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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 reputations

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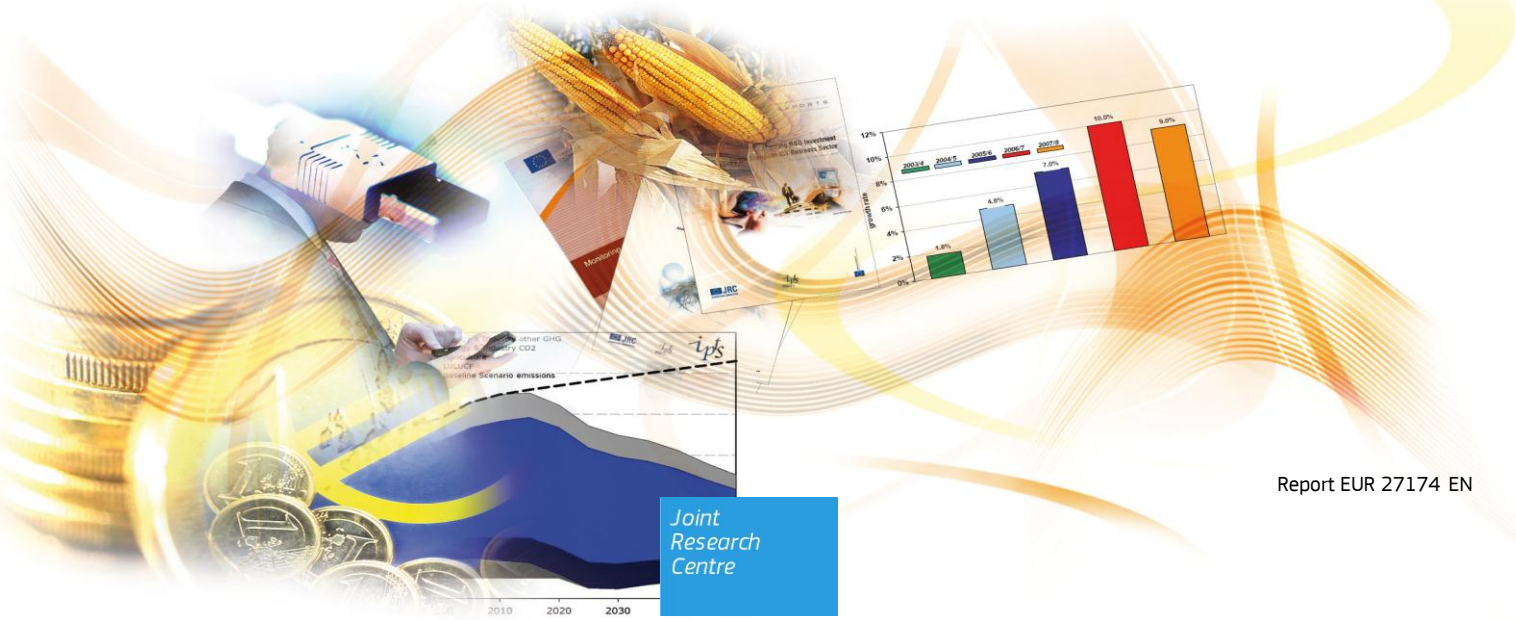

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Abstract

This interim report is part of the JRC-IPTS commissioned study "Analysis of emerging reputation mechanisms for scholars". It aims to set the conceptual framework for the analysis of the data gathered in the subsequent empirical, case-study phases of the investigation. The first part of the report offers an exhaustive literature review for the theoretical framework of scholarly activities based on an updated model of Boyer's (1990) framework and its various reputation building aspects. The second part is a state-of-the-art appraisal of the novel social networking services used by scholars, to build, maintain and showcase their reputation. The framework introduced above serves as the frame of reference for the analysis of the data from 25 such services used by scholars.

TABLE OF CONTENTS

FOREWORD

This report is part of a study funded by JRC-IPTS that explores emerging drivers for Open Science 2.0. Terms like “Science 2.0”, “Digital science” and “Open science” have emerged to encompass trends such as open access to scientific knowledge, citizen science and open peer evaluation systems, to mention but a few. Thanks to Web 2.0 and the shifting paradigm it brings with it, the transformative power of disruptive technologies has also started to shake up the field of science and research, giving rise to new formats for conducting, publishing and disseminating science and research. These developments typically started as grass-root initiatives. Little by little, they have been embedded in more mainstream scientific research practices, which could change how science and research systems function in the future.

With new way of working in the field, evaluating and measuring scientific reputation becomes a new challenge. Two issues arise. First, what is currently missing is a more holistic profile of scholarly activities that not only emphasises scientific excellence through high-impact publications, but also focuses on other scholarly activities and their reputation building aspects such as *teaching, mentoring, peer-reviewing, communication and outreach activities*. Secondly, in addition to a traditional academic profile, there are "new profiles" of scholars with non-traditional academic backgrounds (e.g. free-lance scientists), or even "new actors" in the field of science (e.g. innovators who win an inducement prize or citizen scientists). Conventional indicators fall short of reflecting adequately contributors' reputations and impact in the field of science.

Therefore, to better understand how policy level actions can support this transformation in science and research, there is a need to gather evidence of emerging practices in the field. The aim of this exploratory report is to understand what the above mentioned changes mean for the mechanisms that are used to construct reputation in the field of scientific research. This report presents the results of the first part of the study. The final outcomes of the study can be found in a further report "*Analysis of Emerging Reputation and Funding Mechanisms in the Context of Open Science 2.0*".[1] Other initiatives launched by the European Commission, such as the public consultation on ‘Science 2.0: Science in Transition’[2] and the Communication on "Opening up Education" (COM/2013/0654 final), deal with similar issues.

The JRC-IPTS "ICT for Learning and Skills" team covers a number of interrelated research strands across all education sectors: Open Education and OER, Innovating Learning and Teaching, Key Competences and 21st Century Skills. More than 20 studies have been undertaken resulting in more than 50 publications. All the studies aim to support European policies on the modernisation and innovation of education and training (DG EAC), the development of key competences and qualifications (DG EMPL), the Digital Agenda for Europe (DG CNECT), and more recently, the Digital Single Market (DSM) initiative under the Juncker Commission.

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[1] Vuorikari & Punie, eds. (2015). 'Analysis of Emerging Reputation and Funding Mechanisms in the Context of Open Science 2.0'. JRC Science and Policy Report.

[2] http://scienceintransition.eu/

INTRODUCTION

The report presented below forms a part of the JRC-IPTS commissioned study "Analysis of emerging reputation mechanisms for scholars", conducted by CIBER Research Ltd., which focused on today's Web/Digital Science 2.0 driven challenges to conventional ways of establishing and measuring scholarly reputation. Aiming specifically at laying the conceptual framework for the analysis of the data gathered in the subsequent empirical, case-study phases of the investigation, the following thus summarises the results of the first two stages of the project:

1. A comprehensive literature review and audit of scholarly activities in the digital age and associated reputational mechanisms[3].
2. A state of the art mapping and evaluation of online platforms that offer 'new' reputational mechanisms for scholars[4].

A good scholarly reputation[5] is indubitably a central hallmark of success in the scientific endeavour on both the individual and the institutional level, indeed, one of its principal enablers (Merton, 1968). To be sure, 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." Inevitably so, perhaps: with scholarly contributions subjected to communal evaluation to establish their merits, and scholarly rewards allocated communally, reputation is translated into many concrete consequences for the scientist (Reif, 1961).

This state of affairs remains as true as ever in today's changing realities of the scientific enterprise, with their emerging paradigms for opening up scholarship to a wider range of participants whilst concurrently introducing a wider range of media into its processes and outputs (Goodfellow, 2013). Indeed, as Weller (2011) points out, if traditionally we have tended to think of scholars as being academics, usually employed by universities, the democratisation of the online space opens up scholarship to a much wider constituency. In point of fact, as the huge evidence base amassed over the years (2001-2008) by the CIBER research group clearly shows, many of the general public are being drawn into the scholarly net, so that by now the creation, dissemination and transferring of knowledge may involve actors from the entire range of the professional-amateur-citizen spectrum. Thus, although these days a scholar is still often an institutional academic scholar, it is not invariably so; he/she may very well be a free-lance scientist, who has no institutional affiliation, an amateur expert, who has no traditional academic background, or an informed member of the general public contributing to a PPSR (public participation in scientific research) project.

However, with all that conventional scholarly practices are plainly becoming more open and expansive, there can be little doubt that "to be a scholar is to be a researcher", as Boyer's (1990, p.2) encapsulation of the quarter of a century old, but still very much dominant view goes. Thus, a good scholarly reputation is in fact tantamount to a good publishing record (De Rond and Miller,

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[3] Reputational mechanisms are the processes or methods used to build reputation, such as interacting with peers and disseminating output.

[4] Reputational platforms are the websites that combine and utilise these mechanisms to help build reputation, make it public and comparable. Reputational platforms allow for any or all of: (a) making one's research known to peers and other interested parties (b) sharing knowledge and information (c) giving/receiving expert feedback (d) impacting on others' research or knowledge, on industry, and on society. There are mainly two types of platform: 1) those based on the traditional view of scholarly reputation, which focus on citation and publication, such as Google Scholar and Researcher ID; 2) the emerging ones, the focus of this report, which are based around Science 2.0 principles and social media measurements, aspects that enhance the digital visibility and presence of scholars.

[5] For an exploration of the concept of reputation, basically defined as the beliefs or opinions that are generally held about someone or something (Oxford English Dictionary, 2014), see O'Loughlin et al. (2013).

2005; Harley et al., 2010; O'Loughlin et al., 2013), as measured by the quantity of papers published in high-ranking journals and the number of citations they obtain (Meho, 2006; Moed, 2005; Nicolini and Nozza, 2008; Van Dalen and Henkens, 2012). This is hardly surprising, of course, given the 'publish-or-perish' mentality steered value and reward systems of academe, as exemplified by the central role accorded to output of high quantity and quality in consideration for recruitment, tenure and promotion, as Harley et al. (2010, p. 7) find: "There are a variety of criteria used to judge a successful scholar in a tenure and promotion case: publication, service, and teaching. Excellence in the latter two holds little weight without a stellar publication record and evidence that a scholar's work: is widely read, is judged to be of high quality by internal and external reviewers, and advances the field".

This state of affairs, which inevitably renders many of the activities that form part and parcel of the work-life of a scholar rather marginal, runs counter to today's changing societal priorities, which see the future in the globalised knowledge society as hinging not only on research and innovation, but also on education for all (Altbach et al., 2009). Indeed, the goals and ensuing policy initiatives that have been driving the European academic enterprise for quite some time now see research and teaching not only as mutually dependent and reciprocally reinforcing, but also as equally important[6]. With good reason, too, as Altbach et al. (2009) and Kwiek (2012) suggest: although research and innovation have been and continue to be extremely important contributions to the economic and social development of society, indeed, central enablers of its ability to compete successfully in the international arena, producing a skilled labour force is more than ever critically important for the well-being of a state. Add to this that constant transformations in the labour market and in the economy in general render life-long learning an inescapable dictate of life in the 21st century, and the need for innovative, technology-supported, formal and informal university-level teaching that can cater to the distinctive needs of increasingly differentiated student populations, becomes quite obvious[7].

Moreover, the disproportionate weight given to traditional research achievements (publications and citations) above all other scholarly activities (inclusive of teaching) in assigning reputation, resulting as it does in a relentless pursuit of quantifiable research productivity in academe, seems to have brought about rather unfortunate consequences: for quite a while grave doubts are being voiced as to the value and dependability of some of the new knowledge produced and communicated (Bauerlein et al., 2010; Casadevall and Fang, 2012; Colquhoun, 2011; Truex et al., 2011; Voas et al., 2011). Indeed, there seems to be a growing discontent within and without academe with the conduct, but also with the impact and reach of scholarship (Bess, 2000; Hartley and Harkavy, 2011).

It may yet transpire then that Boyer's (1990) groundbreaking proposition, calling for re-defining scholarship in ways that reflect more realistically the entire range of academic and civic mandates, will come to pass. If so, this will surely bring about attendant changes in scholarly practices, among which reputation building is bound to figure high. Developments in this direction would certainly be bolstered with the full-fledged emergence of Science 2.0[8], with its collaboration-centred, web-based socio-technical systems (Shneiderman, 2008) and open practices of scholarship (Veletsianos and Kimmons, 2012).

As part and parcel of the affordances of Science 2.0 for the present day scientific enterprise, the scholarly arsenal of reputation building tools has already been greatly enriched by a host of innovative, social networking based platforms, techniques and metrics (for a rigorous examination of the various novel ways and means of monitoring 'real time' how research findings are being read, cited and used see Wouters and Costas, 2012; for the results of a recent *Nature* survey of

6 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012IP0139&rid=7

7 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013DC0654&from=EN

8 Also referred to as Digital Science, Open Science or Open Science 2.0

'giant' academic networks and research-profiling sites, which yielded 3,500 responses from 95 different countries, see Van Noorden, 2014). These platforms, techniques and metrics can be utilised interchangeably or complimentarily with more traditional ways and means of constructing, maintaining and augmenting scholarly standing, so that by now there are additional powerful ways at scientists' disposal to boost their professional profile. The question is, of course, to what extent they utilise these novel ways and means to accrue and secure the prestige and priority they desire. This question, in its turn, is framed within the broader question of how today's digital scholars actually construct, sustain and enhance their standing and reputation.

Setting out to find the answer to this question, the study began by constructing the conceptual framework for understanding the opportunities and challenges the emerging reputation mechanisms present for scholars. This, via two literature-based, separate but complementary investigations:

First, guided by Boyer's (1990) well-established model, the range of scholarly activities was defined to provide the various tasks that scholars/researchers undertake, both online and offline that do/might contribute towards building reputation. Each activity thus identified was then analysed to determine its reputational purpose and the mechanisms potentially utilisable for achieving it (e.g., publishing and citations, endorsement, grants and rewards, downloads, ratings, social relations).

Concurrently, a state-of-the-art appraisal of the novel platforms/services used by scholars was conducted. Platforms were identified through the published literature, by searching the Web and by asking scholarly networks. Each platform's offerings were evaluated and mapped against the model of scholarly activities established in the previous stage (above), and novel and successful approaches identified. Platform evaluations were conducted by using information on the site and on the web, by previously published research, and by joining the site and exploring its features and functions as a 'mystery shopper'.

PART 1

The work life of scholars in the digital age and its reputation building components: A review of the literature

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I. A CONCEPTUAL FRAMEWORK FOR SCHOLARLY ACTIVITIES

1. Boyer's model of scholarship (updated)

The almost given point of departure for the analysis of current and emerging scholarly behaviours undertaken here is Boyer's (1990) seminal mapping of the broad territory of scholarly activity, which, although hailing back to the closing decade of the previous century, remains entirely valid in its basic observations and contentions to this day[9]. Still, we need to keep in mind that, as Weller (2011) puts it in an especially apt, if plainly understated suggestion, the time-honoured image of the archetypal scholar as "...a lone individual, surrounded by books (preferably dusty ones), frantically scribbling notes in a library... is somewhat removed from [today's] highly connected scholar, creating multimedia outputs and sharing these with a global network of peers". Undoubtedly so, as anyone well-versed in the ways of the scholarly enterprise will be quick to admit, which is why any consideration of contemporary scholarly practices needs to address its changed and still fluctuating nature. Indeed, Boyer's (1990) view of what it means to be a scholar could not have served our purposes, were it not recently been analysed, updated and extended in a number of studies to reflect the realities of the digital age (Garnett and Ecclesfield, 2011; Greenhow and Gleason, 2014; Heap and Minocha, 2012; Pearce et al., 2010; Scanlon, 2014; Weller, 2011).

Thus, the contextual basis for the exploration of scholars' changing work practices, which is to follow, is Boyer's (1990) well-established, four-dimensional model of scholarship, to which Garnett and Ecclesfield (2011), seeking to update the model, add a fifth one:

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

Using these classifications as a useful benchmark against which present-day practices can be compared, as suggested by Scanlon (2014) and Weller (2011), the following chapters explore how today's scholars, going about their pursuits in an increasingly open-values-based digital and networked environment, might go about establishing, maintaining and enhancing their reputation.

2. The scholarship of research

2.1 The role of reputation in the research undertaking

The scholarship of research, or, as Boyer (1990, p. 17) dubs it 'the scholarship of discovery', aims, as he goes on to say, at advancing the stock of human knowledge through "the commitment to knowledge for its own sake, to freedom of inquiry and to following in a disciplined fashion, an investigation wherever it may lead". It is, as it has already been noted, at the very heart of the scholarly enterprise, indeed, its principal professional endeavour and focal point. However, running

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

contrary to the idealised beliefs held by the uninitiated into the realities of scholarly life, the rationale behind the primacy of the scholarship of research over other dimensions of the scientific undertaking is not merely the undisputable importance of its stated goal, the aforementioned disinterested pursuit of knowledge for its own sake and the benefit of humankind. It is also the fact that research and publications are used as the yardstick by which scholarly success is measured (Boyer, 1990; Harley et al., 2010), a state of affairs that renders research achievements in terms of quality and quantity (especially quality, according to Dewett and Denisi, 2004), of the utmost significance for scholarly reputation building, maintaining and enhancing.

Indeed, although a good scholarly reputation is vital for success in every aspect of the cultivation of science, it is especially so where the scholarship of research is concerned (De Rond and Miller, 2005; O'Loughlin et al., 2013). So much so, that Dewett and Denisi (2004), building on previous literature in their definition of scholarly reputation, even talk of the overall judgment of a scholar's standing as based wholly on their research and impact on the field as determined by experts in that field. This state of affairs, as the seminal works of Hagstrom (1965), Merton (1973) and Storer (1966) indicate, stems from the mutual dependence of scholars on each other in their efforts to achieve new knowledge and understanding through research. Each and every scholar continually acquires ideas from other scholars, evaluates the validity and worth of these ideas as the basis for further exploration, utilises some for subsequent research, and in turn disseminates the results of the research to the scientific community. At the same time, each scholar defers to fellow-contributors to the existing body of knowledge, emulates them, gets influenced by their work, and desires their recognition of his/her own endeavours. Obviously then, the very nature of research work commands the need for recognition of the value of one's work by others in the field.

However, as Merton (1968) shows, dubbing the phenomenon the 'Matthew effect'[10], in the achievement-based race to status amongst scholars, plainly there are colleagues and colleagues... Indeed, there is a clear pattern of a misallocation of credit for scientific work, whereby greater increments of recognition for particular scientific contributions are accorded to scientists of considerable repute and such recognition is withheld from scientists who have not (yet) made their mark. In other words, eminent scientists get disproportionately great credit for their contributions while relatively unknown scientists tend to get disproportionately little credit for comparable contributions. Therefore, achieving/maintaining a good reputation, which, in its turn, leads to career related rewards and research opportunities, has as its prerequisite the ownership of a pre-existing good reputation.

Breaking this vicious circle has traditionally been deemed to be all the more problematic given the gatekeeper role accorded in the scholarly community to the 'invisible colleges', those "small societies of everybody who is anybody in each little particular specialty" (Price, 1975, p. 126). This, however, seems to be changing in today's more open and democratised scholarly environment: the 'invisible college' has become by now more of an 'invisible constituency'– a heterogeneous, open and loosely organised network that serves more as a forum for ad hoc consultation than for gatekeeping (Palmer et al., 2009). The developments in this direction have, as we are about to see, far fetching implications for the researchers in their ongoing pursuit of scholarly prestige and standing.

In direct consequence of these converging circumstances, researchers are greatly concerned with how their work impacts upon the wealth of knowledge accumulating in their field, for the sake of the scholarly endeavour and society, certainly, but also for the sake of their professional reputation. Indeed, as Akerlind (2008) finds, a principal motivation for scholars to undertake research is making their research known to others and gaining thereby academic standing amongst other

[10] The basis for Merton's dubbing the misallocation of credit for the scientific work is the Gospel According to St. Matthew: For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath.

researchers in the field. In fact, according to Brew (2001) a research project is actually seen as a kind of social marketplace, where the products of research (publications, grants and networks) are exchanged for money, prestige or recognition. With reputation thus invariably assuming great importance for researchers, they quite inevitably compete persistently, often fiercely, to achieve maximum prestige (Becher, 1989; Garvey, 1979; Reif, 1961; Schott, 1991; 1998; Travaille and Hendriks, 2010).

Hardly surprisingly then, whilst today's research landscape, with its traditional practices potentially complemented by Open Science 2.0 afforded novel opportunities is clearly in a state of flux (CICS/CIBER, 2013; Nicholas and Rowlands, 2011; Procter et al., 2010; RIN, 2010; Rowlands et al., 2011; Tenopir et al., 2013), the quest for reputation remains its central feature. Fortunately, the innovative ways and means of conducting, disseminating and evaluating research available today, epitomising as they do the converging basic tenets of Open Science 2.0 – digital, networked and open (Weller, 2011) – lend themselves readily to scholarly reputation building. Indeed, whilst the detailed analytic portrayal of the range of traditional and novel activities comprising the scholarship of research in today's knowledge-driven era, presented in Table 1 (see the Annex), shows them all to have a strong reputational focus alongside their scientific one, it is today's novel practices that seem to have an especially compelling potential for the building/ maintaining/ augmenting of professional reputation.

2.2 The reputation building facets of the research process

As Bazeley (2010) suggests, reputation is not merely a by-product of the research process but one of its three main outcomes. Indeed, a successful research performance results in: (1) the product which results from performance – most commonly seen as being in the form of some kind of publication such as a journal article, book or report; (2) the impact on others' research or knowledge, on industry, in practical ways in society, or through changing the way we think about ourselves as human beings; and finally, (3) the enhancing of the reputation of the researcher via creating peer esteem, which potentially leads to invitations, awards, and promotion, as well as to the influencing of the likelihood of further funding. Thus, a research procedure can be seen as aiming at the attaining of enhanced reputation for the scholar, no less than at achieving a new contribution to the wealth of human knowledge and leaving an impact.

The quest for reputation is therefore 'built into' the research process, which, as it has long been established, follows a reliable, if not always consciously or rigorously adhered to progressive order in the stages of producing and disseminating a research output. Setting out to extend the certified knowledge already in existence, the procedure thus encompasses various stages, from the identification of the 'right' problem to pursue and the preparation of a research proposal, through the planning and design of the investigation and its contextualisation and anchoring in previous literature, to the collection, managing, processing and analysis of data, the interpretation of results and the preparation and dissemination of the final report (Garvey et al., 1974).

This generic workflow is very much with us still, albeit made potentially more efficient, and, which is more of our concern here, more effective for attaining scientific as well as reputational purposes, especially if and when researchers opt for more open and social approaches based, digital work practices. Inevitably, perhaps, for the research undertaking, wholly founded as it is on access to an abundance of knowledge, expert feedback and the judicious utilisation of appropriate dissemination channels, is an evolving and iterative process, which can be well-supported indeed by Web 2.0-afforded social tools and platforms.

To be sure, as Veletsianos and Kimmons (2012) rightly point out, scholars have always shared their work with colleagues pre- and post-dissemination of the finalised, formal product of their investigations (e.g., face-to-face, via correspondence, over the telephone, through conferences, by means of informal and formal publication venues), and disciplines have always had open (and less

open) scholars. After all, as it has repeatedly been emphasised, the cultivation of science is a highly communal undertaking, with the scholarly endeavour hinging on interactive communication among similarly interested individuals. However, whilst established scholarly practices are often "monastic and lacking ongoing participation, support, and conversation" (Kumashiro et al., 2005), participatory and social ways of working – most notably, tweeting, blogging, answering questions, providing information, 'tips', resources, and engaging in discussion – are based on openness, conversation, collaboration, access, sharing and transparent revision (Cohen, 2007, cited in Veletsianos and Kimmons, 2012). The ability thus afforded to scholars to engage more effectively, in different ways, and real-time with individuals and community groups interested in their scholarship, should figure high indeed on their list of priorities.

2.2.1 Producing research outputs

Weller (2011) demonstrates how such an open, digital, networked and crowdsourcing-based approach to conducting the first stages of a research undertaking, aimed at producing an original contribution, might be realised:

1. Planning – researchers establish their research question through iterative exposure, using social networks and blogs. They seek feedback and ask for relevant experience. Using online information sources such as Delicious feeds and Google scholar they gather relevant information to inform their research proposal. They set up a series of Google alerts around a number of subjects to gather daily information. A plan is created that incorporates regular release and small-scale outputs. They hold an informal online meeting with some interested parties and establish a project blog or wiki.
2. Collect data – researchers continue to use online information sources for their literature review. They create an online database and seek user contributions, seeded by requested contributions from peers in their network. An online survey is created in SurveyMonkey.
3. Analyse – researchers use Google analytics to examine traffic data and SurveyMonkey analytics to analyse responses. They use data visualisation tools such as ManyEyes to draw out key themes in responses.
4. Reflect – reflection occurs throughout the process by means of a series of blog posts and video interviews.

