A. (2011). Visitors and Residents: A new typology for online engagement. *First Monday*, **16**(9).
- Whyte, A., & Pryor, G. (2011). Open science in practice: Researcher perspectives and participation. *International Journal of Digital Curation*, **6**(1), 199-213.
- Williamson, K., Kennan, M. A., Johanson, G. & Weckert, J. (2015), Data sharing for the advancement of science: Overcoming barriers for citizen scientists. *Journal of the Association for Information Science and Technology*. doi: 10.1002/asi.23564
- Windley, P. J. (2005). *Digital identity*. Sebastopol, CA.: O'Reilly Media, Inc.
- Wouters, P. & Costas, R. (2012). *Users, narcissism and control: Tracking the impact of scholarly publications in the 21st century*. Utrecht: SURF Foundation. Available at: http://sticonference.org/Proceedings/vol2/Wouters_Users_847.pdf
- Wuchty, S., Jones, B. F., & Uzzi, B. (2007). The increasing dominance of teams in production of knowledge. *Science*, **31**, 6(5827), 1036-1039.
- Young, J.R. (2012). 'Badges' earned online pose challenge to traditional college diplomas. *The Chronicle of Higher Education*, January 8. Available at: <http://chronicle.com/article/Badges-Earned-Online-Pose/130241/>

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