The foregoing portrayal of the process, whereby a researcher releases or communicates ideas, progress, mock-ups, prototypes, draft results, etc. throughout their project, gathering feedback as they go, is wholly borne out by self-reported personal experiences[11]. Although the process does require appropriate levels of interest for sufficient contributions to be gained from others, which is by no means an easy feat to accomplish, it certainly leaves us with the strong impression that beyond the very real possibilities it affords for technical improvements in producing a research output, it has considerable reputation enhancing capabilities, too. Arguably, with the whole procedure taking place transparently on the web, spurred on to completion by continuous peer support, the achieving of visibility among likeminded people, which is an essential prerequisite for attaining reputation, should truly be a given.

2.2.2 Disseminating research outputs

The dissemination of research findings is accorded an exceptionally important role in the scholarly endeavour. Indeed, one of the basic tenets of the scientific ethos, as so famously articulated by Merton (1973), is the open disclosure of the interim and final outcomes of a scientific enquiry. True, as David et al., (2008) argue, with all that members of the academic research community generally subscribe to the scientific ethos, the individual behaviours may not always conform to its strictures.

[11] See Conole's series of blog posts on www.e4innovation.com for an example of a reflective ongoing report on the process of the writing and development of a book, as well as Tacke's (2010) and Veletsianos's (2013) accounts of how novel working practices support the producing of an original contribution.

Nevertheless, as David et al., (2008, p. 3) go on to say, the information-disclosure norm, which treats new findings as tantamount to being in the public domain, can bring about a greater efficacy of the cooperative, cumulative generation of eventually reliable additions to the stock of knowledge.

This is all the more so these digital days, for "research findings in digital form can be easily moved around, duplicated, handed to others, worked on with new tools, merged with other data, divided up in new ways, stored in vast volumes and manipulated by supercomputers if their nature so demands" (RIN, 2008). Indeed, Weller (2011) sees the changes in the granularity of outputs as one of the unpredicted and profound consequences of digitisation. Thus, he posits, whilst books and journals will undoubtedly continue to exist, they will not hold the monopoly on being the conduit for ideas. An online essay, a blog, a podcast, a collection of video clips will also be seen as perfectly viable means for disseminating ideas. Combined with today's truly global network, which enables the sharing of research outputs with colleagues and the wider scholarly community, in fact, any interested group or individual, the entire range of research results as they are achieved would thus be made available.

Thinking much along the same lines Borgman (2007) talks of the blurring of primary and secondary sources, wherein primary sources (i.e., data sets) are made more widely available to researchers. Indeed, by now a small but growing number of scientists even practice Open-Notebook Science (ONS), a concept whereby researchers post their laboratory notebooks on the internet for public scrutiny (Stafford, 2010). Thus, as Borgman (2007) goes on to suggest, primary sources and research by-products – data, methodologies, tools, protocols, laboratory notebooks and the like – can as easily be integrated into the present-day scholarly information communication system as formal research outputs, such as books and journal articles.

Making intellectual projects and processes digitally visible whilst inviting and encouraging ongoing criticism of the work done and secondary uses of any or all parts of it (Burton, 2009) undoubtedly has its benefits advantages for the scholar. According to Veletsianos (2013), these may include a better contribution to the knowledge base, a more participatory research process, an expanded definition of 'expert', democratised access to expertise, and, last but definitely not least, enhanced reputation. Indeed, conducting research openly on the web, with the participatory online presence it requires, cannot but lead to enhanced scholarly visibility, which, as it has already been noted, and will be further elaborated upon in the section on networking, can and does contribute significantly to reputation building.

Take, for example, the specific case of data sharing. There is a growing recognition by researchers, their employers and their funders of the potential value in making new data available for sharing, which is why policy makers in Europe and the US have been considering for quite some time now taking steps to ensure access to digital data (Greenhow and Gleason, 2014; RIN, 2008; Whyte and Pryor, 2011). However, the advantages of publicly sharing research data with other researchers go beyond the scientific realm to encompass the reputational one, as well. 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 point of fact, there is also concrete evidence to support that this is indeed the case: Piwowar and Vision (2013) examined 10,555 studies to find if there was any 'citation benefit' to those that made data publicly available, compared to those that did not. The robust citation benefit from open data that they found after accounting for other factors affecting citation rate undoubtedly speaks in favour of the prestige-enhancing capabilities of the practice, for 'getting cited' has been long shown to be a major factor in scholarly reputation building (Meho, 2006; Moed, 2005; Nicolini and Nozza, 2008).

2.2.3 Networking

If there is a recurrent theme that seems to emerge from the discussion so far, it is the vital importance accorded in the scholarly world to connecting, communicating and hence, networking. It has always been so, but these days the shared-interests based formation of bonds and solidarity among distributed individuals has become both far more feasible and potentially rewarding. Indeed, the above-noted transformation of the 'invisible college' into its present-day reincarnation as an informal communication network, functioning as a scholarly in-group within a specialisation, with crosscutting ties between researchers, be they university-affiliated or lay experts, low-status or high-status, from the core or the periphery, established or novice, seems to be well underway. This, very much owing to the unprecedented, Web 2.0- afforded possibilities for scholars to congregate in a virtual area common to all of them order to share their work, ideas and experiences.

As a matter of fact, as White and Le Cornu (2011) suggest, with the social appropriation of new computing technologies, 'place' is the most appropriate metaphor to conceptualise the present-day nature of the web. Defining place as a sense of being present with others, they propose a typology for online engagement, which, seen as a continuum between 'visitors' and 'residents', captures the essence of people's experiences and visibility incurred preferences when they interact socially with others via a computer:

> "Visitors understand the Web as akin to an untidy garden tool shed. They have defined a goal or task and go into the shed to select an appropriate tool which they use to attain their goal... Visitors are unlikely to have any form of persistent profile online which projects their identity into the digital space... Issues of privacy and fear of identity theft are paramount, but there is also a sense that social networking activities are banal and egotistical. [For Visitors the web] is not a 'place' to think or to develop ideas and to put it crudely, and at its most extreme, Visitors do their thinking off-line. So Visitors are users, not members, of the Web and place little value in belonging online.
>
> Residents, on the other hand, see the Web as a place, perhaps like a park or a building in which there are clusters of friends and colleagues whom they can approach and with whom they can share information about their life and work... [T]hey are likely to consider that they 'belong' to a community which is located in the virtual... To Residents, the Web is a place to express opinions, a place in which relationships can be formed and extended. While they [too] use 'tools', they also use the Web to maintain and develop a digital identity. Since they also undertake many of the activities that Visitors do, their residency is an additional layer of interaction and activity. Residents [thus] see the Web primarily as a network of individuals or clusters of individuals who in turn generate content. Value online is assessed in terms of relationships as well as knowledge."

Evidently then, as Esposito (2013) and Veletsianos (2010) suggest, researchers aiming to enhance their reputation are likely to be more successful by adopting a resident approach rather than a visitor one. This, because cultivating digital identities and relationships online, indeed, turning the web into a crucial component of one's research undertakings, as Residents do, can be of great benefit for remaining relevant and visible.

True, as Veletsianos (2010) points out, these days an online presence can be assumed to exist regardless of whether a researcher has taken any steps to bring it about: search for any scholar online and at the very least you will find a departmental profile; however, there is every reason for researchers to cultivate their online presence. Interestingly, with all that traditional reputation building components, most notably, the measures reflecting the quantity of papers published in high-ranking journals and the number of citations they obtain, are held to be just as important as ever (CICS/CIBER, 2013; Harley et al., 2010; Housewright et al., 2013; Meho, 2006; Mulligan and Mabe, 2011; Mulligan et al., 2013; Nicolini and Nozza, 2008; RIN 2009; Rowlands et al., 2004;

Ware, 2008), cultivate they do indeed. As Van Noorden (2014), reporting on the results of the aforementioned, extensive *Nature* survey notes, the most-selected activity on both of the two major platforms, ResearchGate and Academia.edu, was simply maintaining a profile in case someone wanted to get in touch – which he takes to suggest that many researchers regard their profiles as a way to boost their professional presence online. No wonder then that another popular activity on these sites was the discovering of related peers.

2.2.4 Collaborating

Leading as it does to visibility-associated enhanced reputation, the much more extensive network of peers that a researcher can today build via the adoption of the Web 2.0 enabled open and participatory ways of working affords an invaluable basis for forming and maintaining collaborative teams, too (Weller, 2011). This, in an era, which, according to Hsieh (2013), who builds on previous findings, has seen a veritable paradigm shift in scientific research from a singular enterprise into an expanding social endeavour. Indeed, a host of studies cited by Hsieh (2013) and Tacke (2010) all testify to an increase in collaborative research. Apparently, since the second half of the 19th century, the number of one-author manuscripts has declined exponentially, and beginning in the 1950s, multi-author and multi-institute research papers have emerged as the primary products of scientific research in both the natural and social sciences, with hundreds of papers currently published each year having more than a hundred authors and even a handful with more than a thousand authors.

Beyond laying the foundations for future cooperative ventures by establishing a researcher in a networked community of likeminded people, participatory online activities can provide both serendipitous and actively-sought-out opportunities for discovering shared interests and igniting opportunities for scholarly collaboration. Thus, for example, according to Weller (2011), if researchers are constructing a research proposal and realise they need a partner with experience in a particular subject, they will approach someone in their online network who has blogged or tweeted knowledgeably about the subject, although alternatively, they may simply put out a direct online request. As online social networks allow an individual to reach many more people than it would have been possible in pre- social media times, and via far more platforms, too, these activities can become both easier to perform and more effective.

This social media afforded ease of collaborating with colleagues is beneficial from a reputation building and maintaining angle, too, for in academe it is not only what you produce, important a criterion for recognition as the quality of your research output is, but also who you are and where you come from ((Becher and Trower, 2001; Kling and McKim, 1999; Park, 1993). Thus, there can be a kind of 'reflected glory' to be gained from working in collaboration with other scholars, especially if they are among the more renown in the field. So much so, in fact, that, as Lindgren (2011) finds, it is the author's professional status, rather than the research design, its methods or the author's gender and nationality, that plays a significant role in researchers' citing behaviour.

A case in point is the ease with which these days geographically dispersed colleagues can come to know each other, at least by reputation, and, in result, possibly join forces in collaborative ventures. In point of fact, social media, playing, as they do, an increasingly important part in scholarly communication (Rowlands et al., 2011), might even be helping to break down the social and cultural barriers that prevent academics from the provinces of world-science taking their rightful place in the international research community. Indeed, as Wagner and Leydesdorff (2005) show, the networks of international collaborations that emerge external to policy decisions are formed through the individual interests of researchers seeking resources, true, but, just as much – reputation.

Furthermore, there is ample evidence, also cited by Hsieh (2013) and Tacke (2010) that collaboration holds considerable advantages for the researcher in terms of manuscript quality,

scientific output, citation number, and rates of manuscript acceptance. Given the Matthew-effect-governed reward structures within science, the scholarly achievements based professional recognition thus entailed by collaborative work leads to additional work and heightened reputation in a virtuous circle.

2.2.5 Assigning and calibrating quality, authority and trustworthiness

As a recently completed research project on trust and authority in scholarly communications in the light of the digital transition (CICS/CIBER, 2013) has shown, there seems to be very little fundamental change in the long-established perceptions and ensuing practices of scholarly information evaluation. Today's researchers may be wholly cognisant of the changing realities of conducting research, may be more or less aware of the need for and even the existence of alternative or at least additional tactics for quality and reliability evaluations, but their behaviour in all aspects of their research undertakings, inclusive of reputation building, is clearly guided by the long-established norms of peer-reviewed publications and citation-based metrics. Indeed, the strength of these norms seems to have grown as a result of the digital transition, the widening of the scholarly net and the greater competition this has ushered in. Researchers are typically recruited, promoted and obtain funding on the basis of their publication record in high impact factor peer reviewed journals and their citation scores.

Still, the various stakeholders in the scholarly world, most notably the researchers themselves, are very mindful indeed of the many shortcomings of traditional ways and means of assigning and calibrating quality, authority and trustworthiness[12]. This state of affairs, coupled with the above-noted increased competition characterising today's academe, must be the reason why researchers are unmistakably interested and curious about novel, social reviewing practices that can furnish them with additional information as to how they perform against their colleagues (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). These reviewing practices, as Greenhow and Gleason (2014), building on the work of Cohen (2007) suggest, can take two forms: *explicit review* and *implicit review*. Explicit review is the process whereby the scholarly 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), collected in the real-time social web on the activities that take place between viewing a paper and citing it, in order to provide immediate feedback about the performance of a journal, an author or an article.

However, for the time being neither the *explicit* nor the *implicit* model of review seems to be able to fully realise its set goal of complementing, indeed challenging more traditional quality assessment models in terms of coverage, efficiency and scalability. The former, because social feedback may be superficial, irrelevant, deliberately misleading or derogatory, and the latter, because metadata may be an inaccurate indicator, susceptible to gaming as it is (Greenhow and Gleason, 2014). In fact, as Wouters and Costas (2012) show in their rigorous examination of the various novel tools aimed at monitoring 'real time' how research findings are being read, cited and used, these cannot be used for research evaluation and assessment, at least not yet, not until they adhere to a far stricter protocol of data quality and indicator reliability and validity than they currently do.

In any case, as Weller (2012) points out, the agreed set of evidence that could be seen as acting as a proxy for excellence in research needs to be significantly expanded to include digital scholarship

[12] For critical analyses of the problems see Egghe and Bornman (2013) and Fitzpatrick (2009) on peer review; Falagas and Alexiou (2008), Monastersky, (2005), Rossner et al. (2007) and Seglen (1999) on the Impact Factor; Bornmann and Daniel (2008) on citation counts.

outputs. However, as he goes on to say, it may be that no such definitive list can be provided anymore. Thinking much along the same lines, Veletsianos and Kimmons (2012), citing the specific case of interpretive or positional work characterising, for example, the social sciences, also note the lack of an established framework of evaluation for judging the legitimacy or quality of research output that is distributed via non-traditional channels. Such a framework, yet to be developed, would need to consider complex aspects of digital publication, such as time invested, originality, transferability, impact, peer judgments, and usefulness to the field and to society.

If for evaluation purposes these novel ways and means of passing judgment on research performance are still evolving, they are already quite useful for reputational purposes. According to Wouters and Costas (2012), these alternative forms of impact measurement allow for a degree of self-assessment, enabling researchers, as they do, to see statistical evidence regarding the impact, usage, or influence of their work without too much effort. Thus they serve as 'technologies of narcissism', though not as 'technologies of control' yet, and can help researchers to showcase their achievements.

2.2.6 By way of summary

The just-concluded look at the reputation building facets of the research undertaking in today's digital, networked and increasingly open realities demonstrates the affordances and challenges contemporary scholars are faced with in their pursuit of this crucially important component of their work-life. As it has been shown, scholars' various activities in the course of their research undertakings, be these in the course of the actual producing of an original contribution to human knowledge, the dissemination of the by-products and outputs of their research work, the networking and collaborating with colleagues or the assigning and calibrating of quality and trustworthiness to others' research outputs, all have reputation-accruing goals. Indeed, alongside the scientific purpose driving each and every of the many activities comprising research work, there is a clearly discernible reputational purpose, too, and a fit-for-purpose mechanism enabling it, as delineated in Table 1 in the Annex.

3. The scholarship of integration

The second of Boyer's (1990) four components of scholarship, the scholarship of integration, is defined as the arraying of extant knowledge into larger intellectual patterns within a wider, cross-disciplinary context. Setting out as it does to connect individual discoveries and isolated facts by putting them within a wider, often multi- or interdisciplinary context, for example, in the form of a literature review, a textbook or a course, the scholarship of integration therefore seeks to critically analyse, interpret, draw together and bring new insight to bear on original research.

Obviously then, as the scholarship of integration is just as much concerned with creating knowledge as the scholarship of research, many of the characteristics of the research enterprise, as described in the preceding chapters, hold true for both. Nevertheless, there is a clear distinction between the scholarship of research and the scholarship of integration, which, according to Boyer, can best be understood by the questions posed. Those engaged in original research (discovery) ask 'What is to be known, what is yet to be found?'. Those engaged in integration ask 'What do the findings *mean*? Is it possible to interpret what's been discovered in ways that provide larger, more comprehensive understanding?'

The integrative mode of research, which combines perspectives, information, data, techniques, tools, perspectives, concepts, and/or theories, more often than not from two or more disciplines, thus aims at a wide-ranging exploration of problems from novel perspectives (for a detailed analytic portrayal of the range of traditional and novel activities comprising the scholarship of integration in the era of Science 2.0 see Table 2 in the Annex). This approach to

problem solving is especially suitable for tackling complex, societal often global challenges, which cannot be solved by a single disciplinary approach (Weller, 2011). Indeed, as Rhoten and Parker (2004) contend, interdisciplinarity has become synonymous with all things progressive about research and education, not because of some simple philosophic belief in heterogeneity but because of the scientific complexity of problems currently under study. Furthermore, according to Greenhow and Gleason (2014), funding agencies, such as the National Science Foundation in the USA and the Economic and Social Research Council (ESRC) in the UK, also champion integration as important catalysts of innovation. Perhaps inevitably then, interdisciplinary research has been receiving the widespread support that it has because of its expected benefits to science and society (Leahey et al., 2012).

Viewed from the point of view of the individual scholar, engaging in integrative research has its benefits, but also its costs. On the plus side, there is its intellectually challenging nature: integrative research work helps broaden mindsets, encourages thinking laterally or 'out of the box', enables researchers to do things that they could not do on their own, and has them interacting with and learning from people with different backgrounds, which in their turn, may give rise to fresh theoretical insights, indeed, generate 'breakthrough' research results (Conole et al., 2010; Carayol and Thi, 2005). Moreover, as Leahey et al. (2012) find in their study of 900 researchers, interdisciplinary research work improves their visibility in the scientific community as indicated by cumulative citation counts (a 10% increase in interdisciplinary research boosts citations by 15.7% over the course of one's career). This is obviously of crucial importance for the reputation of the researcher, given the above-noted, widely recognised stature of citations as a proxy for peer recognition and esteem.

However, an integrative research undertaking can be problematic, too, for the researcher, especially when it aims at disciplinary-boundaries crossing, which it almost by definition does. The roots of this, as Conole (2010) and Weller (2011) argue, are traceable to the discipline specialisation embedded in much academic practice. Thus, whilst the complexity and diversity of contemporary research requires for disciplines to be brought together around a single research question, as the current academic values and practices tend to be very much discipline-specific, the managing of the transition between disciplinary and cultural boundaries can be quite challenging. So is, for that matter, the level to which interdisciplinary researchers can master more than one discipline. It takes, therefore, more time, effort, diligence and coordination for scientists trained in disparate disciplines to work together (Leahey et al., 2012). In result of this state of affairs, the traditional academic career incentives do not stimulate interdisciplinary research (Carayol and Thi, 2005), and when scholars do opt for interdisciplinary research undertakings, as Leahey et al. (2012) find in their aforementioned study of interdisciplinary researchers, it brings on a 'production penalty': scholars with greater levels of engagement with interdisciplinary research experience lower levels of productivity, so that a 10% increase in interdisciplinary research engagement reduces productivity by almost as much (9.1%).

Complicating things further, evaluating integrative research outputs presents another set of problems. As Conole (2010) argues, it is not easy to obtain consensus among researchers from different disciplines, so that establishing standards of validity and effective criteria across subject domains is wrought with difficulties. Also, as it is hardly reasonable to expect that interdisciplinary researchers master more than one discipline to the same standard that a disciplinary researcher would be expected to attain, assessing an integrative contribution might present a challenge, too. Indeed, as Mallard et al. (2009) show in their study of how epistemological differences in peer review are negotiated, "discipline-specific ways of producing theory and methods are still the bedrock of peer evaluation". So much so, in fact, that as Rafols et al. (2012, p. 1282) conclude on the basis of previous studies as well as their own empirical investigation of the evaluation of interdisciplinary research, "...criteria of excellence in academia are essentially based on disciplinary standards, and this hinders interdisciplinary endeavours in general, and policy and socially relevant

research in particular". Thus, with all that the intellectual breadth of an interdisciplinary work may be of considerable value to science, it may not be accorded the credit it deserves.

Add to this that the prestigious journals tend to be strongly disciplinary (Weller, 2011), and interdisciplinary publications are seen as less prestigious (Conole, 2010), and it becomes quite obvious why researchers claim that integrative research undertakings 'come at a price', have 'long-term costs', and are 'completely risky in the long run' (Rhoten and Parker, 2004). To be sure, according to Jacobs and Frickel (2009), this relative absence of epistemic clarity is likely indeed to impact on the trajectory of interdisciplinary careers, as reflected in the results from a survey of researchers working in five interdisciplinary programs (Rhoten, 2004; Rhoten and Parker, 2004). Younger faculty and especially graduate students express more enthusiasm for interdisciplinary work, claim more experience working in interdisciplinary contexts, and develop more interdisciplinary than disciplinary connections than do their more senior colleagues. At the same time, younger researchers are also more likely to identify particular costs associated with the decision to pursue an interdisciplinary research track, including expectations that they would encounter obstacles to employment and tenure.

An evolving solution to the problem, as proposed by both Weller (2011) and Rhoten (2004), is harnessing Open Science 2.0 afforded, more 'lightweight' forms of communication to help overcome existing disciplinary boundaries and thereby foster interdisciplinary knowledge sharing. Information sharing networks may indeed often yield 'harder to count', but equally important – albeit different – outputs, such as public policy initiatives, popular media placements, alternative journal publications, or long-term product developments. However, while these are the opportunities that often draw individuals to interdisciplinary work, they are also some of the most under-appreciated and unrewarded activities within today's academy, especially from a reputation building angle.

This exploration of the reputation building facets of the research process in the scholarship of integration shows them to be potentially more easily supported in in our present-day era of Open Science 2.0, but, at the same time, to be more challenging, too. Offering, as this research-focused mode of scholarship does, cross-disciplinary solutions to real world problems as well as integrative portrayals of multi-faceted scholarly knowledge in the form of literature reviews, textbooks or educational resources, it has the potential to contribute greatly to science and society. This could bring considerable reputational gains to the scholar, as demonstrated in Table 2 in the Annex, especially if they utilise for the purpose the social media based networking tools and platforms available today. However, given the costs associated with the decision to opt for integrative research pursuits, most notably where employment, promotion and tenure are concerned, taking this route certainly necessitates careful consideration on the part of the individual scholar.

4. The scholarship of application

The scholarship of application is the third of the four components that according to Boyer (1990) comprise scholarship. Defined as the application of disciplinary knowledge and skill to societal/practical problems, it sets out to aid the wider world outside academia via the judicious utilisation of scholarly knowledge and expertise. Thus, whilst the scholarships of research and integration reflect the investigative and synthesising traditions, the scholarship of application moves toward engagement as the scholar asks 'How can knowledge be responsibly applied to consequential problems?' 'How can it be helpful to individuals as well as institutions?', and even 'Can social problems themselves define an agenda for scholarly investigation?' However, as Boyer clarifies, "...a sharp distinction must be drawn between *citizenship* activities and projects that relate to scholarship itself. To be sure, there are meritorious social and civic functions to be performed, and faculty should be appropriately recognized for such work. But all too frequently, service means not doing scholarship but doing good. To be considered scholarship, service activities must be tied

directly to one's special field of knowledge and relate to, and flow directly out of, this professional activity. Such service is serious, demanding work, requiring the rigor and the accountability traditionally associated with research activities" (pp.21-22).

Linking theory to practice through dynamic interaction, the scholarship of application thus sees scholars partnering with various stakeholders (e.g. practitioners, policymakers, community leaders) to apply theory and research-based insights to designing practical solutions to intractable social problems (Greenhow and Gleason, 2014). Setting out as it does to address community or industrial/organisational challenges, it "opens up the boundaries between academia and the real world", as Pearce et al. (2010) so aptly put it. This, via activities such as serving industry or government as an external consultant; using scholarly expertise and/or knowledge to benefit one's professional/ disciplinary community (i.e. sitting on committees, serving as a journal editor, assuming leadership roles in professional organisations); releasing to the public full details of a potentially useful invention/discovery, often registered as a patent; producing a community-interest driven, application oriented research output (for a detailed analytic portrayal of the range of traditional and novel activities comprising the scholarship of application in the era of Science 2.0 see Table 3 in the Annex).

The notion of science communicated with the express purpose of informing practice has nothing new to it, of course; it is the well-known and much studied basis for the scholarship of application. As we are about to see, in the era of Science 2.0 this communication process can assume wholly different dimensions, but first, a look at science communication as a multifaceted process of knowledge exchange can provide us with the context and background needed to understand the potential developments concerning application scholarship.

The typology of science communication proposed by Harwood and Schibeci (unpublished manuscript, cited in Palmer and Schibeci, 2014, p. 513) describes the process of knowledge exchange as involving particular types of actors who want to communicate their knowledge to others. There is a relationship among the actors, based on the kind of knowledge that is being exchanged and their assumed understanding of that knowledge; there is a purpose for communicating the knowledge; and the mechanisms of knowledge exchange are predicated on the relationship between the actors and the purpose for communicating the knowledge.

- Type 1 is Professional science communication in which knowledge is exchanged among scientists, and is associated with the professional practice of science.
- Type 2, Deficit science communication, is characterised by a flow of knowledge exchange from scientists to 'the public', broadly understood.
- Type 3, Consultative science communication, is knowledge exchanged iteratively from scientists to the non-scientific public, and from the non-scientific public to the scientists.
- Type 4, Deliberative science communication, shows similar characteristics to Type 3, but comprises what are essentially more democratic and deliberative aspects. In this case, however, the principal actors have equal standing, and scientific knowledge and local knowledge are mutually respected.

Proceeding from this typology of science communication, Palmer and Schibeci (2014) identify three main models of science/practice communication: the 'deficit' model, the 'dialogue', 'interactive', 'two-way' or 'consultation' model, and the 'participation' model. In the 'deficit' model the public is considered to have a low level of understanding, which needs to be overcome in order to make what scientists consider to be 'rational' decisions. Thus, the communication of science is seen as a unidirectional flow of information from scholars to lay receivers. In the 'dialogue' model, citizens work actively with science knowledge, as well as drawing on knowledge which is specific to a local context. Nevertheless, it is not an equal relationship; although members of the public may be given the opportunity to voice concerns and ask questions, the scholars are more concerned with

promoting the merits of scientific knowledge in the interests of engendering support, or at least lessening hostility. In the 'participation' model citizens have a direct and active role in shaping research agendas, with both parties seeking to understand one another through deliberative and democratised, collaborative procedures.

Apparently then, these days the practicing of application oriented scholarship can be a very different undertaking indeed, courtesy of the Science 2.0 afforded approaches to addressing community challenges. To be sure, as Grand et al. (2012, p. 683) suggest, with Web 2.0 social media tools, predicated on interpersonal networking, rendering the boundaries of the scientific community more porous, lay experts' participation can go beyond "counting, checking, and organizing data to involvement in the full complexities of the research process and in dialogue with researchers". Thus, public groups are offered the opportunity to engage not just with the published outcomes of science but also with its processes, including methodologies, codes, models, and raw data.

These joint ventures, which, as Greenhow and Gleason (2014, p. 399) suggest, "break down traditional binaries like research/practice, scholar/participant, inside/outside and contributor/user", can prove to be advantageous for both the lay and the scholarly researchers participating. For the former, it is the opportunities for 'sustained dialogue' among groups normally excluded from decision making. For the latter, it is the opportunities to open up "fresh interconnections between public, scientific, institutional, political and ethical visions of change in all their heterogeneity, conditionality and disagreement" (Irwin, 2008, p. 210). Obviously, too, the opening of the entire process of research to the scrutiny of public collaborators and audiences contributes significantly to the achieving of public visibility and societal impact, both of which can enhance scholarly prestige. Also, very interestingly indeed, a study canvassing 3500 researchers has clearly shown that, contrary to what is often suggested, scientists who engage with society perform better academically (Grand et al., 2012; Jensen et al., 2008).

It is not that professional/non-professional alliances for research purposes hold no problems for the scientists - rather the contrary. They may have apprehensions about a lack of shared language between research and lay communities, which may lead to fears of misunderstandings of methods and practices; they may be concerned about time taken away from 'real' work; they may be worried that such publicly transparent practices may lead to their being 'scooped'; they may find engagement activities irrelevant, pointless or not enjoyable (Jensen et al., 2008).

However, perhaps above all, a major discourager for scholars to take on community-interest driven, application oriented research projects is that many scholarly outcomes of faculty public service work remain unpublished (Braxton et al., 2002). In the scholarly world, where success is measured by the number of publications in top journals, a project which accrues no scientific-achievements based eligibility for recognition is likely to be regarded as hardly worthwhile doing. This is all the more so, as Jaeger and Thornton (2006) contend, considering that these unpublished endeavours are often not considered for promotion and tenure purposes. Even in institutions that formally recognise multiple forms of scholarship, so that faculty may experience a pressure to excel in all areas of scholarship, research is still most prominent. As Sandmann et al. (2008) assert, it is one thing to change the policy and still another to change the culture. Indeed, with evaluation standards for public participation based cooperative projects remaining ambiguous at most institutions, even when the results of such an investigation yield societal publications, such as newspaper articles, television appearances, presentations for non-academic audiences, exhibitions, websites and social media, they 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).

Apparently then, the scholarship of application, just as much as the aforementioned two other modes of research-focused scholarship, hold great potential for enhancing a scholar's standing and reputation. Here too, however, this comes at a cost. Thus, as it can be seen in Table 3 in the Annex, each of the application oriented research activities has obvious reputation-enhancing capabilities for the scholar, whether it is offering consultancy for industry or government, devising solutions for societal, communal, organisational or industrial problems, producing patented commercial applications, benefiting one's own professional/disciplinary community via serving on committees or fulfilling editorial roles or popularising scientific knowledge for the general public. All have the potential for entailing scientific-achievements eligibility for peer recognition and career-related rewards/research opportunities, as well as public visibility and societal impact, which can enhance scholarly prestige, too. Still, where the application-oriented activity cannot be readily translated into conventional research outputs, most notably journal articles, the price to be paid for engaging in application oriented projects may arguably be seen as too high.

5. 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, extends beyond its commonly held perceptions. Setting out as it does to stimulate active learning and critical, creative ways of thinking, scholarly teaching thus involves the building upon the latest ideas in a given disciplinary field as well as current ideas about teaching in the field, the creating of practices of classroom assessment and evidence gathering, peer collaboration and peer review. Thus, as Greenhow and Gleason (2014) point out, the teaching dimension of the scholarly undertaking requires that scientists take a studied approach to pedagogy in order to achieve evidence-based 'best' teaching practices. However, with the scholarship(s) of research – for, as it has already been noted, the scholarships of integration and application also qualify for the term – steadfastly held to be the most legitimate, acceptable and rewarding form of the scientific pursuit (see, for example, Braxton et al., 2002), the focus of the profession is inevitably elsewhere.

This, when novel perceptions of the teaching/learning process, coupled with the affordances of Open Science 2.0, have the potential to realise Boyer's vision of the scholarship of teaching transforming, extending and enhancing students' learning. Indeed, the detailed analytic portrayal of the range of traditional and novel activities currently comprising the scholarship of teaching, presented in Table 4 in the Annex, reflect novel approaches to the efforts aimed at achieving effective learning.

According to Brew (2003), the qualitatively different conceptions of teaching and learning held by higher education teachers are traceable to the different ways in which they approach their teaching. Thus, whilst the old model, known as the 'information transmission/teacher focused' approach to teaching, presupposed a conception of teaching that was teacher-focused and concentrated upon information transmission, the new model, labelled the 'conceptual change/student focused' approach, proceeds from a notion of student-focused teaching that concentrates on bringing about change in students' conceptions of the phenomena of their study. In the new model, then, as Brew (2003, p. 109) goes on to say, "research and teaching are both viewed as activities where individuals and groups negotiate meanings, building knowledge within a social context". Hardly surprisingly, therefore, incorporating the open and social approaches based digital ways and means of teaching, so conveniently on offer these days, can facilitate the kinds of transformative and active learning best suited by current thinking to promote effective learning.

First and foremost, perhaps, as Pearce et al. (2010) suggest, with the advent of a wide variety and high quality of freely available academic content online, the individual student is no longer limited by the physical resources they can locate. Thus, the lecturer/university is no longer regarded as the sole source, not to say gatekeeper of knowledge, as the learner can pick and choose elements from

a variety of courses, provided freely by any number of diverse institutions. This ubiquitous access to an unprecedented wealth of digitised learning resources, brought about by the adoption of open educational resources (OER) policies by a wide variety of governmental, institutional and philanthropic organisations (Veletsianos and Kimmons, 2012) is further bolstered by the many, social-media afforded networked spaces that invite participatory engagement in scholarly discussions (Veletsianos, 2010). There are then firm underpinnings to enable the above-noted shift to learner-centred, active learning.

By the same token, the increasingly more prevalent practice of creating open courses and/or making openly available course materials to the public also pave the way for supporting current conceptual approaches to learning. As Couros (2010) suggests, the creation of Personal Learning Environments (PLEs) – flexible and meaningful digital spaces that contain dynamically updated and personally relevant information – through the harnessing of such freely and conveniently available aggregated learning resources, certainly enables individuals to take their rightful place at the very heart of the learning process. Also, as Tacke (2010) concludes on the basis of the experiences in two open courses, in which students interacted with the public via their personal, publicly accessible blogs and a wiki, opening up the discussion in this way brought along added richness of broader perspectives for the participants.

From the point of view of the scholar, engaging in the scholarship of teaching can be rewarding on two levels. Firstly, pursuing research into teaching and learning, and incorporating into it reflection, communication and dissemination about classroom practices, can be just as conducive to achievement-based eligibility for peer recognition, and the potentially ensuing, career related benefits, as any other research undertaking. After all, scholars would surely report the results of their efforts in the form of a scholarly publication. Also, if the actual teaching done is not confined to the four walls of the classroom, as is the case with teacher focused, face-to-face, institution-based, often access controlled courses, it can lead to enhanced scholarly and public visibility. This is especially true where social networks based, crowd-sourcing technologies enabled participatory MOOCs (massive open online courses) are concerned. In point of fact, these MOOCs demonstrate most eloquently the potential of scholarly teaching, possibly for meaningful pedagogical achievements, although this is seen as controversial (Bates, 2012), but certainly for reputation building.

MOOCs, so dubbed by Dave Cormier after his analysis of one of the first MOOCs (Weller and Anderson, 2013), first landed in the spotlight, according to Lewin (2012) in 2011 when Sebastian Thrun, a Stanford professor, offered a free artificial-intelligence course attracting 160,000 students in 190 nations. The resulting storm of publicity galvanized elite research universities to offer similar courses, which offer no credentials, but do seem to aim at what Katz (2010, p. 49) considers the goal of the scholarship of teaching in the digital age: "preparing students to understand the nature of information, to evaluate evidence and its political, historical, scientific, and social contexts, and to study both information and evidence in rigorous and valid ways".

However, as Daniel (2012) contends, the real revolution of MOOCs is that they can achieve the broader purpose of Boyer's (1990) book, which was to encourage the emergence of a scholarship of teaching alongside the scholarships of discovery (research), integration and application. This, because placing their MOOCs in the public domain for a worldwide audience will oblige institutions to do more than pay lip service to importance of teaching and put it at the core their missions. If so, scholars conducting MOOCs stand to gain twice: their teaching achievements will be taken into consideration whilst the massive and unlimited, globe-spanning visibility, which is an inherent feature of MOOCs, will surely continue to contribute significantly to their scholarly and public reputation.

Plainly then, running contrary to widely held notions, the activities pertaining to the scholarship of teaching can aid a scholar in achieving their reputational purposes, as it clearly emerges from the in-depth, analytic exploration offered in Table 4 in the Annex. This, if and when teaching is approached, as Boyer (1990) suggests, in a manner similar to research-focused undertakings, as a disciplinary- and pedagogical-knowledge based and peer-authorised enterprise, which can result in expert achievements-based eligibility for peer and student recognition and esteem, and for the potentially ensuing career-related rewards/opportunities. Here too, the affordances of Open Science 2.0 can go a long way towards furthering scholarly reputation building, as the specific example of MOOCs amply demonstrates, bringing about as they do online scholarly and public visibility and substantial opportunities for reaching multiple and diverse audiences, for gaining peer and public recognition, for advancing social networking and for enhancing one's digital identity.

6. 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 (2011) update Boyer's (1990) seminal model of scholarship by proposing the addition of a fifth dimension, the scholarship of co-creation. This, because, as they contend, 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 accurately reflects today's increasingly converging processes of knowledge discovery and knowledge transmission and the resultant blurring of the distinction between the roles of researcher and teacher. Indeed, the analytic delineation of the activities that can be seen as comprising the scholarship of co-creation, presented in Table 5 in the Annex, demonstrates that in these digital days of social media facilitated Science 2.0, the collaborative discovery of new knowledge and the processes of participatory learning intertwine at times to form a whole.

Arguably, the most obvious instances of co-creation can be seen in the increasingly widespread trend of public participation in scientific research (PPSR). Defined as intentional collaborative endeavors between science researchers and public participants – including but not limited to amateur experts, concerned community members, scientists trained in other fields, and/or school students – aiming to generate new, science-based knowledge to address real-world problems (Shirk et al. 2012), PPSR projects can be seen as following three models, according to the varying degrees of public participation in the scientific research process: contributory, collaborative and co-created PPSR projects (Bonney et al., 2009).

A Contributory PPSR project, also referred to in the literature as a citizen science research project, is typically designed and led by scientists, with members of the public primarily contributing data. A Collaborative PPSR project, also referred to as a community involvement/adaptive citizen science/adaptive co-management research project, is typically designed and led by scientists, with members of the public contributing data but also helping to refine project design, analyse data and disseminate findings. A Co-Created PPSR project, also referred to as a participatory/participatory action research project, is typically designed by scientists and members of the public working together, with the public participants actively involved in most or all aspects of the research process. Although yielding somewhat differing outcomes (for a detailed comparison see Shirk et al., 2012), the three models share both scholarship-promoting capabilities and a strong reputation building capacity in terms of scholarly and public visibility, which may lead to scholarly as well as societal recognition and esteem. If nothing else, as Bonney et al. (2009, p. 12) muse, "[Although] few instances where PPSR project participation has affected attitudes toward science have been documented… individuals who learn to function as scientists, or at least to understand how scientists work could be expected to increase their already positive attitudes towards science."

Looking at these co-creative activities, as they are delineated in Table 5 in the Annex, from the specific angle of reputation building, demonstrates their strengths in this area, too. PPSR projects,

inviting as they do amateur experts and informed citizens to join the scholarly net, can bring about increased visibility for the scholar. No less importantly, the fact that such projects yield both formally structured, conventional scientific papers and societal publications, serves to accrue for the scholar both scientific-achievements based eligibility for peer recognition and esteem and societal impact (this last, in its turn, as it has already been noted, can enhance scientific prestige, too). Plainly, this is a win-win situation for the scholar, at least from the reputational point of view.

II. CONCLUDING REMARKS

If there is a recurring theme emerging from the just-concluded, literature-based review of the way the scholarly endeavour is undertaken these days, it is the extent to which its circumstances are in a flux. The comprehensive picture presented on the preceding pages bears testimony to the ongoing relevance of core professional norms values dictated work conventions, whilst a host of Science 2.0 afforded, rapidly evolving opportunities converge to invite change. Today's scholars thus construct, sustain and enhance their standing and reputation against the backdrop of a shifting scholarly landscape, where the pursuit of science can become a more dynamic, open and participatory, but, at the same time, also a more tentative and uncertain activity.

Take, for example, the greater visibility afforded by transparent and open practices. With all their obvious advantages for reputation building and maintaining, they may occasionally prove to be a two-edged sword, at least in the eyes of some. A case in point is the negative exposure which is often believed to result from making mistakes online. As Tacke (2010) rightly points out, although mistakes are inherent to a research/learning process, people nevertheless may be reluctant to publicly make mistakes or to admit to all and sundry that mistakes have been made, for fear of losing prestige. By the same token, if in keeping with traditional scholarly ways of working, it is refined, rather than in-progress work that is to be shared with colleagues, the posting of draft versions of a manuscript may represent for the researcher a possibly not very welcome break with established practices (Veletsianos, 2013).

It is in the context of the changes characterising today's scholarly scene, where the scientist is faced with strong incentives to embrace open and participatory ways and means of working at the same time that these also question some of the traditionally held elements of scholarly practice, that the next stages of the study needed to establish how today's digital scholars actually construct, sustain and enhance their standing and reputation.

III. REFERENCES

Åkerlind, 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. and Rumbley, l. (2009). *Trends in global Higher Education: Tracking an academic revolution*. Chestnut Hill, MA: Boston College Center for International Higher Education.

Bates, T (2012). What's right and what's wrong about Coursera-style MOOCs? Available at: http://www.tonybates.ca/2012/08/05/whats-right-and-whats-wrong-about-coursera-style-moocs/

Bauerlein, M., Gad-el-Hak, M., Grody, W., McKelvey, B., and Trimble, S.W. (2010). We must stop the avalanche of low-quality research. *The Chronicle of Higher Education*, June 13, 2010. Available at: http://chronicle.com/article/We-Must-Stop-the-Avalanche-of 65890.

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: The Society for Research into Higher Education & Open University Press.

Becher, T., and Trowler, P. (2001). *Academic tribes and territories: Intellectual enquiry and the culture of disciplines*. McGraw-Hill International.

Bess, J.L. (2000). *Teaching alone teaching together: transforming the structure of teams for teaching*. Chapter One: Tasks, talents, and temperaments in teaching the challenge of compatibility. San Francisco: Jossey, 1-32.

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*. MIT Press, Hong Kong.

Bornmann, L. and Daniel, H.D. (2008). What Do Citation Counts Measure? A Review of Studies on Citing Behavior. *Journal of Documentation*, 64(1), 45-80.

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.

Braxton, J. M., Luckey, W., and 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.academicevolution.com/2009/08/the-open-scholar.html

Carayol, N., and Thi, T.U.N. (2005). Why do academic scientists engage in interdisciplinary research?. *Research Evaluation*, 14(1), 70-79.

Casadevall, A., and Fang, F.C. (2012). Reforming science: methodological and cultural reforms. *Infection and Immunity*, 80(3), 891-896.

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

Colquhoun, D. (2011). Publish or perish: peer review and the corruption of science. *The Guardian*, 5 September, 2011. London, UK. Available at: http://www.theguardian.com/science/2011/sep/05/publish-perish-peer-review-science

Conole, G., Scanlon, E., Mundin, P., and Farrow, R. (2010). *Interdisciplinary research - Findings from the Technology Enhanced Learning Research Programme. TLRP, UK.* Available at: http://www.tlrp.org/docs/TELInterdisciplinarity.pdf

Couros, A. (2010). Developing personal learning networks for open and social learning. In: Velettsianos, G., (Ed). *Emerging technologies in distant education*. Edmonton, AB: Athabasca University Press, 109-128.

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., and 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

De Rond, M. and Miller, A.N.(2005). Publish or perish: bane or boon of academic life?. *Journal of Management Inquiry*, 14(4), 321-329.

Dewett, T., and Denisi, A. S. (2004). Exploring scholarly reputation: It's more than just productivity. *Scientometrics*, 60(2), 249-272.

Egghe, L. and Bornmann, L. (2013). Fallout and Miss in Journal Peer Review. *Journal of Documentation*, 69(3), 411-416.

Esposito, A. (2013). Neither digital or open. Just researchers: Views on digital/open scholarship practices in an Italian university. *First Monday*, 18(1).

Falagas, M.E. and Alexiou, V.G. (2008). The Top-Ten in Journal Impact Factor Manipulation. *Archivum Immunologiae et Therapiae Experimentalis*, *56*(4), 223-226.

Fitzpatrick, K. (2010). Peer-to-Peer Review and the Future of Scholarly Authority. *Social Epistemology*, 24(3), 161-179.

Garnett, F., and Ecclesfield, N. (2012). Towards a framework for co-creating open scholarship. *Research in Learning Technology*, *19*. ALT-C 2011 Conference Proceedings.

Garvey, W.D., Tomita, K. and Woolf, P. (1974). The dynamic scientific information user. *Information Storage and Retrieval*, 10, 115-131.

Garvey, W. (1979). *Communication: The essence of science: Facilitating information exchange among librarians, scientists, engineers and students*. Oxford: Pergamon Press.

Goodfellow, R. (2013). The literacies of digital scholarship–truth and use values. In: Goodfellow, R. and Lea, M.R. Eds., *Literacy in the Digital University: Critical Perspectives on Learning, Scholarship and Technology*, 67-78.

Grand, A., Wilkinson, C., Bultitude, K., & Winfield, A. F. (2012). Open science a new "trust technology"?. *Science Communication*, 34(5), 679-689.

Greenhow, C. and 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. and 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*, 1-18.

Harley, D., Acord, S.K., Earl-Novell, S., Lawrence, S., and 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

Hartley, M. and Harkavy, I. (2011). The civic engagement movement and the democratization of the academy. In: Longo, N.V. and Gibson, C.M., Eds. *From command to community: A new approach to leadership education in colleges and universities*. Medford, Mass.: Tufts University Press, 67-82.

Heap, T., and Minocha, S. (2012). An empirically grounded framework to guide blogging for digital scholarship. *Research in Learning Technology*, *20*.

Housewright, R., Schonfeld, R. C., and Wulfson, K. (2013). *Ithaka S+ R US Faculty Survey 2012*. Available at: http://lgdata.s3-website-us-east1.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*. London, England: Routledge, 199-212.

Jacobs, J. A., & Frickel, S. (2009). Interdisciplinarity: A critical assessment. *Annual Review of Sociology*, 35, 43-65.

Jaeger, A. J., and Thornton, C. H. (2006). Neither honor nor compensation faculty and public service. *Educational Policy*, 20(2), 345-366.

Jensen, P., Rouquier, J. B., Kreimer, P., and Croissant, Y. (2008). Scientists who engage with society perform better academically. *Science and Public Policy*, 35(7), 527-541.

Katz, R. N. (2010). Scholars, scholarship, and the scholarly enterprise in the digital age. *Educause Review*, 45(2), 44-56.

Kling, R. and McKim, G. (1999). Scholarly communication and the continuum of electronic publishing. *Journal of the American Society for Information Science,* 50(10), 890-906.

Kumashiro, K., Pinar, W., Graue, E., Grant, C., Benham, M., Heck, R. Scheurich, J.J., Luke, A. and Luke, C. (2005), Thinking collaboratively about the peer-review process for journal-article publication. *Harvard Educational Review*, 75 (3) 257–285.

Kwiek, M. (2012). The growing complexity of the academic enterprise in Europe: A panoramic view. *European Journal of Higher Education*, 2(2-3), 112-131.

Leahey, E., Beckman, C. and Stanko, T. (2012). The impact of interdisciplinarity on scientists' careers. In: *Annual Meeting of The American Sociological Association, Denver, CO*.

Lewin, T. (2012). College of future could be come one, come all. *The New York Times*, November 19, 2012

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., and Guetzkow, J. (2009). Fairness as appropriateness negotiating epistemological differences in peer review. *Science, Technology & Human Values*, 34(5), 573-606.

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.

Monastersky, R. (2005). The Number That's Devouring Science. *The Chronicle*, *52*, A12.

Mulligan, A., Hall, L., and Raphael, E. (2013). Peer review in a changing world: an international study measuring the attitudes of researchers. *Journal of the American Society for Information Science and Technology,* 64(1), 132–161.

Mulligan, A. and Mabe, M. (2011). The Effect of the internet on researcher motivations, behaviour and attitudes. *Journal of Documentation*, 67(2), 290-311.

Nicholas D. and Rowlands, I. (2011) Social media use in the research workflow. *Information Services and Use,* 31(1-2), 61-83.

Nicolini, C. and Nozza, F. (2008). Objective assessment of scientific performances world-wide. *Scientometrics*, 76(3), 527-541.

O'Loughlin, D., MacPhail, A., and Msetfi, R. (2013). The rhetoric and reality of research reputation: 'Fur coat and no knickers'. *Studies in Higher Education*, 8, 1-15.

Oxford English Dictionary. Available at: http://www.oed.com/

Palmer, C. L., Teffeau, L. C., & Pirmann, C. M. (2009). *Scholarly information practices in the online environment: Themes from the literature and implications for library service development.* Report commissioned by OCLC Research. Available at:

http://www.oclc.org/content/dam/research/publications/library/2009/2009-02.pdf?urlm=162919

Palmer, S. E., & Schibeci, R. A. (2014). What conceptions of science communication are espoused by science research funding bodies?. *Public Understanding of Science*, 23(5), 511-527

Park, T.K. (1993). The nature of relevance in information retrieval: An empirical study. *Library Quarterly*, 63(3), 318-351.

Pearce, N., Weller, M., Scanlon, E., & Kinsley, S. (2012). Digital scholarship considered: How new technologies could transform academic work. *In Education*, 16(1).

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.

Piwowar, H. A., and Vision, T. J. (2013). Data reuse and the open data citation advantage. *PeerJ*, *1*, e175.

Ponte, D., and 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.

Price, D.J. de Solla (1975). *Science since Babylon*. New Haven, CT.: Yale University Press.

Procter, R., Williams, R., Stewart, J., Poschen, M., Snee, H., Voss, A. and 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., and 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.

Rhoten, D. (2004). Interdisciplinary research: Trend or transition. *Items and Issues*, 5(1-2), 6-11.

Rhoten, D., and Parker, A. (2004). Risks and rewards of an interdisciplinary research path. *Science(Washington)*, 306(5704), 2046.

RIN (Research Information Network), (2010). *If you build it, will they come? How researchers perceive and use Web 2.0. A Research Information Network Report*. Available at: http://www.rin.ac.uk/system/files/attachments/web_2.0_screen.pdf

RIN (Research Information Network), (2009). *Communicating knowledge: How and why UK researchers publish and disseminate their findings. A Research Information Network Report*. Available at:

https://dspace.lboro.ac.uk/dspace-jspui/bitstream/2134/5465/1/Communicating-knowledge-report.pdf

RIN (Research Information Network), (2008). *To share or not to share: Publication and quality assurance of research data outputs. A Research Information Network Report*. Available at: http://www.rin.ac.uk/our-work/data-management-and-curation/open-science-case-studies

Rossner, M., Van Epps, H. and Hill, E. (2007). Show Me the Data. *The Journal of Cell Biology*, *179*(6), 1091-1092.

Rowlands, I., Nicholas, D., and 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. and Watkinson, A. (2011). Social media use in the research workflow. *Learned Publishing*, 24(3), 183-195.

Sandmann, L., Saltmarsh, J., and O'Meara, K. (2008). An integrated model for advancing the scholarship of engagement: Creating academic homes for the engaged scholar. *Journal of Higher Education Outreach and Engagement*, 12(1), 47-64.

Scanlon, E. (2014). Scholarship in the digital age: Open educational resources, publication and public engagement. *British Journal of Educational Technology*, *45*(1), 12-23.

Schott, T. (1991). The world scientific community: Globality and globalisation. *Minerva*, 29, 440-462.

Schott, T. (1998). Ties between center and periphery in the scientific world-system: Accumulation of rewards, dominance and self-reliance in the center. *Journal of World-Systems Research*, 4(2), 112-144.

Seglen, P.O. (1999). Causal Relationship between Article Citedness and Journal Impact. *Journal of the American Society for Information Science*, *45*(1), 1-11.

Shirk, J. L., Ballard, H. L., Wilderman, C. C., Phillips, T., Wiggins, A., Jordan, R., ... and 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.

Stafford, N. (2010). Science in the digital age. *Nature*, 467(7317), S19-S21.

Storer, N.W. (1967). The hard sciences and the soft: Some sociological observations. *Bulletin of the Medical Library Association*, 55, 75-84.

Tacke, O. (2011). Open Science 2.0: How research and education can benefit from open innovation and Web 2.0. In: *On collective intelligence*. Springer Berlin Heidelberg, 37-48.

Tenopir, C., Volentine, R. and King, D.W. (2013) Social media and scholarly reading. *Online Information Review*, 37(2), 193- 216.

Travaille, A.M. and Hendriks, P.H. (2010). What keeps science spiralling? Unravelling the critical success factors of knowledge creation in university research. *Higher Education*, 59(4), 423-439.

Truex, D., Cuellar, M., Vidgen, R. and Takeda, H. (2011). Emancipating scholars: Reconceptualizing scholarly output. *7th International Critical Management Studies Conference (Cms7 2001). Naples, Italy, July 11-13, 2011.* Naples, Italy: CMS7

Van Dalen, H.P. and 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.

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. (2010). Participatory scholars and 21st century scholarship. *ITForum Discussion Paper,* April, 12-16.

Veletsianos, G. and Kimmons, R. (2012). Assumptions and challenges of Open Scholarship. *The International Review of Research in Open and Distance Learning*, 13(4), 166-189.

Voas, J., Hurlburt, G.F., Miller, K.W., Laplante, P.A. and Michael, B. (2011). Thoughts on Higher Education and scientific research. *IT Professional*, 13(2), 6-9.

Wagner, C. S., and Leydesdorff, L. (2005). Network structure, self-organization, and the growth of international collaboration in science. *Research policy*, 34(10), 1608-1618.

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

Weller, M. (2012). Digital scholarship and the tenure process as an indicator of change in universities. *RUSC. Universities and Knowledge Society Journal*, 9(2), 347–360. Available at:

http://elcrps.uoc.edu/ojs/index.php/rusc/article/viewFile/v9n2-rubio/v9n2-dossier-eng#page=89

Weller, M., and Anderson, T. (2013). Digital resilience in higher education. *European Journal of Open, Distance and E-Learning*, 16(1), 53.

White, D. S. and Le Cornu, A. (2011). Visitors and Residents: A new typology for online engagement. *First Monday*, 16(9).

Whyte, A., and Pryor, G. (2011). Open science in practice: Researcher perspectives and participation. *International Journal of Digital Curation*, 6(1), 199-213.

Wouters, P. and 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

IV. ANNEX

Table 1: The scholarship of research[13]: scholarly activities and reputation mechanisms

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Identifying a researchable topic	Detecting a gap in human knowledge which can be translated into a potentially solvable problem	Finding and formulating research question(s) to be pursued in order to extend/ change/contest extant knowledge	Producing persuasive evidence of both the significance of the proposed problem and its solvability in order to look into collaboration and funding possibilities	Constructing and refining through iterative exposure to colleagues an informally presented proposal for peer scrutiny of its validity and worth
Planning a research project	Defining and scoping a scholarly investigation towards producing an original contribution to human knowledge	Establishing how the theoretical perspective and the insights offered by the confirmed knowledge will combine with the data to be collected to inform the research question(s)	Producing persuasive evidence of scholarly proficiency-based ability to conduct the investigation as proposed, in order to enlist collaborators and obtain funding	Constructing and refining through iterative exposure to colleagues/funding bodies a formally structured proposal suitable for peer evaluation of its quality, authority and reliability
Building upon previous knowledge	Accessing, selecting, perusing/ reading, interpreting, critically analysing, using and citing reports of previously established knowledge	Conceptualising and contextualising a scientific truth-claim so that it can serve its goal of extending the certified knowledge already in existence	Attaining scholarly expertise- and proficiency-based eligibility for peer recognition and esteem	Demonstrating scholarly competence via the judicious selection of high quality and trustworthy scientific content to build upon
Requesting/providing help in locating research literature	Requesting/providing help in locating research literature inaccessible via a library or on the open web	Anchoring a research undertaking in the conceptual basis of a scholarly field	Achieving enhanced disciplinary and trans-disciplinary visibility via social networking	Finding and sharing research literature peer-to-peer or through crowdsourcing

[13] This is the first of Boyer's four components of scholarship, the one he calls the scholarship of discovery. It refers to the creation of new knowledge for its own sake

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Producing research output[14]	Gathering/ generating, managing, processing and analysing data towards producing an original scientific contribution	Discovering new knowledge and/or achieving enhanced understanding	Attaining scientific-achievements based eligibility for peer recognition and esteem and for the ensuing career-related rewards/research opportunities	Presenting the results of a scientific investigation in a formally structured form suitable for peer evaluation of its quality, authority and reliability
Producing research output collaboratively	Gathering/generating, managing, processing, analysing and sharing data in a collaborative team towards producing an original scientific contribution	Synergistically discovering new knowledge and/or achieving enhanced understanding	Attaining scientific-achievements and affiliation[15] based eligibility for peer recognition and esteem and for the ensuing career-related rewards/ research opportunities	Presenting the results of a collaborative scientific investigation in a formally structured form suitable for peer evaluation of its quality, authority and reliability
Producing research output collaboratively in large-scale projects	Gathering/generating, managing, processing, analysing and sharing data in a distributed, large-scale, capital-intensive collaborative team towards producing an original scientific contribution	Synergistically discovering new knowledge and/or achieving enhanced understanding	Attaining scientific-achievements and affiliation based eligibility for peer recognition and esteem and for the ensuing career-related rewards/ research opportunities	Presenting the results of a collaborative scientific investigation in a formally structured form suitable for peer evaluation of its quality, authority and reliability

[14] While the focus on traditional research outputs (articles, monographs, books) will likely remain critical into the foreseeable future, there is increasing recognition of the importance of other research outputs, too, such as research datasets, scientific software, posters and presentations at conferences, electronic theses and dissertations, blogs

[15] In academe it is not only what you produce, important a criterion for recognition as the quality of your research output is, but also who you are and where you come from

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Producing research output by committed amateur experts[16]	Gathering/ generating, managing, processing and analysing data towards producing an original scientific contribution	Discovering new knowledge and/or achieving enhanced understanding	Attaining scientific-achievements based eligibility for recognition and esteem in the scholarly community as well as achieving public visibility and societal impact	Presenting the results of a scientific investigation in a formally structured form suitable for the scholarly community's evaluation of its quality, authority and reliability
Releasing data to the scholarly community	Releasing sets of raw or derived/reduced data to the wider scholarly community pre- or post-completion of a scientific project	Enabling multiple users to productively use data for discovering new knowledge faster as well as opening up future opportunities for collaboration	Achieving enhanced disciplinary and trans-disciplinary visibility and scholarly impact based peer recognition and esteem, as reflected in citation and/or usage based metrics	Sharing citable data sets informally – peer to peer, or publishing them via institutional websites, data centres or repositories
Releasing methodologies, research tools and protocols to the scholarly community	Releasing information on methodologies, research tools and protocols to the wider scholarly community pre- or post-completion of a scientific project	Moving science forward at a quicker pace via enabling multiple users to productively utilise tried and tested methods for discovering new knowledge; promoting scholarly rigour and scrutiny	Achieving enhanced disciplinary and trans-disciplinary visibility and peer recognition via social networking	Transparent working practices: making methodologies, research tools and protocols available on the internet
Releasing laboratory notebooks to the scholarly community	Releasing real time laboratory notebooks and all associated raw data to the wider scholarly community (Open-Notebook Science)	Moving science forward at a quicker pace via input from outsiders as well as promoting scholarly rigour and scrutiny	Achieving enhanced disciplinary and trans-disciplinary visibility and gaining peer recognition via networking	Transparent working practices: making the entire process of a scholarly investigation available on the internet

[16] Committed amateur/non-credentialed experts, working on their own, as exemplified by amateur astronomers, archaeologists and taxonomists, who make critical contributions to science that may not otherwise transpire owing to a lack of resources, time, skills, or inclinations in the professional scientific community

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Keeping up with new developments	Following new developments in one's area of expertise by gathering, selecting, perusing and reading newly disseminated scholarly information	Building on all relevant scientific progress made for discovering new knowledge and/or achieving enhanced understanding	Avoiding the danger of inadvertently duplicating costly and time-consuming research already done, which, if taken as a sign of ignorance, exposes a scholar to peer ridicule	Demonstrating scholarly proficiency and competence via keeping abreast of potentially relevant, high quality and trustworthy scientific content to build upon
Getting help for solving topical problems	Requesting assistance from and offering suggestions to colleagues either peer-to-peer or via online social networking sites	Solving topical problems arising in the course of research work	Achieving online scholarly visibility; advancing social networking; enhancing digital identity	Exchanging information, 'tips', resources, methodologies and research tools in social media based scholarly communities
Disseminating research results formally via traditional scholarly channels	Disseminating research results formally via traditional scholarly communication channels	Reporting the results of a scientific investigation for scholarly peers to verify/ critique, use and build upon	Securing priority of an original contribution; achieving scholarly visibility and gaining peer recognition and esteem through quantitative and qualitative research productivity	Publishing copiously in highly regarded and peer reviewed scholarly outlets[17], to achieve scholarly impact as reflected in citation and/or usage based metrics
Disseminating research results formally via Open Access scholarly channels	Disseminating research results formally via Open Access (OA) scholarly communication channels	Reporting the results of a scientific investigation for scholarly peers to verify/ critique, use and build upon and for practitioners and the public to use	Securing priority of an original contribution; achieving unimpeded scholarly visibility and gaining peer recognition through quantitative and qualitative research productivity	Publishing copiously in highly regarded and peer reviewed Open Access scholarly outlets[18], to achieve scholarly impact as reflected in citation and/or usage based metrics

[17] Most notably high Impact Factor/elite journals

[18] Here too, most notably high Impact Factor/elite journals

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Disseminating research results formally via enhanced Open Access scholarly channels	Disseminating research results formally via Open Access scholarly communication channels that offer innovative features (i.e. open peer review, data sharing, social reading options[19], plain language summaries, impact tracking via metrics)	Reporting the results of a scientific investigation for scholarly peers to verify/critique, use and build upon and for practitioners and the public to use	Securing priority of an original contribution; achieving unimpeded scholarly visibility and gaining peer recognition through quantitative and qualitative research productivity; achieving public visibility and societal impact, which contribute to scholarly prestige, too	Publishing copiously in highly regarded and peer reviewed Open Access scholarly outlets with innovative features, to achieve scholarly impact as reflected in citation and/or usage based metrics
Disseminating research results informally via active participation in conferences	Disseminating research results informally via active participation in conferences (both face to face and virtual)	Reporting the results of a scientific investigation to update peers and obtain their scrutiny and feedback	Establishing priority of an original contribution; achieving scholarly visibility; gaining peer recognition and esteem; advancing one's social networking	Making research results accessible for peer recognition and scrutiny, both explicit and implicit[20], by giving a keynote talk/paper/ poster; live blogging/ live tweeting from the conference
Disseminating research results informally via repositories/websites	Disseminating research results informally via disciplinary/institutional repositories and/or personal/institutional websites	Reporting the results of a scientific investigation to update peers and interact with them in order obtain their scrutiny and feedback	Establishing priority of an original contribution; achieving online scholarly visibility; reaching multiple and diverse audiences; gaining peer recognition and esteem; advancing social networking	Making research results openly accessible for peer acknowledgement and scrutiny, both explicit and implicit

[19] Content enhanced with social highlighting, ratings, note-sharing, tags, and links to Facebook and Twitter

[20] Explicit: for example, comments and ratings. Implicit: for example: tagging, bookmarking, re-tweeting, page views, downloads

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Disseminating research results informally via social media	Disseminating research results informally via social media sites appropriated and repurposed to fit scholarly objectives (i.e. YouTube, Twitter)	Reporting the results of a scientific investigation to update peers and the public and interact with them in order to obtain their scrutiny and feedback	Achieving online scholarly and public visibility; reaching multiple and diverse audiences; gaining peer and public recognition; advancing social networking; enhancing digital identity	Promoting a scholarly project/publication via announcements or specially created video trailers that make scientific results openly accessible for public and peer recognition and scrutiny, both explicit and implicit
Disseminating research results, ideas and opinions informally via scholarly social networking sites	Disseminating research results, but also ideas and informed opinions informally, via social networking sites specifically targeting scholars (i.e. Academia.edu, ResearchGate)	Reporting the results of a scientific investigation to update peers and interact with them in order to obtain their scrutiny and feedback; influence scholarly thinking and attitudes	Achieving online scholarly visibility; reaching multiple and diverse audiences; gaining peer recognition; advancing social networking; enhancing one's digital identity	Making research results, ideas and opinions openly accessible for peer acknowledgement and scrutiny, both explicit and implicit
Disseminating research results, ideas and opinions informally via blogs	Disseminating research results, but also ideas and informed opinions informally, via research blogs	Reporting the results of a scientific investigation to update scholarly peers and the public; interacting with them in order to obtain their scrutiny and feedback; influencing scholarly thinking and attitudes	Achieving online scholarly and public visibility; reaching multiple and diverse audiences; gaining peer and public recognition; advancing social networking; enhancing one's digital identity	Making research results, ideas and opinions openly accessible for peer and public recognition and scrutiny, both explicit and implicit
Peer reviewing	Peer reviewing of others' research results as an editor-appointed referee	Maintaining and improving research quality and rigour through effective review and scrutiny	Gaining peer recognition and esteem for expert help in maintaining and improving research quality and rigour (if and when known)	Appearing on the list of a journal's editor-appointed referees; noting on one's CV or homepage having served as an editor-appointed referee

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Participating in open peer reviewing	Participating alongside fellow scholars and non-professional scientists in open peer reviewing of others' data, software, protocols and research results	Maintaining and improving research quality and rigour through more open review and scrutiny processes	Gaining peer recognition and esteem for expert help in maintaining and improving research quality and rigour; achieving online scholarly and public visibility; enhancing one's digital identity	Posting reviews of others' research products/results on online sites, where open debates are conducted among self-appointed referees, whose identity is known to all
Monitoring one's impact	Monitoring the scholarly achievements based impact of one's research work	Accruing tangible evidence of the scientific quality and trustworthiness of one's research work so as to enable scholarly peers to use and build upon it	Accruing tangible evidence of scientific excellence towards gaining peer and public recognition and esteem and the ensuing career-related rewards/ research opportunities	Promoting one's scholarly impact via making openly accessible the scores achieved in: citations-based bibliometric measures;[21] download/ visitor/link/ social network reference counts (altmetrics); net-native recognition metrics/ ratings[22]

[21] For example, the h index and its variants

[22] Online communities may have their own measures of value, such as the RG score of ResearchGate

Table 2: The scholarship of integration[23]: scholarly activities[24] and reputation mechanisms

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Identifying a topic for a comprehensive literature review/textbook	Detecting a need for a more wide-ranging understanding and/or novel perspectives based treatment of a complex/multi-faceted topic	Finding and formulating a research question to be pursued via the cross-fertilisation of knowledge, if need be across disciplines, in order to present a comprehensive, analytic portrayal of a topic	Producing persuasive evidence of the significance of the undertaking and its proposed integrative treatment in order to look into collaboration and publishing possibilities	Constructing and refining, through iterative, possibly social media based exposure to like-minded[25] colleagues an informally presented proposal for peer scrutiny of its validity and worth
Identifying a researchable multiple-faceted topic	Detecting a gap in human knowledge, typically arising from a complex, societal, often global challenge, which can be translated into a potentially solvable problem	Finding and formulating a research question to be pursued via the cross-fertilisation of knowledge, if need be across disciplines, in order to extend/change/ contest extant knowledge	Producing persuasive evidence of both the significance of the proposed problem and its integrative-approach solvability in order to look into collaboration and funding possibilities	Constructing and refining, through iterative, possibly social media based exposure to like-minded colleagues an informally presented proposal for peer scrutiny of its validity and worth
Planning a comprehensive literature review/textbook project	Defining and scoping a scholarly investigation towards producing an integrative, often multi- or inter-disciplinary interpretation of extant knowledge on a topic	Offering new, synthesised interpretations of extant knowledge on a complex topic via the cross-fertilisation of knowledge, if need be across disciplines	Producing persuasive evidence of a multi-faceted, scholarly proficiency-based capability to conduct the investigation as proposed, in order to enlist collaborators and publishers	Constructing and refining through iterative exposure to colleagues/publishers/editors a formally structured proposal suitable for peer evaluation of its quality, authority and reliability

[23] This is the second of Boyer's four components of scholarship, which refers to the arraying of extant knowledge into larger intellectual patterns within a wider, cross-disciplinary context

[24] As the scholarship of integration is just as much concerned with creating knowledge as the scholarship of research, many of the activities of the former are essentially identical in their nature to those characterising the latter. Therefore, only those activities that reflect the idiosyncratic features of this synthesis-aimed, often inter- and/or multi-disciplinary approach are delineated here

[25] The strong cultural norms characterising social media based communities may at times bring about a greater affinity among today's scholars than their disciplinary-affiliation based collegial relationships

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Planning an integrative research project	Defining and scoping a scholarly investigation towards producing an integrative, often multi- or inter-disciplinary approach based original contribution to human knowledge	Establishing how a wide angle, possibly cross-disciplinary theoretical perspective and the insights offered by the confirmed knowledge will combine with the data to be collected to inform the research question	Producing persuasive evidence of a multi-faceted, scholarly proficiency-based capability to conduct the investigation as proposed, in order to enlist collaborators and obtain funding	Constructing and refining through iterative exposure to colleagues/funding bodies a formally structured proposal suitable for peer evaluation of its quality, authority and reliability
Producing a literature review/textbook via traditional strategies	Aggregating, perusing/ reading, interpreting, critically analysing, integrating and citing reports of previously established knowledge on a topic	Achieving an integrative, often multi- or inter-disciplinary interpretation and understanding of the established knowledge on a topic	Attaining scholarly expertise- and proficiency-based eligibility for peer recognition and esteem	Demonstrating scholarly competence via the judicious selection and synthesis of high quality and trustworthy scientific content from traditional sources
Producing a literature review/textbook via open strategies	Using a social networking space to aggregate and collectively discuss an evolving body of literature on a topic	Achieving an integrative, often multi- or inter-disciplinary interpretation and understanding of the extant knowledge and informed opinion on a topic	Attaining scholarly expertise- and proficiency-based eligibility for peer recognition and esteem; advancing social networking; enhancing one's digital identity	Demonstrating scholarly competence via the judicious selection and synthesis of high quality and trustworthy content from multiple formal and informal sources
Producing an integrative research output[26]	Gathering/generating, managing, processing and analysing data towards producing an integrative, often multi- or inter-disciplinary approach based original contribution	Discovering novel perspectives afforded new knowledge and/or achieving enhanced insights and more comprehensive understandings	Attaining scientific-achievements based eligibility for peer recognition and esteem and for the ensuing career-related rewards/research opportunities	Presenting the results of an integrated- approach- based scientific investigation in a formally structured form suitable for peer evaluation of its quality, authority and reliability

[26] While the focus on traditional research outputs (articles, monographs, books) will likely remain critical into the foreseeable future, there is increasing recognition of the importance of other research outputs, too, such as research datasets, scientific software, posters and presentations at conferences, blogs

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Producing an integrative, often multi- or inter-disciplinary research output collaboratively	Gathering/generating, managing, processing, analysing and sharing data in a collaborative team, towards producing an integrative, often multi- or inter-disciplinary approach based original contribution	Synergistically discovering novel perspectives afforded new knowledge and/or achieving enhanced insights and more comprehensive understandings	Attaining scientific-achievements and affiliation[27] based eligibility for peer recognition and esteem and for the ensuing career-related rewards/ research opportunities; creating a network of relationships, often across disciplines	Presenting the results of a collaborative, integrated, often multi- or inter-disciplinary scientific investigation in a formally structured form suitable for peer evaluation of its quality, authority and reliability
Producing an integrative, often multi- or inter-disciplinary research output collaboratively in large-scale, distributed projects	Gathering/generating, managing, processing, analysing and sharing data in large-scale, distributed, capital-intensive collaborative teams, towards producing an integrative, often multi- or inter-disciplinary approach based original contribution	Synergistically discovering novel perspectives afforded new knowledge and/or achieving enhanced insights and more comprehensive understandings	Attaining scientific-achievements and affiliation based eligibility for peer recognition and esteem and for the ensuing career-related rewards/research opportunities; creating a network of relationships, often across disciplines	Presenting the results of a collaborative, integrated, often multi- or inter-disciplinary scientific investigation in a formally structured form suitable for peer evaluation of its quality, authority and reliability
Producing Open Education Resources (OER)[28]	Creating via integrative approaches, managing, improving and sharing open learning content through the utilisation of open source software tools	Expanding access to traditional and non-traditional learners and improving the quality of education through the development and open sharing of teaching resources	Creating a network of relationships, often across disciplines, through the global exchange of educational knowledge and resources; achieving public visibility and societal impact	Sharing freely on the web one's educational resources for everyone to use and reuse

[27] In academe it is not only what you write, important a criterion for recognition as the quality of your research output is, but also who you are and where you come from

[28] Educational resources (full courses, lesson plans, instructional modules, syllabi, course materials, textbooks, streaming videos, tests, quizzes, games, simulations, software) offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research

Table 3: The scholarship of application[29]: scholarly activities[30] and reputation mechanisms

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Identifying a researchable topic focussing on practical problems experienced by public/practitioner audiences	Detecting a gap in human knowledge arising from a practical, societal/communal challenge, which can be translated into a potentially solvable problem	Finding and formulating a research question via partnering with practitioners and/or policy makers and/or community leaders in order to extend/ change/contest extant knowledge and its potential applications	Producing persuasive evidence of both the significance of the proposed problem and its solvability in order to look into collaboration and funding possibilities	Constructing and refining, through iterative, possibly social media based exposure to colleagues and community stakeholders an informally presented proposal for peer and public scrutiny of its validity and worth
Identifying a researchable topic focussing on practical problems experienced in organisational/industrial settings	Detecting a gap in human knowledge arising from a practical, organisational/ industrial challenge, which can be translated into a potentially solvable problem	Finding and formulating a research question via partnering with industrial/organisational practitioners in order to extend/change/ contest extant knowledge and its potential applications	Producing persuasive evidence of both the significance of the proposed problem and its solvability in order to look into collaboration and funding possibilities	Constructing and refining, through iterative, possibly social media based exposure to colleagues and industry-based stakeholders an informally presented proposal for peer and public scrutiny of its validity and worth

This is the third of Boyer's four components of scholarship, which refers to the application of disciplinary knowledge and skill to societal/practical problems. This can take three main forms: in the first, the public, considered to have a low level of understanding, is the passive recipient of a unidirectional flow of information from the scholarly community (the deficit model); in the second, citizens, although not considered to be on equal footing with scholars, do work actively with science knowledge, as well as drawing on knowledge which is specific to local context (the 'dialogue', 'interactive', 'two-way' or 'consultation' model); in the third, citizens have a direct and active role in shaping research agendas, with both parties seeking to understand one another through deliberative collaborative procedures (t'participation' model).

[30] As the scholarship of application is just as much concerned with creating knowledge as the scholarship of research, many of the activities of the former are essentially identical in their nature to those characterising the latter. Therefore, only those activities that reflect the idiosyncratic features of this public-good-aimed, community-responsive or community-based approach are delineated here.

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Planning a research project focussing on practical problems experienced by public or practitioner audiences	Defining and scoping a real-world-problem oriented scholarly investigation towards producing an application-aimed original contribution to human knowledge	Establishing how a theoretical perspective driven approach and the insights offered by the confirmed knowledge will combine with the data to be collected to inform the research question	Producing persuasive evidence of scholarly proficiency-based capability to conduct the investigation as proposed, in order to enlist collaborators and obtain funding	Constructing and refining through iterative exposure to colleagues/funding bodies a formally structured proposal suitable for peer and public evaluation of its quality, authority and reliability
Producing an application oriented research output[31]	Gathering/ generating, managing, processing and analysing data towards producing an application-oriented original scientific contribution	Discovering new knowledge that offers solutions to real-world problems and leads to application and action; arriving at unexpected insights and innovations	Attaining scientific-achievements based eligibility for peer recognition and career-related rewards/ research opportunities; achieving public visibility and societal impact, which, in their turn, can enhance scholarly prestige, too	Presenting the results of a scientific investigation both in the form of a societal publication[32] and in a formally structured form suitable for peer and public evaluation of its quality, authority and reliability
Producing a community-interest driven, application oriented research output	Gathering/generating, managing, processing, analysing and sharing data in a community-initiated and contracted project towards producing an application-oriented original scientific contribution	Discovering new knowledge on a community-interest (rather than field-developments) driven topic that leads to application and action; arriving at unexpected insights and innovations	Attaining scientific-achievements eligibility for peer recognition and career-related rewards/research opportunities; achieving public visibility and societal impact, which can enhance scholarly prestige, too	Presenting the results of a scientific investigation in the form of a report, a societal publication and in a formally structured form suitable for peer and public evaluation of its quality, authority and reliability

[31] While the focus on traditional research outputs (articles, monographs, books) will likely remain critical into the foreseeable future, there is increasing recognition of the importance of other research outputs, too, such as research datasets, scientific software, posters and presentations at conferences, electronic theses and dissertations, blogs

[32] Publication types such as newspaper articles, television appearances, presentations for non-academic audiences, exhibitions, websites and social media

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Producing an application oriented research output through a PPSR (public participation in scientific research)[33] project	Taking part together with amateur experts in gathering, managing, processing, analysing and sharing data towards producing an application-oriented original scientific contribution	Discovering new knowledge that offers solutions to real-world problems and leads to application and action; arriving at unexpected insights and innovations	Attaining scientific-achievements based eligibility for peer recognition and esteem; achieving public visibility and societal impact, which can enhance scholarly prestige, too	Presenting the results of a scientific investigation both in the form of a societal publication and as a formally structured paper
Participating in the commercialisation of one's inventions/discoveries (for example, by filing patents)	Translating research-generated knowledge into commercial applications for economic benefit	Releasing to the public full details of a potentially useful invention/discovery, often registered as a patent	Securing priority of an original contribution; achieving public and scholarly visibility and gaining peer and societal recognition and esteem	Presenting the results of a scientific investigation both in the form of a societal publication and as a formally structured paper
Serving industry or government as an external consultant	Using one's expertise and/or knowledge to address specific community or organisational needs (long term or ad hoc)	Providing scholarly expertise and/or knowledge which offer solutions to real-world problems and lead to application and action	Achieving public and scholarly visibility and gaining peer and societal recognition and esteem	Demonstrating scholarly expertise and competence via reporting in public media and/or social media based channels on one's outreach services and achievements
Serving one's professional/disciplinary community	Using scholarly expertise and/or knowledge to benefit one's professional/ disciplinary community (i.e. sitting on committees, serving as a journal editor, assuming leadership roles in professional organisations)	Providing scholarly expertise and/or knowledge towards maintaining and furthering the aims and undertakings of one's professional/ disciplinary community	Achieving scholarly visibility and gaining peer recognition and esteem for fulfilling leadership roles in one's professional/disciplinary community; advancing social networking	Noting on one's CV or homepage the leadership roles fulfilled in one's professional/disciplinary community; taking an active part in professional community held social functions (i.e. reporting on editorial achievements)

[33] Projects in which public participants take part to varying degrees in the scientific research process (for a detailed examination of the three models of public participation in scientific research see the table summarising the activities pertaining to the scholarship of co-creation)

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Popularising scientific knowledge	Familiarising the public with the extant knowledge on a scientific topic via the plain language exposition of a scientific topic (i.e. a general interest book or a television programme)	Promoting public understanding of scientific ideas and their often value-judgments-associated implications (such as in the case of genetic modification)	Attaining scholarly expertise- and proficiency-based eligibility for public recognition and esteem; creating a network of communal relationships; achieving public visibility and societal impact	Demonstrating scholarly competence via the expert selection, synthesis and presentation of high quality and trustworthy content from multiple formal and informal scholarly sources

Table 4: The scholarship of teaching[34]: scholarly activities and reputation mechanisms

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATION AL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Designing a course/learning programme[35]	Laying out a route map of the purposeful configuration of suitable content, activities, tools, and methods of delivery and assessment towards the construction of a classroom and/or web based course/learning programme	Establishing how extant knowledge may best be transmitted/shared to promote and support an effective learning process	Producing persuasive evidence of disciplinary, pedagogical and technological proficiency-based ability to teach the course/programme as proposed, in order to attain peer and public recognition and enlist participants	Constructing and refining, possibly through iterative exposure to colleagues, a formally or informally disseminated proposal suitable for peer and/or student/ and/or public evaluation of its quality and potential effectiveness
Producing and delivering a teacher focussed[36], face-to-face, institution-based, often access controlled course/ learning programme	Conducting a course/ programme, organised as a tightly knit group with designated roles and hierarchies, towards transferring information from the syllabus to learners, most notably by means of lectures	Achieving effective learning via the transmission of disciplinary knowledge from the expert knower to his/her audience	Attaining disciplinary expertise and pedagogical achievements based eligibility for peer and student recognition and esteem and for the potentially ensuing career-related rewards/ opportunities	Access and/or participation based institutional (students' and authorised colleagues') monitoring and evaluation of the learning experience, its quality, effectiveness and impact, both explicit and implicit[37]

[34] This is the fourth of Boyer's four components of scholarship, which refers to the conveying of the human store of knowledge to new generations. However, the scholarship of teaching extends beyond scholarly teaching to include the building upon the latest ideas in a given disciplinary field as well as current ideas about teaching in the field, the creating of practices of classroom assessment and evidence gathering, peer collaboration and peer review

[35] The terms 'course' or 'learning programme' refer to theory-driven, systematised units of learning, designed for a planned educational purpose, which can be for credit/not for credit, fee-based or free, face to face/on-line/blended

[36] The teacher focussed/information transmission approach to teaching is based on an idea of the teacher as the focal point of teaching, as opposed to the student focussed/conceptual change approach, which endeavours to change the students' conceptions of the phenomena of their study

[37] Explicit: for example, comments and ratings. Implicit: for example: tagging, bookmarking, re-tweeting, page views, downloads

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATION AL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Co-producing and co-teaching a teacher focussed, face-to-face, institution-based, often access controlled course/learning programme	Collaboratively conducting a course/programme, organised as a tightly knit group with designated roles and hierarchies, towards the transmission of knowledge to learners, most notably by means of lectures	Achieving effective learning via the synergistic transmission of disciplinary knowledge from expert knowers to their audience	Attaining expertise as well as pedagogical achievements based eligibility for peer and student recognition and esteem and for the potentially ensuing career-related rewards/ opportunities	Access and/or participation based institutional (students' and authorised colleagues') monitoring and evaluation of the learning experience, its quality, effectiveness and impact, both explicit and implicit
Producing and delivering a teacher focussed, online, institution-based, either access controlled or freely accessible course/ learning programme	Conducting a course/ programme, organised as a tightly knit networked group with designated roles and hierarchies, towards the transmission of knowledge to learners through web-based tools (social networking sites, blogs)	Achieving effective learning via the technology-aided transmission of disciplinary knowledge from the expert knower to his/her audience	Attaining expertise as well as pedagogical and technological achievements based eligibility for peer and student recognition and esteem and for the potentially ensuing career-related rewards/ opportunities	Access and/or participation based institutional (students' and authorised colleagues') monitoring and evaluation of the quality, effectiveness and explicit and implicit impact of the learning experience
Co-producing and co-teaching a teacher focussed, online, institution-based, either access controlled or freely accessible course/ learning programme	Collaboratively[38] conducting a course/programme, organised as a tightly knit networked group with designated roles and hierarchies, towards the transmission of knowledge to learners through web-based tools (i.e. social networking sites, blogs)	Achieving effective learning via the synergistic, technology-aided transmission of disciplinary knowledge from expert knowers to their audience	Attaining expertise as well as pedagogical and technological achievements based eligibility for peer and student recognition and esteem and for the potentially ensuing career-related rewards/ opportunities	Access and/or participation based institutional (students' and authorised colleagues') monitoring and evaluation of the quality, effectiveness and explicit and implicit impact of the learning experience

[38] 'Collaboratively' in the case of online courses can mean 'with the help of so called online network monitors' – colleagues who agree to collectively aid in the teaching process

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATION AL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Conducting a social networks based, participatory MOOC (massive open online course)	Facilitating the learning process in a free, university level, web-based, course/ learning programme that harnesses crowd sourcing and networking technologies to enable the participatory-processes-based achieving of shared learning goals	Achieving effective learning via participants' reciprocal engagement in a continual flow of expert-facilitated dialogue and exchange of knowledge	Achieving massive online scholarly and public visibility; reaching multiple and diverse audiences; gaining peer and public recognition; advancing social networking; enhancing digital identity	Participation based public and peer monitoring and evaluation of the quality, effectiveness and explicit and implicit impact of the learning experience
Pursuing the Open-Notebook Science model in the classroom	Drawing upon students for collaboration in an ongoing scientific investigation, whilst enabling them to follow closely the actual processes involved via Open-Notebook Science methods	Modeling of best practices in a scientific inquiry for the benefit of learners/novice researchers	Achieving enhanced visibility and gaining peer and public recognition via networking	Transparent working practices: making the entire process of a scholarly investigation/teaching project available on the internet
Tutoring/mentoring students on an individual basis	Advising and guiding students on discipline-specific, increasingly web-based inquiry processes	Conveying and modeling of best practices in a scientific inquiry for the benefit of learners/novice researchers	Attaining expertise, as well as pedagogical and technological achievements based eligibility for student recognition and esteem and for the potentially ensuing career-related rewards/ opportunities	Students' monitoring and evaluation of the learning experience, its quality, effectiveness and impact as expressed in institutional/ state-wide teacher ratings
Advancing learning theory through classroom research	Gathering and analysing feedback on teaching practices, either via explicit, learner feedback data (i.e. ratings) or implicit, learning analytics[39]/ social analytics[40] generated data	Discovering new pedagogical knowledge and/or achieving enhanced understandings of instructional design	Attaining pedagogical-achievements based eligibility for peer recognition and esteem and for the ensuing career-related rewards/research opportunities	Presenting the results of a classroom research based contribution to pedagogy in a formally structured form suitable for peer evaluation of its quality, authority and reliability

[39] Learning analytics are the measurement, collection, analysis, and reporting of data about learners

[40] Social analytics are automated methods for examining, filtering and categorising social media content, which can yield data on learners' ideas, questions, interests, etc.

Table 5: The scholarship of co-creation[41]: scholarly activities and reputation mechanisms

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Participating as a consultant in a PPSR (public participation in scientific research)[42] project	Participating as a consultant in a citizen-conceived, possibly also citizen-planned and executed science project, which typically aims at resolving local concerns via formal knowledge production	Providing professional scholarly help in amateur-experts focussed discovery of new knowledge, typically aimed at resolving local concerns	Achieving public visibility and societal impact, which, in their turn, can enhance scholarly prestige, too	Presenting the results of a scientific investigation in the form of a societal publication
Leading a Contributory PPSR (public participation in scientific research)[43] project	Planning and managing a project based on citizen-collected data, which aims at formal knowledge production but has a strongly valued, if often unstated educational purpose, too	Spatially and temporally expanding the scope of discovering new knowledge; promoting learning and reflecting about science concepts, theories and processes; promoting competent and responsible civic participation	Attaining eligibility for peer recognition and esteem; achieving public visibility and societal impact, which, in their turn, can enhance scholarly prestige, too	Presenting the results of a scientific investigation both in the form of a societal publication[44] and as a formally structured paper

[41] This is a fifth component of scholarship (Garnett and Ecclesfield, 2011), updating Boyer's four, which 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

[42] PPSR projects, in which public participants take part to varying degrees in the scientific research process, follow three models, as identified in Shirk et al (2012): contributory, collaborative and co-created.

[43] A Contributory PPSR project, also referred to as a citizen science research project, is typically designed and led by scientists, with members of the public primarily contributing data

[44] Publication types such as newspaper articles, television appearances, presentations for non-academic audiences, exhibitions, websites and social media

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Leading a Collaborative PPSR (public participation in scientific research)[45] project	Planning and managing a project based on amateur experts' help in the research process, which typically aims at resolving local concerns via formal knowledge production but has a strongly valued, if often unstated educational purpose, too	Spatially and temporally expanding the scope of discovering new knowledge; arriving at unexpected insights and innovations; promoting learning and reflecting about science concepts, theories and processes; promoting competent and responsible civic participation	Attaining eligibility for peer recognition and esteem; achieving public visibility and societal impact, which, in their turn, can enhance scholarly prestige, too	Presenting the results of a scientific investigation both in the form of a societal publication and as a formally structured paper
Collaborating in a Co-Created PPSR (public participation in scientific research)[46] project	Collaborating with amateur experts in the democratised research processes of a Co-Created PPSR project, which typically aims at resolving local concerns via formal knowledge production but has a strongly valued, if often unstated educational purpose, too	Spatially and temporally expanding the scope of discovering new knowledge; arriving at unexpected insights and innovations; promoting learning and reflecting about science concepts, theories and processes; promoting competent and responsible civic participation	Attaining scientific-achievements based eligibility for peer recognition and esteem as well as achieving public visibility and societal impact, which, in their turn, can enhance scholarly prestige, too	Presenting the results of a scientific investigation both in the form of a societal publication and as a formally structured paper

[45] A Collaborative PPSR project, also referred to as a community involvement/adaptive citizen science/adaptive co-management research project, is typically designed and led by scientists, with members of the public contributing data but also helping to refine project design, analyse data and disseminate findings

[46] A Co-Created PPSR project, also referred to as a participatory/participatory action research project, is typically designed by scientists and members of the public working together, with the public participants actively involved in most or all aspects of the research process

ACTIVITY	PROCEDURE	SCIENTIFIC PURPOSE	REPUTATIONAL PURPOSE	FIT FOR PURPOSE REPUTATIONAL MECHANISM
Conducting a PPSR (public participation in scientific research) project in the classroom or in a web based course/learning programme	Facilitating the learning process in a PPSR project, which involves students in the research process as well as in the civic participation and action the scientific inquiry entails	Achieving effective learning; promoting learning and reflecting about science concepts, theories and processes; promoting competent and responsible civic participation	Attaining disciplinary expertise and pedagogical achievements based eligibility for peer and student recognition and esteem and for the potentially ensuing career-related rewards/ opportunities	Access and/or participation based institutional (students' and authorised colleagues') monitoring and evaluation of the learning experience, its quality, effectiveness and impact, both explicit and implicit[47]

[47] Explicit: for example, comments and ratings. Implicit: for example: tagging, bookmarking, re-tweeting, page views, downloads

PART 2

A state-of-the-art appraisal of the social networking services used by scholars to build, maintain and showcase their reputations

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I. METHOD FOR THE SCOPING STUDY

The purpose of this study is to identify a number of novel social networking services and tools that are used by scholars to support and enhance their work, but also eventually to build and maintain their scholarly online reputation. The framework introduced above, based on Boyer's (1990) model of scholarly activities, serves as the frame of reference for the analysis of the data gathered in this phase of the study.

Some of the platforms that are of interest for this study have been created to support a wide range of scholarly activities ranging from sharing publications and datasets to collaboration that is carried out in the course of research (e.g. sharing artefacts such as lab notes and data sets) and engaging new actors in science (e.g. through citizens science or through new funding mechanisms). Within some of the communities of such platforms, these activities are turned into metrics that can be used to build individual's reputation and display it across the network leveraging well known mechanisms from social networking services and online shopping platforms such as eBay. This has given a rise for new measurements based on various web-analytics and metrics to measure the reputation of scientific researchers.

A wide variety of tools and platforms were reviewed for this phase of the study, out of which 25 were selected to be further reviewed and described in this report, henceforth, they are called short case studies. This represents a very heterogeneous population and demonstrates that a scholar's online activities are scattered across an almost unmanageable range of sources. A number of criteria were used to select them in this report:

1. We were interested in novel online tools and social networking services (SNS) that are used by scholars to perform their scholarly activities in the field of science (for the definition of scholarly activities, see Part 1). The tools and SNS chosen for the study provide a personal profile with collaboration aspects and lists of connections/friends, even if they are not always directly related to reputation building.
2. Most of the tools provide the opportunity to (partly or wholly) build, maintain or showcase scholarly reputation. In the cases of many of the services covered reputation is not the main focus, it is a second-level concern. These tools and services are mainly focused on supporting some part(s) of the scholarly activities.
3. They had to be relevant, available and used by scholars in EU countries.
4. Last, because the various scholarly activities that make up reputation are dealt with by a myriad of services, there was an attempt to be representative of the various types of platform. The platforms reviewed here included a range of different services including:
    - Altmetric services
    - Citizen Science platforms
    - Code repositories
    - Data repositories
    - Discipline specific academic social networking services
    - Electronic laboratory notebooks
    - Multidisciplinary academic social networking services
    - Open Peer review systems
    - Professional social networking services
    - Q & A Sites
    - Reference management tools with social media feature
    - Review systems for MOOCs
    - Social learning platforms

Each short case study follows the same description format. It includes the following

- A short introduction and a fact sheet.

  The fact sheet includes a ranking of the site by Alexa. Alexa ranks websites globally based on the number of their visitors. The top three sites globally currently (Sept. 2014) are Google, Facebook and YouTube. So a rank of 12 (e.g. LinkedIn) means it is the 12th most visited site globally.

- A list of scholarly activities supported by the platform.

  For listing activities supported by the platform, five tables of scholarly activities prepared during previous stages of the project have been used (presented also in the appendix Excel file). For this, each activity whose reputational purpose is served by the platform is listed under the platform. This means that for an activity to be listed under a platform, the platform should support achieving its reputational purpose not necessarily supporting actual undertaking of an activity[48]. Although the names of the activities supported are presented under each platform, a code is also given to each activity which refers to the corresponding code in the Excel file for more detail. A list of activities and their codes is also presented in Annex 1 at the end of this report. Some platforms suggested for coverage lack essential data because they probably do not pass muster.

- Last, a review of past research on the platform (if any) is presented with some scores and statistics provided by the platform.

The review of each platform does not include technical matters (e.g. system design and development or technical specifications of the system). The platforms reviewed here are organised based on their type of service.

[48] For example on Edmodo, users can offer courses and use it for teaching, however, it doesn't have any feature for reviewing and monitoring those teaching activities. In other words, the platform supports scholarship activities but does not support reputational purpose of those activities.

II. REVIEW

Altmetric services

1. Kudos

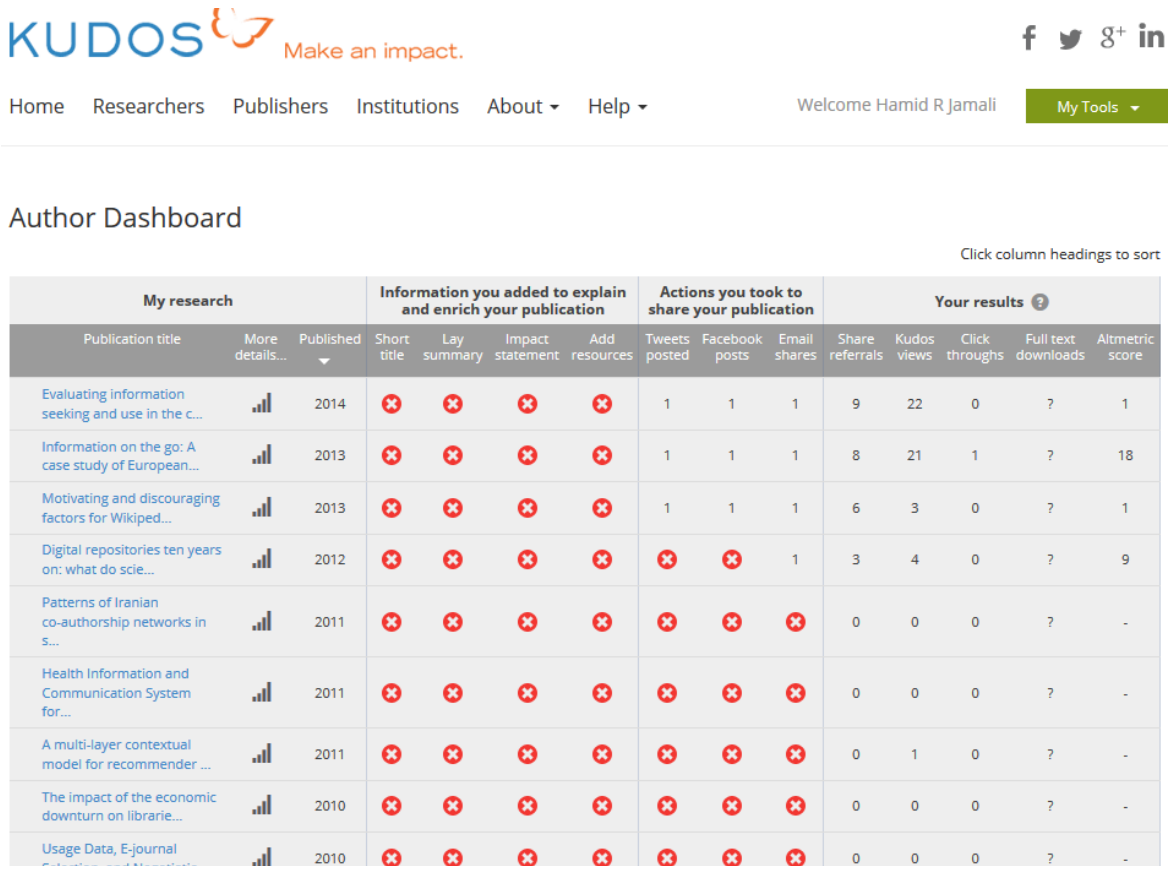
Introduction

According to the site itself Kudos is "a web-based service that helps researchers and their institutions and funders to maximize the visibility and impact of their published articles. Kudos provides a platform for assembling and creating information to help search filtering, for sharing information to drive discovery, and for measuring and monitoring the effect of these activities."
Researchers register on Kudos, search, find and claim their publications and then explain and enrich their publications by writing short title, lay summary and impact statement (why it is important) about their articles and by adding links to other relevant resources, then they share their publication on Tweeter, Facebook and through email. Kudos then helps them measure how this visibility-increasing measures impacted on the readership and altmetrics of their article.

Publishers and institutions also use Kudos. Participating publishers (around 30) can see statistics, such as:

- Total views of Publication Pages on Kudos for a specific publisher
- Total click-throughs from sharing pages
- Total click-throughs from shares to Kudos (those who clicked on email or Twitter or Facebook shares and landed on the publication page on Kudos)
- Total click-throughs from shares to DOI link (usually the publisher site) (those who clicked on email or Twitter or Facebook shares that included link to DOI)
- Total click-throughs from Kudos to DOI link (usually the publisher site) (those who clicked on the publication page of an item on Kudos and went to the item's page on the publisher's site)

While we have categorized Kudos as being an altmetrics platform its owners refer to it now as an 'outreach' service.



Facts

URL	www.growkudos.com
Launched	2014, April
Country	120+
Owner	Kudos
Created by	M. Kenneway, C. Rapple, D. Sommer
Number of members	40,000
Number of countries	120+
Number of publications	NA
Number of full-text publications	0
Alexa Ranking (Sept 2014)	2,736,302
Type of site	Altmetric service
Purpose	Helping researchers increasing visibility and impact of publications, Outreach
Target audience	Journal article authors
Type of research	All
Research areas	All
Language	English
Membership	Free
Mobile App	No

Scholarship activities covered

Research

- R19. Disseminating research results informally via social media
    - Users can promote their output by tweeting and posting on Facebook through the site and also create public-friendly content to promote their output on the site
- R24. Monitoring one's impact
    - The site provides some altmetrics data to monitor the impact of authored journal articles

Past research on Kudos

There has not been any research on Kudos yet, it is too new. However, according to Kudos website (https://www.growkudos.com/about/faqs) in a pilot version of Kudos during 2013, researchers using the Kudos sharing tools saw an average increase in downloads of their publications of 19% compared to a control group. Data up to September 2014 shows that a third of registered users are Professors, approx. 20% are faculty members, and lecturers account for approx. 10% of registered users. Registered are from more than 3000 institutions and more than 120 countries. Chemistry and then Business and Management subjects has the highest number of members. 22% of users are from UK and 18% from USA. A survey by Kudos team was done in 2013 which is confidential.

Scores, statistics and data provided

- Tweets posted: number of tweets posted by author to promote the publication
- Facebook posts: number of Facebook posts by author to promote the publication
- Email shares: number of times author has sent email to colleagues/friends with link the publication page on Kudos or with the link to the article page on the publisher's site
- Share referrals: number of visits to the publication page on Kudos that is generated by sharing activities via email or social media
- Kudos views: total number of visits to publication page on Kudos
- Click throughs
- Full-text downloads: number of times the publication is downloaded from the publisher's site
- Abstract view: number of times the publication's abstract is clicked on or viewed on the publisher's site
- Altmetric score: a score generated by Altmetric.com (which includes tweets, Mendeley and CiteULike readership)

(The screenshot above shows the dashboard for these data)

Sum up

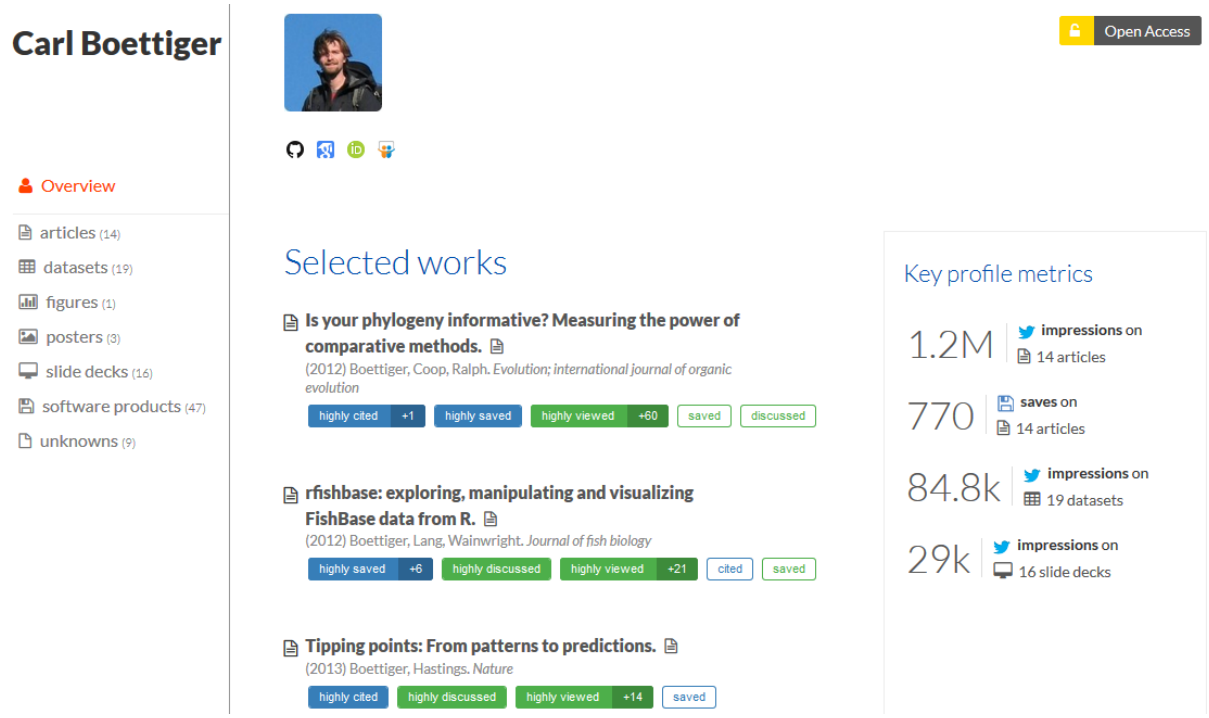
Kudos is an outreach service, supported by social media data, and designed to help authors improve the visibility and impact of their publications. Reputation building on Kudos relates to research and more specifically publications only. Authors can showcase their publication and the impact of their publications. The site provides some altmetrics scores. Explaining and enriching features of the site for publications make it possible for authors to get the message of their publications to a wider audience. Kudos does not support many scholarship activities as it is restricted to journal articles and books. It does not allow members to upload files and share; users can only list their publications. This could be because they depend on publishers for their data.

2. Impactstory

Introduction

The site description is “Impactstory is an open-source, web-based tool that helps researchers explore and share the diverse impacts of all their research products—from traditional ones like journal articles, to emerging products like blog posts, datasets, and software. By helping researchers tell data-driven stories about their impacts, we're helping to build a new scholarly reward system that values and encourages web-native scholarship.”

Impactstory supports a range of research products including articles, posters, figures, slides, videos, datasets, software products and so on. It relies on third party data for scores and statistics. Third parties include services such as Altmetric, YouTube, PLoS, Scopus, PMC, Vimeo, Dryad, GitHub, Figshare, Slideshare, CiteULike, Delicioius, Mendeley, Wikipedia, Twitter, Arxiv, CrossRef, and a few others. Users simply add their products and then monitor altmetric-based impact scores of their products. They can also download their profile as csv or json (json or JavaScript Object Notation is a lightweight data-interchange format) files.



Facts

URL	http://impactstory.org
Launched	2011
Country	NA
Owner	Impactstory
Created by	Heather Piwowar, Jason Priem
Number of members	NA
Number of countries	NA
Number of publications	NA
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	916,449
Type of site	Altmetric service
Purpose	Monitoring impact of research products
Target audience	Researchers
Type of research	All
Research areas	All
Language	English
Membership	Paid ($60 a year)
Mobile App	No

Scholarship activities covered

Research

- R24. Monitoring one's impact
    - The site's only purpose is to help researchers monitor their research impact using mainly altmetric scores provided by third parties such as altmetric.com
    -

Past research on Impactstory

None

Scores, statistics and data provided

- Number of blog posts, Facebook public posts, Google+ posts, Twitter impressions, tweets, and news outlets from Altmetric.com
- Number of bookmarks from CiteULike and Delicious
- Number of downloads, views and shares from Figshare
- Number of followers, stars and forks from GitHub
- Number of readers from Mendeley
- Number of comments, downloads, favourites, views, and followers from Slideshare
- Number of followers, tweets (by author) and the number of presence in twitter lists.
- Number of comments, likes and plays (for videos) from Vimeo
- Number of comments, likes, dislikes, favourites and views (for videos) from YouTube
- Number of mentions in Wikipedia articles
- Number of html and pdf views from PLoS
- Number of citations from Scopus
- Number of citations from PubMed Central and number of citations in editorial from PMC
- Number of times the research product was mentioned in the full-text of PLOS papers
- Number of downloads, shares and views from Figshare

- Whether the articles has been reviewed in F1000 (F1000 or Faculty of 1000 is a site in medicine and life science in which scientists review and recommend articles)
- Number of package views and total downloads from Dryad (Dryad is an open repository to share research data)

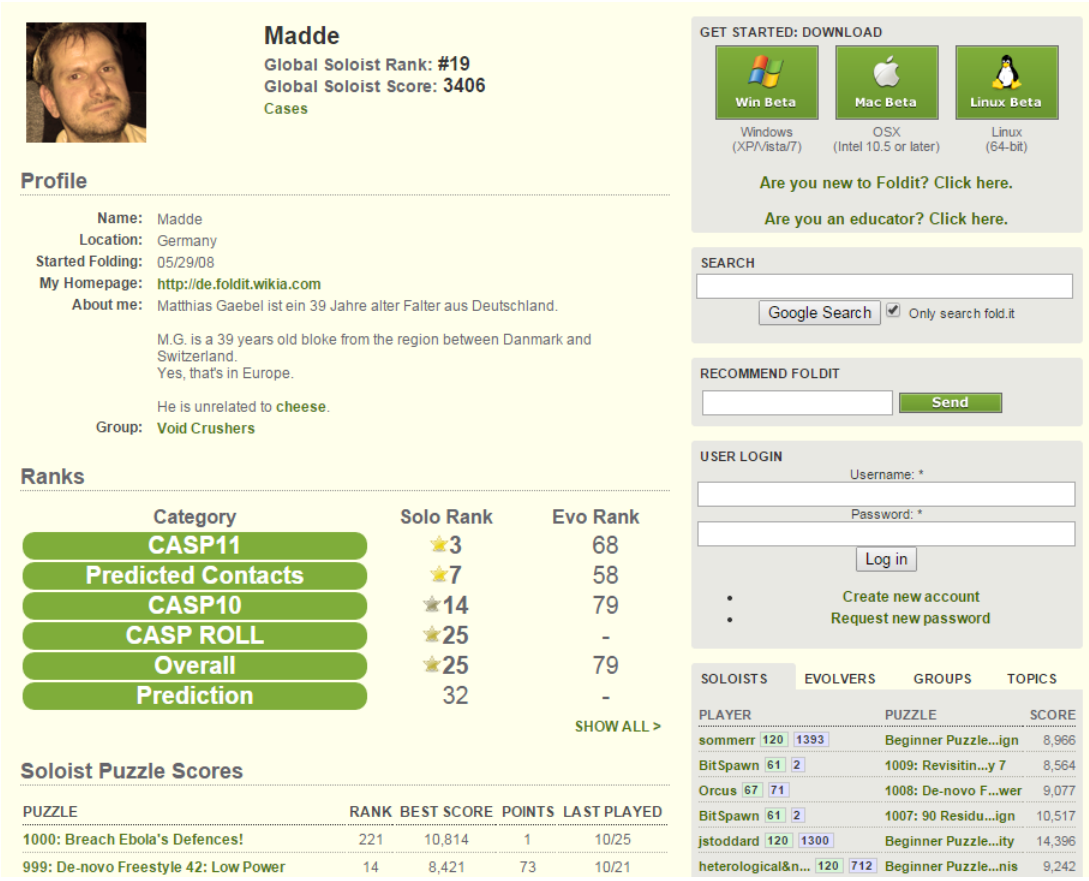
Sum up

Impactstory is an altmetrics service, perhaps an exemplar of such service. Authors can monitor the impact of their research output through a set of metrics provided by third party sites to Impactstory. The strength of the site is that it is not limited to journal articles or publications and it includes codes (GitHub) and data among other products. Users build reputation on this site by showcasing their research products and high research impact.

3. Foldit

Introduction

Foldit is essentially an online puzzle video game about protein folding. Users contribute to a citizen science project related to proteins by participating in the game. The game is part of an experimental research project.



Facts

URL	www.fold.it
Launched	2008
Country	USA
Owner	University of Washington
Created by	David Baker
Number of members	550,000
Alexa Ranking (Sept 2014)	293,482
Type of site	Citizen Science
Purpose	Contributing in citizen science projects
Target audience	citizens
Type of research	Life sciences
Research areas	Proteins
Language	English
Membership	Free
Mobile App	No

Scholarship activities covered

Co-creation

- C1 Participating as a consultant in a PPSR (public participation in scientific research) project
    - Amateur scholars can participate in scientific experiments on the site and build reputation by gaining points and scores
- C2 Leading a Contributory PPSR (public participation in scientific research) project
    - Amateur scholars can participate in scientific experiments on the site and build reputation by gaining points and scores
- C3 Leading a Collaborative PPSR (public participation in scientific research) project
    - Amateur scholars can participate in scientific experiments on the site and build reputation by gaining points and scores
- C4 Collaborating in a Co-Created PPSR (public participation in scientific research)project
    - Amateur scholars can participate in scientific experiments on the site and build reputation by gaining points and scores
- C5 Conducting a PPSR (public participation in scientific research) project in the classroom or in a web based course/learning programme
    - The platform has instruction and features (such as creating groups and monitoring group members by instructor) that allow use of puzzles in classrooms.

Past research on Foldit

None.

Scores, statistics and data provided

- Rank, score and points of participant based on his or her participation in puzzles
- Rank, score and points of participant based on his or her participation in contests (contests are set up by players/participants and are not looked at by scientists, unlike puzzles that are set up by scientists)

- Achievements (something like badges awarded to players who have completed certain tasks)

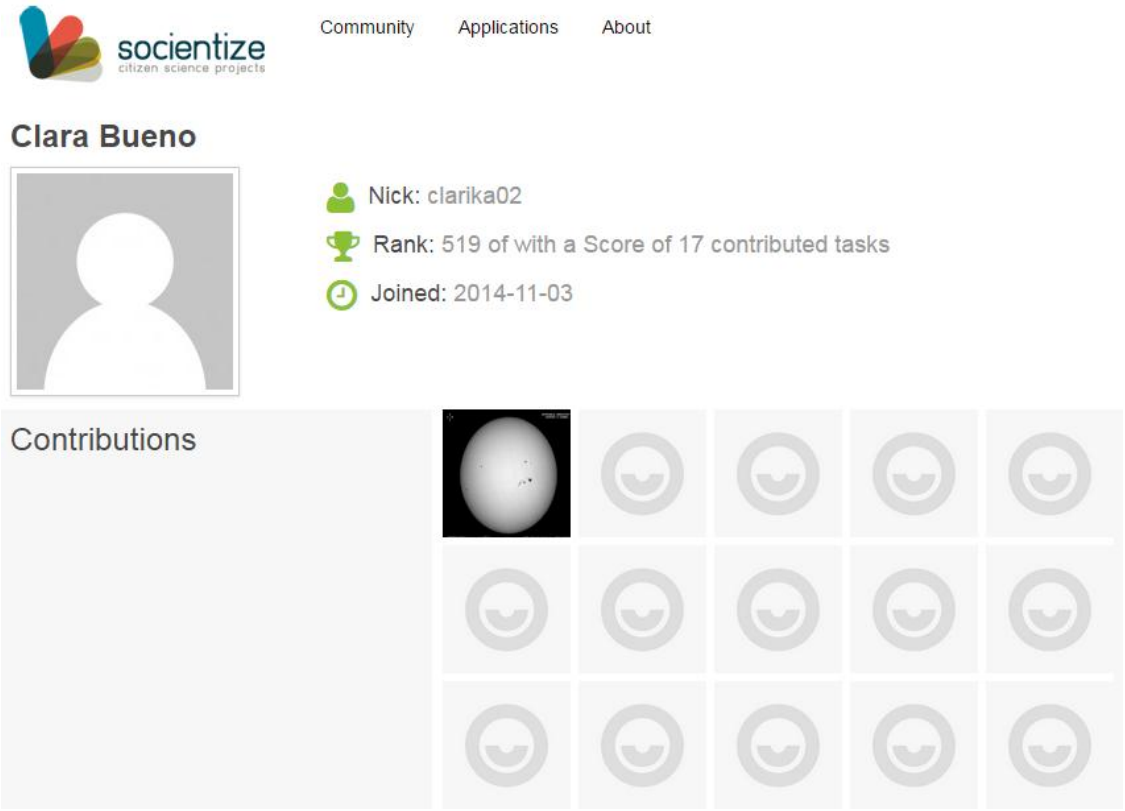
Sum up

Foldit uses games as a means of engaging players in a scientific experiment. The information generated through games is used for protein structure prediction and protein design. Users can create a profile and participate in puzzles (created by scientists) and contests (created by other players) and build reputation by gaining points and scores and improving their rank among other users.

4. Socientize

Introduction

Socientize is project created by European Commission to coordinate all agents involved in the citizen science process. It 'sets up a network where infrastructure providers and researchers will recruit volunteers from a general public to perform science at home'.
Citizens as armature scholars and actors can contribute to scientific studies with their own knowledge and resources participating in an active way.



Facts

URL	www.socientize.eu
Launched	2012
Country	EU
Owner	European Commission
Created by	European Commission
Number of members	2,892
Number of applications	8
Number of tasks	13,118
Alexa Ranking (Sept 2014)	870,231
Type of site	Citizen Science
Purpose	Contributing in citizen science projects
Target audience	citizens
Type of research	All
Research areas	All
Language	English, Spanish, French, Portuguese
Membership	Free
Mobile App	No

Scholarship activities covered

Co-creation

- C1 Participating as a consultant in a PPSR (public participation in scientific research) project
    - The site provides infrastructure to create and participate in PPSR and gain visibility and societal impact
- C2 Leading a Contributory PPSR (public participation in scientific research) project
    - The site provides infrastructure to create and participate in PPSR and gain visibility and societal impact
- C3 Leading a Collaborative PPSR (public participation in scientific research) project
    - The site provides infrastructure to create and participate in PPSR and gain visibility and societal impact
- C4 Collaborating in a Co-Created PPSR (public participation in scientific research) project
    - The site provides infrastructure to create and participate in PPSR and gain visibility and societal impact
- C5 Conducting a PPSR (public participation in scientific research) project in the classroom or in a web based course/learning programme
    - The platform can be used in classrooms and by teachers.

Past research on Socientize

None.

Scores, statistics and data provided

- Number of users
- Number of teams
- Number of applications
- Number of tasks
- Number of tasks a user contributed in
- Rank of a user among all users

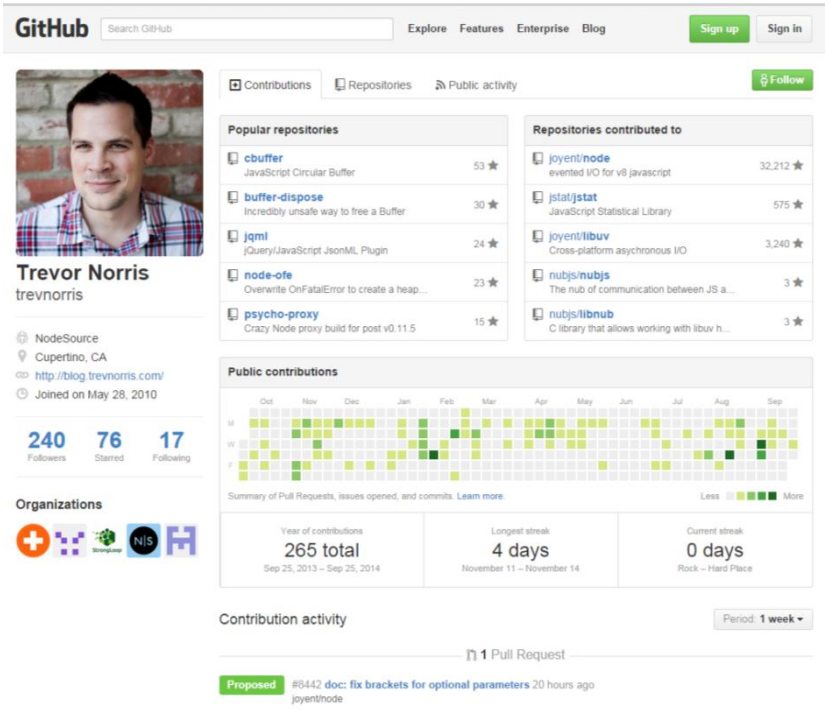
Sum up

Socientize is a citizen science platform which provides the necessary infrastructure for those who want to create citizen science projects or participate in them. Citizens as amateur scholars, teachers and scientists all can participate and use the platform. Participants build reputation by doing more tasks and improving their rank among users.

5. Github

Introduction

GitHub is a code sharing and publishing service with social networking features for programmers. It provides a web-based graphical interface, desktop as well as mobile integration. GitHub offers both paid plans for private repositories (i.e. code repositories), and free accounts, which are usually used to host open source software projects. Users can create a repository and share their codes. They can share codes, fork a repository (copying a repository into own account for making changes), and collaborate.



Facts

URL	www.github.com
Launched	2008
Country	USA
Owner	GitHub Inc.
Created by	Tom Preston-Werner, Chris Wanstrath, and PJ Hyett
Number of members	6,000,000+
Number of countries	NA
Number of repositories	15,800,000
Alexa Ranking (Sept 2014)	138
Purpose	Hosting and sharing codes and collaboration
Type of site	Code repository
Target audience	IT professionals
Type of research	IT
Research areas	IT, computer programming
Language	English
Membership	Free
Mobile App	Yes

Scholarship activities covered

Research

- R10. Releasing methodologies, research tools and protocols to the scholarly community
    - Users can publish and share codes produced for or during a research project for public use

Past research on GitHub

Dabbish et al. (2012) used a series of in-depth interviews with central and peripheral GitHub users in order to examine the value of transparency for large-scale distributed collaborations and communities of practice. They found that people make a surprisingly rich set of social inferences from the networked activity information in GitHub, such as inferring someone else's technical goals and vision when they edit code, or guessing which of several similar projects has the best chance of thriving in the long term. Users combine these inferences into effective strategies for coordinating work, advancing technical skills and managing their reputation.

Marlow, Dabbish and Herbsleb (2013) undertook a qualitative investigation of impression formation in GitHub and found that users seek out additional information about each other to explore the project space, inform future interactions, and understand the potential future value of a new person. They form impressions around other users' expertise based on history of activity across projects, and successful collaborations with key high status projects in the community. These impressions influence their receptivity to strangers' work contributions.

Scores, statistics and data provided

- Number of members who follow the person
- Number of members who are followed by the person
- Number of starred code repositories shared by the person
- Year of activity (could not find how it is calculated)

Sum up

GitHub is essentially a code repository that can be used publicly or privately. Programmers build reputation on the site by their contribution (releasing their codes to the public) and through popularity of their codes and the credits that their codes receive.

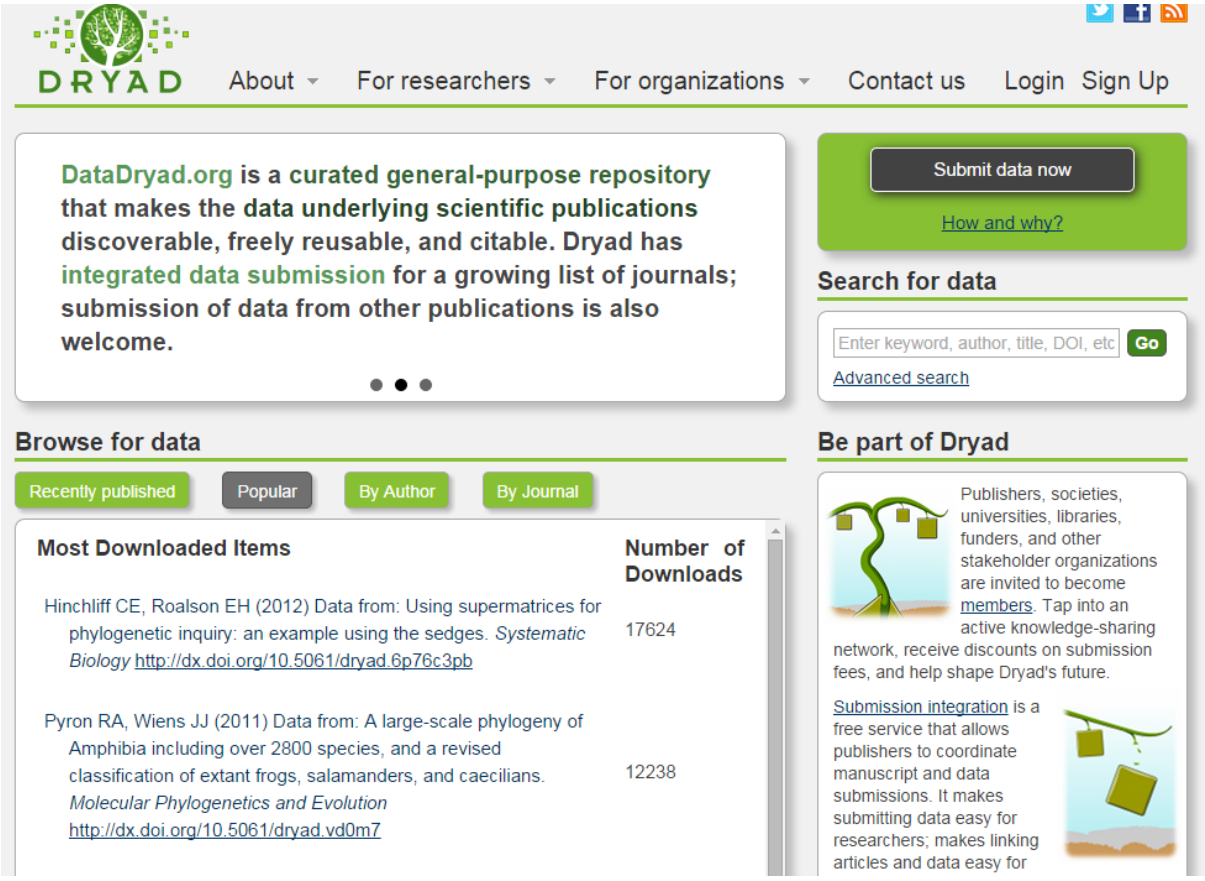
6. Dryad

Introduction

"The Dryad Digital Repository is a curated resource that makes the data underlying scientific publications discoverable, freely reusable, and citable. Dryad provides a general-purpose home for a wide diversity of datatypes.

Dryad originated from an initiative among a group of leading journals and scientific societies in evolutionary biology and ecology to adopt a joint data archiving policy (JDAP) for their publications, and the recognition that easy-to-use, sustainable, community-governed data infrastructure was needed to support such a policy. See this page to learn more about JDAP."

Authors or their organisations pay to submit data to Dryad, then Dryad assign DOI to data files and packages and makes them freely available for users to download and reuse. Users can browse data packages by date, author, journal, subject or popularity (downloads) or search for data packages.



Facts

URL	www.datadryad.org
Launched	2008
Country	USA
Owner	Dryad
Created by	A group of journals and societies
Number of journals	353
Number of data packages	6,378
Number of data files	19,483
Number of downloads	587,130
Alexa Ranking (Sept 2014)	1,702,565
Type of site	Data repositories
Purpose	Publishing research data to make them citable and open access
Target audience	Researchers
Type of research	All
Research areas	Life sciences
Language	English
Membership	Free to access and download data for users/charges for submission, price varies for countries and organizations and individuals, for individuals $80 per data package
Mobile App	No

Scholarship activities covered

Research

- R9. Releasing data to the scholarly community
    - The site allows uploading and sharing data packages and makes them citable by assigning DOI and then provides download statistics for each package, users can see list of packages by popularity

Past research on Dryad

Although there are works on the metadata structure of the Dryad Repository and its architecture (e.g. Carrier, 2008; White et al., 2008), there has not been any study on the use of the system or its role in scholarly communication or reputational aspect.

Scores, statistics and data provided

- Number of downloads for each data package
- Number of data package for each author

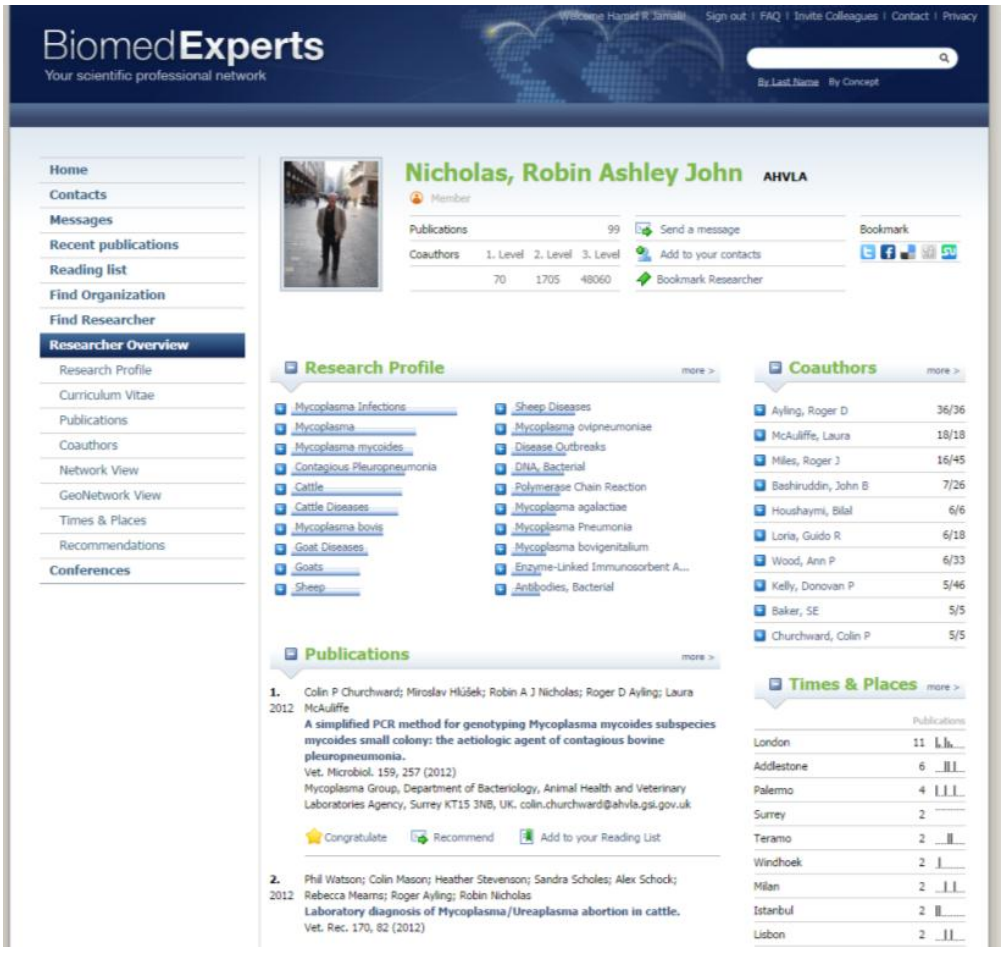
Sum up

The Dryad repository serves one reputational purpose, which is releasing scientific data to the public for reuse without legal or access barriers. Because the repository provides download data, authors can build a reputation by submitting more data packages and encourage the reuse of their data by other scientists. Journals can also sponsor the submission of the data whose articles they publish and the Dryad organization makes the list of integrated journals with the number of submissions by each journal's authors available in its annual report. Therefore, it is also a reputation mechanism for journals and organizations as it shows how open and transparent they are in their scientific publishing.

7. BiomedExperts

Introduction

BiomedExperts is "the first literature-based scientific professional network that brings the right researchers together and allow them to connect, network, communicate and collaborate online." It is discipline specific for life scientists and it is based around publications indexed in PubMed. It extracts publications and the name of authors from PubMed papers and creates profile for those authors. Therefore it has 1.8 million profiles that have been automatically created using PubMed papers. However, only 470,000 users have registered and claimed their profile. Those without any paper in PubMed can still register but they cannot use many features as they don't have publications in the system. Users complete their profile and CV and they can create reading lists, bookmarks and message researchers, monitor recent publications and conferences, search for publications, organizations and researchers, receive article recommendation, and recommend articles.



Facts

URL	www.biomedexperts.com
Launched	2009, January
Country	USA
Owner	Elsevier
Created by	Collexis Holdings inc.
Number of members	470,000 registered, 1.8m profiles
Number of countries	160
Number of publications	18,000,000
Number of full-text publications	Connecting and collaborating with colleagues
Alexa Ranking (Sept 2014)	319,068
Type of site	Discipline specific academic social networking service
Purpose	Networking
Target audience	Life science researchers
Type of research	All
Research areas	Life Sciences
Language	English
Membership	Free
Mobile App	No

Scholarship activities covered

Research

- R4. Requesting/providing help in locating research literature
    - Reading list and recommendation options of the site allow users to do this. Each user can recommend an item to others
- R12. Keeping up with new developments
    - Monitoring feature helps users keep up with new publications and events.

Application

- A8. Serving industry or government as an external consultant
    - Profile feature allows users to list their experience and skills and show if they have served industry or government
- A9. Serving one's professional/disciplinary community
    - Profile feature allows users to list their experience and skills and show if they have served their professional community

Past research on BiomedExperts

Spiroski (2010) analysed publication activity of Macedonian biomedical scientists reported in BiomedExperts. The researcher searched the database for scientific experts in a total of 145 countries, as well as scientific profiles originating from Republic of Macedonia (June 17, 2008). The finding was that Macedonian authors with 410 papers contributed only 0.006% of publications in the BiomedExperts. All neighbouring countries of Madeconia, except Albania (0.001%), had higher percentage of scientific papers in BiomedExperts including Greece (0.468%), Serbia (0.111%), and Bulgaria (0.092%). Only 54 scientists were presented under the name of Republic of Macedonia. They published 825 scientific papers (indexed in PubMed), from which 580 were affiliated with the Republic of Macedonia (70.3%). Macedonian biomedical scientists on average had 14.69 co-authors in their scientific papers.

In a recent survey of about 3000 researchers published in Nature (Van Noorden, 2014) about four percent visited BiomedExperts regularly and about 67 percent were not aware of the service.

Scores, statistics and data provided

- Analysis of co-authorship network, first level, second level and third level (2nd means for example a person who has co-authored a paper with one of the person's direct co-author, so co-author of the person's co-author)
- Visualization of network, geo-network, co-authorship network, Times and places (where and when author has published)
- Categorization of publications by topics
- Analysis of publications (for each paper: list of related experts, related topics, related publications)

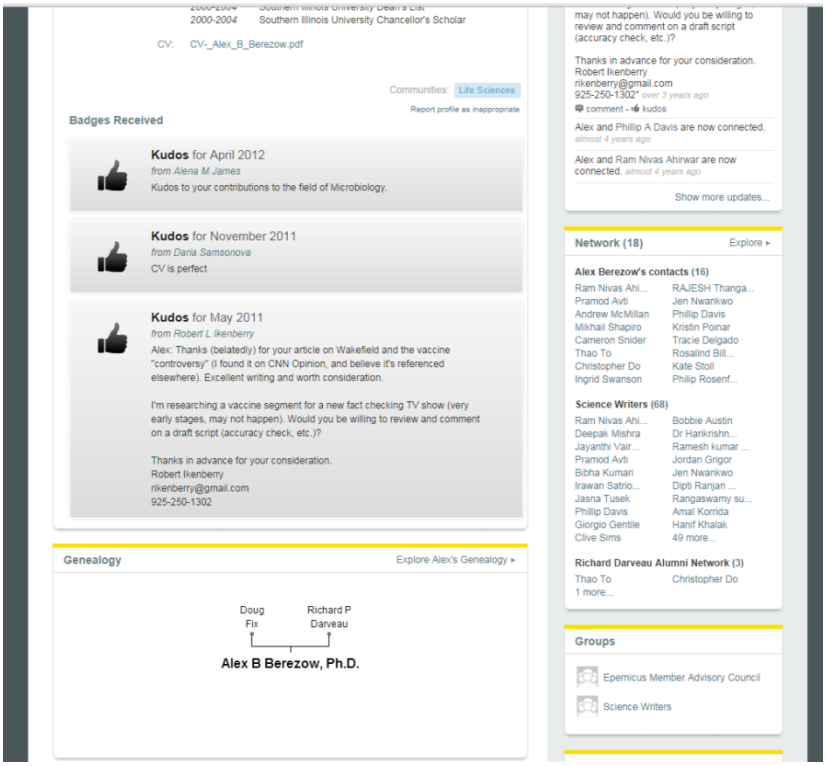
Sum up

BiomedExperts is a social network system based on the publications indexed in PubMed. Most of its features are related to the analysis of the publications that members claim and add to their list of publications; features such as co-authorship network and subject analysis of articles. As a result, the main reputational mechanism that is supported by BiomedExpert is locating literature through features such as reading lists and article recommendations (users can recommend an article). The systems also supports keeping up-to-date through features such as recent publications and updates. As users can list their experience and skills on their profile it also shows if users have served their community or industry or government.

8. Epernicus

Introduction

The Epernicus Network is a professional networking platform for research scientists, mainly in the life sciences and its aim is to help researchers find "*the right people with the right expertise at the right time*". Users create profile and add publications and CV, network and message each other. They can post status, questions and comments, form and join groups and give kudos to other members.



Facts

URL	www.epernicus.com/network
Launched	2007
Country	USA
Owner	Epernicus
Created by	V. Murthy, E. Silberstein, E. Freeman, C. Snider
Number of members	20,000+
Number of countries	NA
Number of publications	NA
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	1,132,815
Purpose	Networking
Type of site	Discipline specific academic social networking service
Target audience	Researchers
Type of research	All
Research areas	Life Sciences
Language	English
Membership	Free
Mobile App	No

Scholarship activities covered

Research

- R12. Keeping up with new developments
    - Monitoring feature and also groups helps users keep up with new publications and events by joining and following groups and receiving updates
- R13. Getting help for solving topical problems
    - There is a BenchQ feature by which people can interact and discuss issues. BenchQ is a communication and forum environment

Application

- A8. Serving industry or government as an external consultant
    - Profile feature allows users to list their experience and skills and show if they have served industry or government
- A9. Serving one's professional/disciplinary community
    - Profile feature allows users to list their experience and skills and show if they have served their professional community

Past research on Epernicus

None

Scores, statistics and data provided

- Genealogy of researcher: a graph that shows to whom a member is connected through educational links. This is mainly based on the supervisor-student relations
- Badges (kudos) received from other members: as mentioned above members can give kudos (thumbs up) to each other if they think someone has achieved something

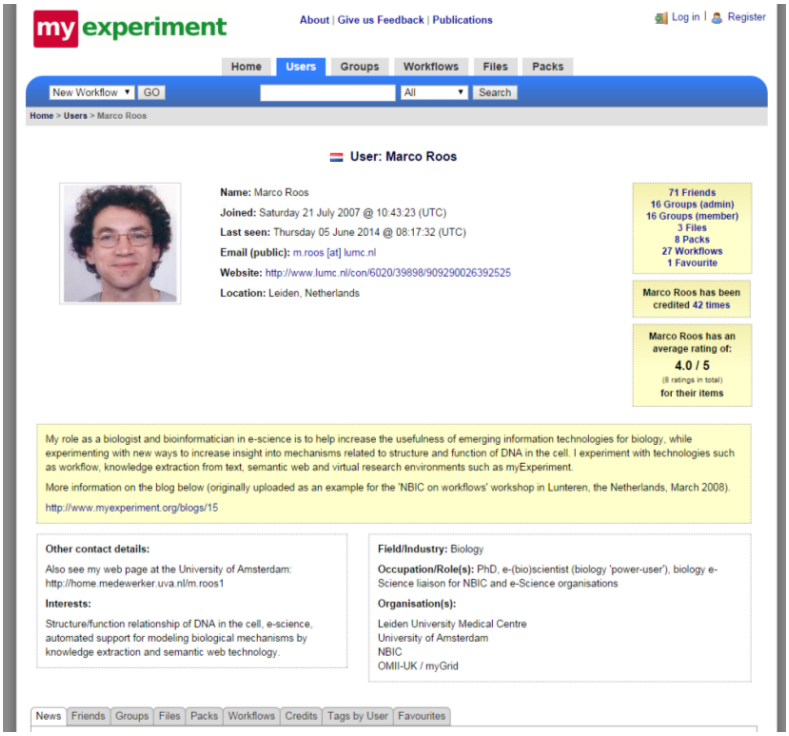
Sum up

Epernicus is a social network for life scientists. In terms of reputation, its BenchQ feature which is a kind of discussion forum, could be used for seeking information/advice and solving problems. Active participation of members in BenchQs can help them build reputation. Users also award kudos to each other based on their impressions of member's achievement, participation or helpfulness. The site also supports keeping up-to-date and the listing past positions and posts in order to show if someone has served industry, government or one's profession.

9. myExperiment

Introduction

"myExperiment is a social networking site and Virtual Research Environment (VRE) designed for people to share, discover and reuse workflows." It is mainly by life scientists to share and create a pool of workflows that can be reused and repurposed by other scientists in order to create time-to-experiment, share expertise and avoid reinvention. It has no specific feature for sharing publication but users can share workflows and other research objects (packs), network, create and join groups and collaborate. Users receive credits and ratings.



Facts

URL	www.myexperiment.org
Launched	2007
Country	UK
Owner	University of Manchester, University of Southampton
Created by	NA (probably JISC)
Number of members	8,820
Number of countries	NA
Number of groups	304
Number of workflows	2415
Alexa Ranking (Sept 2014)	748,559
Purpose	Sharing research objects mainly workflows
Type of site	Discipline specific academic social networking service
Target audience	Researchers
Type of research	All
Research areas	Life sciences
Language	English
Membership	Free
Mobile App	No

Scholarship activities covered

Research

- R9. Releasing data to the scholarly community
    - The site allows sharing research objects, files, packs and workflows and it shows how posted items are used by other members
- R10. Releasing methodologies, research tools and protocols to the scholarly community
    - The site allows sharing research objects, files, packs and workflows it shows how posted items are used by other members
- R11. Releasing laboratory notebooks to the scholarly community
    - The site allows sharing research objects, files, packs and workflows it shows how posted items are used by other members
- R13. Getting help for solving topical problems
    - Group feature of the site allows building communities and discuss and exchange knowledge and tips for solving problems

Past research on myExperiment

None

Scores, statistics and data provided

- Number of friends a person has
- Number of groups the person is administrator of
- Number of groups the person is a member of
- Number of files uploaded and shared by the person
- Number of packs (other digital objects and bundles) uploaded and shared by the person
- Number of workflows uploaded and shared by the person
- Number of favourites
- Number of times the person is credited by others for the use of his/her shared items
- Number of total ratings a person receives from others
- Average rating of the person

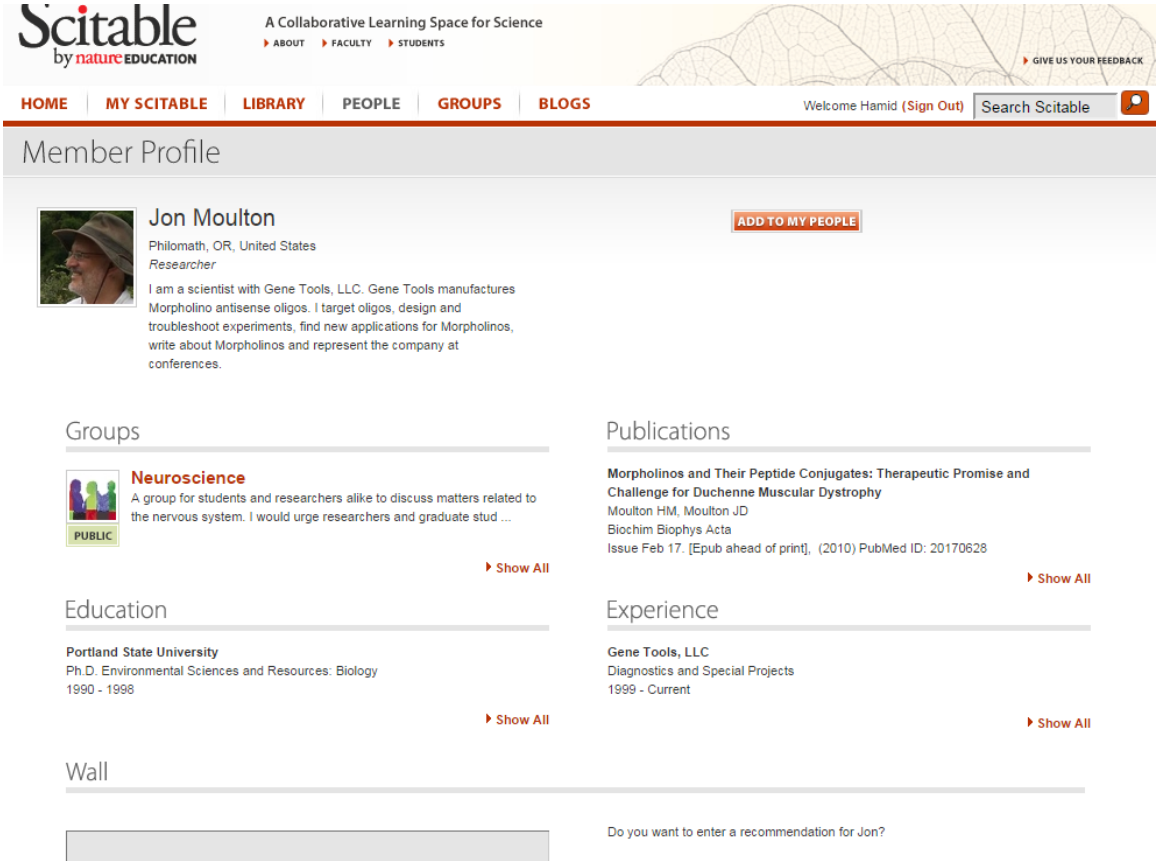
Sum up

myExperiment is a social network for researchers with a focus on workflows used in experiments mainly undertaken by life scientists. It supports sharing workflows in different formats as well as sharing some other research objects. Therefore, users can build reputation by sharing their methodologies, protocols, data and alike. The system's features also allow users to exchange knowledge and seek advice for problem solving. Users build reputation based on how popular their research objects/workflows are and how many other people have used and rated them and how active they are in sharing their research objects with others.

10. Scitable

Introduction

“Scitable is an online teaching/learning portal combining educational articles with technology-based community features help exchange of scientific insights, teaching practices, and study resources. It contains educational articles in the fields of genetics, cell biology and ecology, and is intended for undergraduate faculty and students. Short eBooks on basic science as well as scientific communication and careers help readers connect across disciplines and imagine a future of science participation. Scitable's blog and forum network features a community of both students and professors connecting readers to science news topics, videos and podcasts”.
Users can create a personal page, connect with others, find people, create and join groups, create custom e-books, create blogs, create classrooms and receive updates.



Facts

URL	http://www.nature.com/scitable
Launched	2009
Country	USA
Owner	Nature Publishing Group
Created by	Nature Education
Number of members	NA
Number of countries	180+
Number of publications	NA
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	NA
Type of site	Discipline specific academic social networking service
Target audience	Academics and students
Type of research	All
Research areas	Genetics, cell biology
Language	English
Membership	Free
Mobile App	Yes

Scholarship activities covered

Research

- R12. Keeping up with new developments
  - Users can receive update and can join and follow groups to keep up-to-date
- R21. Disseminating research results, ideas and opinions informally via blogs
  - The site allows users to create blogs and write about their research

Past research on Scitable

None

Scores, statistics and data provided

None

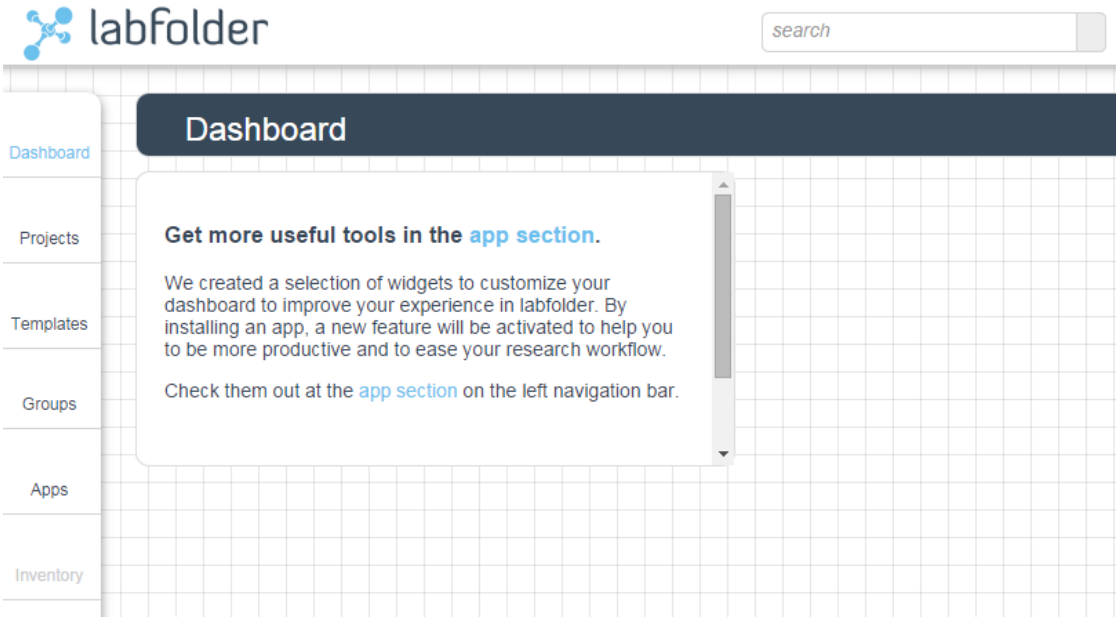
Sum up

Scitable is a social network created by Nature Education. It distinct feature as compared to other social networks is that it has classroom feature that scientists can use to create a class and teach. However, there is no monitoring or evaluative feature that could be used to evaluate the teaching activity taken place in classrooms. Therefore, it does not serve any of the teaching related reputation mechanism. However, it serves keeping up-to-date through joining subject groups and disseminating research results through blogs by using its blog feature.

11. Labfolder

Introduction

labfolder is a digital lab notebook and collaboration platform, used to document research process and organize protocols and data and collaborate. *As a viable alternative to traditional paper-based laboratory notebooks, labfolder allows scientists to document and organize their research, plan their experiments and collaborate with others digitally.*



Facts

URL	www.labfolder.com
Launched	2013
Country	Germany
Owner	Labfolder
Created by	Simon Bungers, Florian Hauer, Mathias Schäffner
Number of members	NA
Number of countries	NA
Number of publications	NA
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	551,903
Type of site	Electronic laboratory notebook
Purpose	Helping documentation and planning tool for laboratory research
Target audience	Researchers
Type of research	All
Research areas	All, mainly sciences
Language	English
Membership	Free basic/paid premium (€160 a year)
Mobile App	Yes

Scholarship activities covered

None

Past research on labfolder

None

Scores, statistics and data provided

None

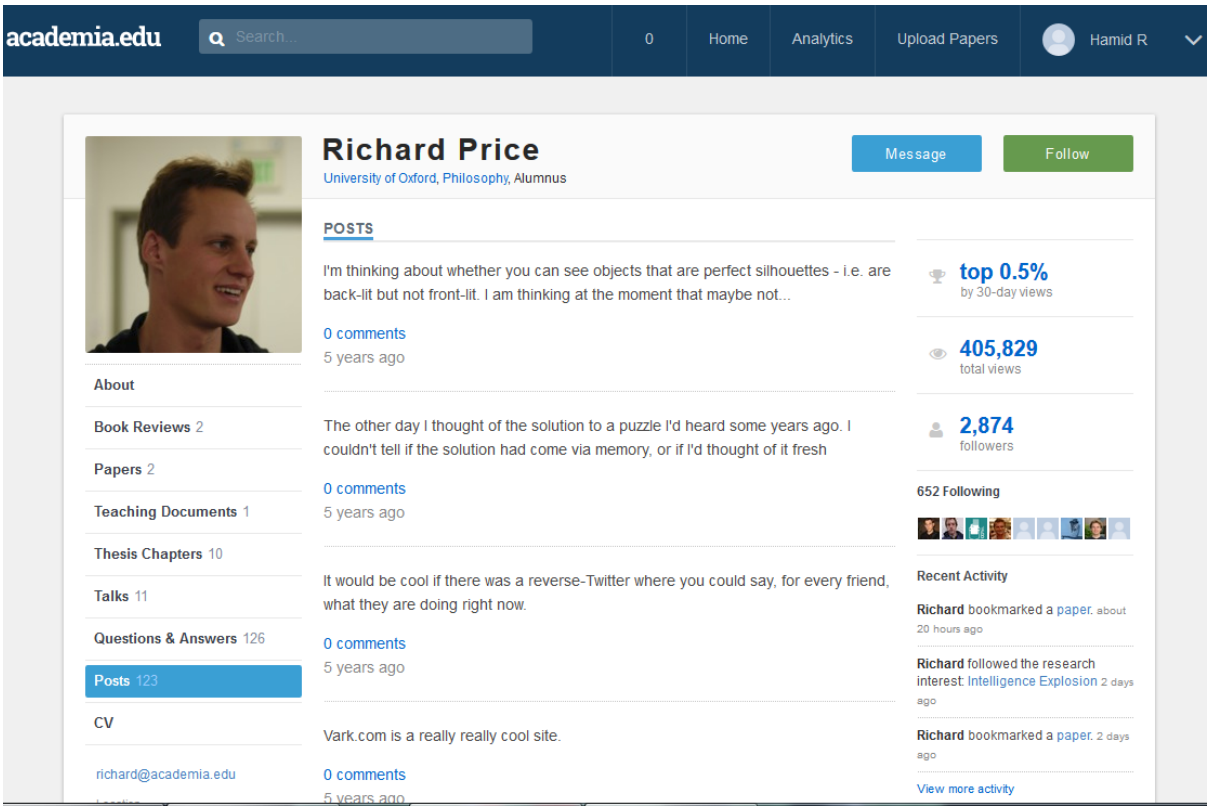
Sum up

labfolder is a tool (Electronic Laboratory Notebook) used by scientists (probably mainly life scientists) to manage their projects and collaborate. It creates a private work space for the research team and is not necessarily open to the public. The reason it is included here is to check and see if these types of research tools could be used for any reputational purposes.

12. Academia

Introduction

Academia.edu was founded in 2008 by Richard Price as a site for sharing research papers after he finished his Ph.D. in philosophy at the University of Oxford in 2007, and moved to San Francisco (Mangan, 2012). The site description is "*Academics use Academia.edu to share their research, monitor deep analytics around the impact of their research, and track the research of academics they follow.*" It is basically a social networking service for academics to create profile and connect with colleagues and share publications. It has other features such as job suggestion, Q & A, and journal suggestions and following journals.



Facts

URL	www.academia.edu
Launched	2008
Country	USA
Owner	Academia
Created by	Richard Price
Number of members	13,044,747
Number of countries	100+
Number of publications	3,255,883
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	1,633
Type of site	Multidisciplinary academic social networking service
Purpose	Sharing publications, Connecting with colleagues,
Target audience	Researchers
Type of research	All
Research areas	All
Language	English
Membership	Free
Mobile App	No

Scholarship activities covered

Research

- R4. Requesting/providing help in locating research literature
    - Publications, sharing, and bookmarking features of the site allows users to find and share literature. The site also make article suggestions based on the members network
- R12. Keeping up with new developments
    - Monitoring feature helps users keep up with new publications and events in their field
- R13. Getting help for solving topical problems
    - Q & A feature helps users exchange tips and knowledge and help others solve problems or seek advice from others
- R14. Disseminating research results formally via traditional scholarly channels
    - Publication and sharing features can be used to list publications in traditional channels and the site shows number of downloads
- R15. Disseminating research results formally via Open Access scholarly channels
    - Publication and sharing features can be used to list publications in OA channels and the site shows number of downloads
- R16. Disseminating research results formally via enhanced Open Access scholarly channels
    - Publication and sharing features can be used to list publications in OA channels and the site shows number of downloads
- R17. Disseminating research results informally via active participation in conferences
    - Publication and sharing features can be used to list conference presentations and the site shows number of downloads
- R18. Disseminating research results informally via repositories/websites
    - Publication and sharing features can be used to list publications and upload full-text to share and the site shows number of downloads
- R20. Disseminating research results, ideas and opinions informally via scholarly social networking sites

    - Publication and sharing features can be used for this purpose and the site shows downloads

Application

- A8. Serving industry or government as an external consultant
    - Profile feature allows users to list their experience and skills and show if they have served industry or government
- A9. Serving one's professional/disciplinary community
    - Profile feature allows users to list their experience and skills and show if they have served their professional community

Past research on Academia

An investigation of Academia.edu users with a registered interest in anthropology, philosophy, chemistry, and computer science based upon data from March-June 2011 found differences in the extent of its use between disciplines and between types of user (faculty, graduate students, independent researchers, postdoctoral researchers). Philosophers and anthropologists seemed to be the most active users, and faculty had similar profile attributes to graduate students in most respects, except that faculty uploaded more documents in all disciplines. One substantial disciplinary difference was that philosophers and anthropologists listed twice as many interests than did chemists (Almousa, 2011).

Menendez, Angeli, and Menestrina (2012) analysed data from 30,426 Academia users in order to study the effect of academic position, university ranking and country on people's behaviour. They also aimed to see how researchers present themselves in a social network specifically developed for supporting academic practices, how they share information and engage in dialogues with colleagues worldwide. Results suggested that the virtual network closely mirrors physical reality, reproducing the same hierarchical structure imposed by position, ranking, and country on user behaviour. Despite the potential for bridging and bonding social capital the networks have not achieved substantial changes in structures and practices of the academic context. They highlight the need of finding new strategies to motivate the users to contribute to the community and support equal participation, as so far the community is mainly exploited as a static website.

Kelly and Delasalle (2012) provided evidence which suggested that personal use of services like LinkedIn and Academia can increase the number of downloads by increasing SEO (Search Engine Optimisation) rankings through inbound links from highly ranked web sites. A survey of the use of such services across Russell Group universities showed the popularity of a number of social media services such as LinkedIn. They proposed that institutional encouragement of their use by researchers may generate increased accesses to institutional research publications at little cost to the institution.

A survey of 160 University of Delhi researchers found that 51% of researchers used Academia (compared to 54% for ResearchGate, 39% for LinkedIn and 35% for CiteULike (Madhusudhan, 2012). Another survey of 71 bibliometricians found that 21% used Academia and ResearchGate compared to 68% for LinkedIn and 24% for Mendeley (Haustein, Peters, Bar-Ilan, et al., 2013).
A study of the web presence of about 1,500 highly cited scientists working at European institutions, however, found a minority to be represented in major social network sites: a quarter had LinkedIn profiles and fewer had Academia and Mendeley profiles (Mas Bleda, Thelwall, Kousha, & Aguillo, 2013).

Thelwall and Kousha (2014) investigated attributes of philosophy scholars on Academia.edu, introducing a median-based time-normalising method to adjust for time delays in joining the sit e. In comparison to students, faculty tend to attract more profile views but female philosophers did not attract more profile views than did males, suggesting that academic capital drives philosophy

uses of the site more than friendship and networking. Secondary analyses of law, history and computer science confirmed the faculty advantage (in terms of higher profile views) except for females in law and females in computer science. It also found a female advantage for both faculty and students in law and computer science as well as for history students. Hence, Academia.edu overall seems to reflect a hybrid of scholarly norm s (the faculty advantage) and a female advantage that is suggestive of general social networking norms. Finally, traditional bibliometric measures did not correlate with any Ac ademia.edu metrics for philosophers, perhaps because more senior academics use the site less extensively or because of the range of informal scholarly activities that cannot be measured by bibliometric methods.

In a recent survey of about 3000 researchers published in Nature (Van Noorden, 2014) it was found that about five percent visit Academia regularly and a little more than 70 percent were not aware of the site. They asked respondents how they use the site and the three main options were joining the site just in case someone wanted to contact them, discovering peer and discover recommended papers.

Scores, statistics and data provided

- Number of profile views (last 30 days, last 60 days, & total)
- Number of document views (last 30 days, last 60 days, & total)
- Number of document downloads (last 30 days, last 60 days, & total)
- Number of unique visitors
- Referrals, the sources that directed the users to the site (e.g. a search engine)
- Search engine referrals keywords
- Number of external links to documents
- Number of visitors by country (last 30 days, last 60 days, & total)

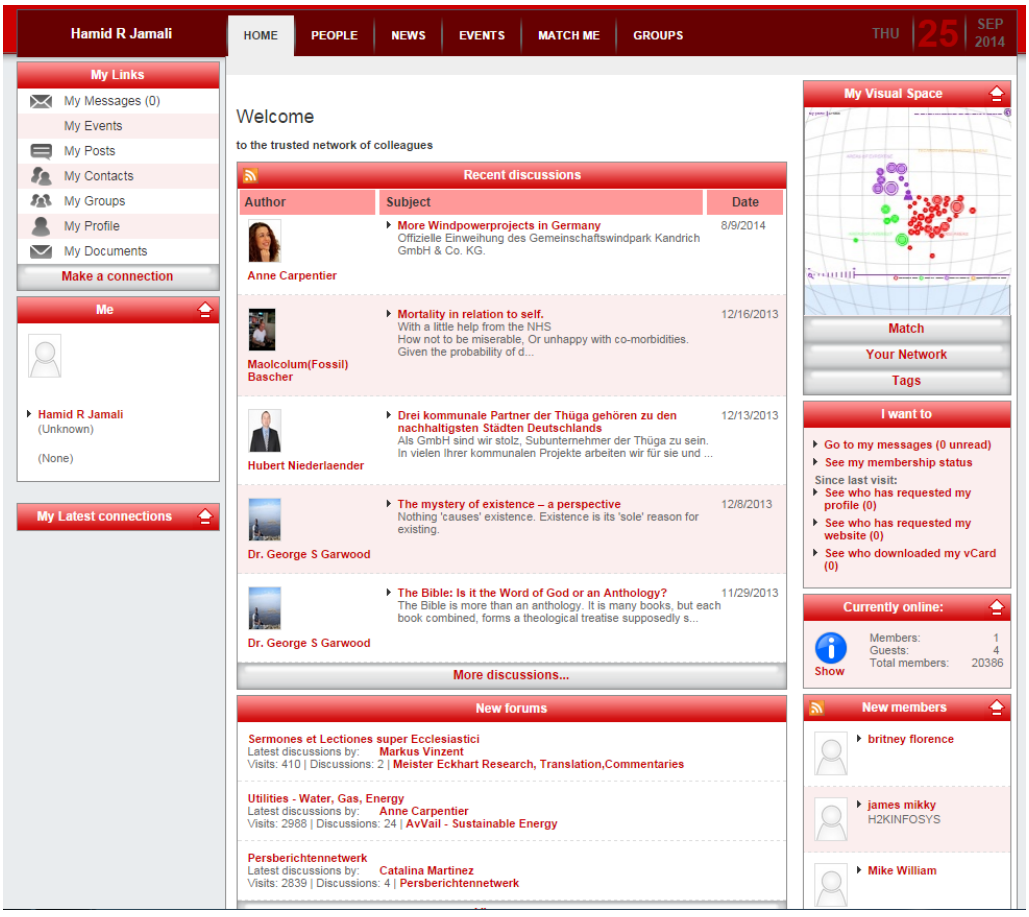
Sum up

A multidisciplinary academic social networking service which is good for showcasing publications. The service provides download statistics, but not citation and other metrics. In terms of reputation, its strength mainly lies in publication-related activities to showcase and disseminate publications. Its profile and CV feature allows users to demonstrate their experiences and skills.

13. Academici

Introduction

Academici is a social networking service that "offers registered users two platforms: a closed, free contact networking platform as well as a closed, paid communication platform for the exchange of business contacts and information." Users can create detailed profiles, upload and share publications, form and join groups, participate in discussions, monitor events and news and receive RSS feeds. Its different feature compared to other SN services is its Visual Space feature that visualizes the network of the person and find and suggest similar matches to the user. This feature is available in paid subscription.



Facts

URL	www.academici.com
Launched	2008
Country	UK
Owner	Academici Ltd.
Created by	NA
Number of members	20,386
Number of countries	200
Number of publications	NA
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	6,142,891
Type of site	Multidisciplinary academic social networking service
Purpose	Connecting with others, social interaction, knowledge exchange
Target audience	Researchers
Type of research	All
Research areas	All
Language	English/ Dutch
Membership	Free basic/paid premium (€28 a year)
Mobile App	No

Scholarship activities covered

Research

- R12. Keeping up with new developments
    - Monitoring feature helps users keep up with new publications and events in his/her interested subjects
- R13. Getting help for solving topical problems
    - It is possible to send messages and contact other member and the site has discussion feature that can be used for asking questions or discussing issues
- R20. Disseminating research results, ideas and opinions informally via scholarly social networking sites
    - Users can upload and share publications through this SN site

Application

- A8. Serving industry or government as an external consultant
    - Profile feature allows users to list their experience and skills and show if they have served industry or government
- A9. Serving one's professional/disciplinary community
    - Profile feature allows users to list their experience and skills and show if they have served their professional community

Past research on Academici

None

Scores, statistics and data provided

- Activity meter: The activity meter indicates the level of activity of a person within the network. It is based on that person's activities within the last 30 days only. The percentage is based on amongst others things, how often this person has logged on in

the last 30 days, how many mails someone has sent and the number of contact requests this person has made.

- Last 15 users that requested your profile
- Last 15 users whose profile you visited recently
- Last 15 users who have visited you or your company's homepage
- Last 15 users whose website you visited recently
- Last 15 users that requested your vCard (a file format standard for electronic business cards)

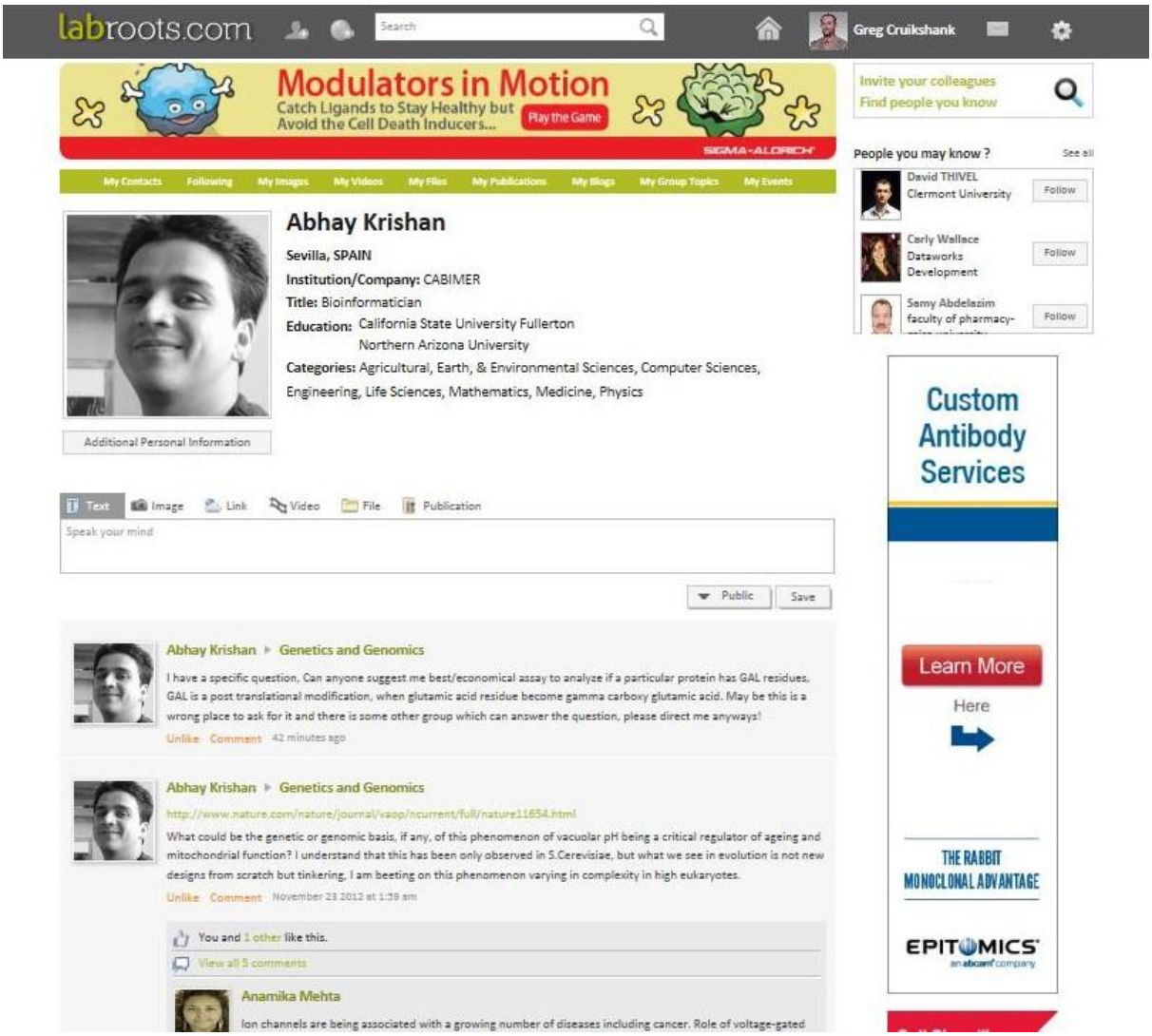
Sum up

A multidisciplinary academic social networking service with no specific feature for publications. Although it allows uploading documents and sharing it in the site's forum and message boards, it does not look suitable for sharing or disseminating publications. The site does not provide statistics for documents (e.g. number of downloads). In terms of reputation, its strength mainly lies in keeping up with developments through site's updates (events & discussions) and group participation; and seeking/offering help in solving problem through groups and message features. Its profile and CV feature allows users to show their experiences and skills and demonstrate if they have served their community or government.

14. labroots

Introduction

It is a professional networking service designed to connect scientists. Users can create profile and connect with each other. They can share items such as publications, images, links, files and videos, search for jobs, follow companies, and monitor conferences, events, webinars and seminars. There are monthly scientific photo/image contests in which users can participate to win prizes (e.g. cash, Amazon gift cards). Another important feature is that users can post reviews of items such as publications, products, companies and so on. They can create blogs and also bookmark publications.



Facts

URL	www.labroots.com/
Launched	2008
Country	USA
Owner	LabRoots
Created by	Greg Cruikshank
Number of members	NA
Number of countries	NA
Number of publications	30,000,000
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	88,970
Purpose	Networking,
Type of site	Multidisciplinary academic social networking service
Target audience	Researchers
Type of research	All
Research areas	All, emphasis on sciences
Language	English
Membership	Free
Mobile App	No

Scholarly activities covered

Research

- R9. Releasing data to the scholarly community
    - The site allows sharing different types of content and users can post their data for public use
- R10. Releasing methodologies, research tools and protocols to the scholarly community
    - The site allows sharing different types of content and users can post research tools, protocols or methodological related items for public use
- R11. Releasing laboratory notebooks to the scholarly community
    - The site allows sharing different types of content and users can post their lab notebooks for public use
- R12. Keeping up with new developments
    - Different features of the site including following groups, others and updates of the site helps users do this
- R20. Disseminating research results, ideas and opinions informally via scholarly social networking sites
    - Users can upload and share their publications on this SN site
- R21. Disseminating research results, ideas and opinions informally via blogs
    - Users can create blogs on the site to write about their research

Application

- A8. Serving industry or government as an external consultant
    - Profile feature of RG allows users to list their experience and skills and show if they have served industry or government
- A9. Serving one's professional/disciplinary community
    - Profile feature of RG allows users to list their experience and skills and show if they have served their professional community

Integration

- I10. Producing Open Education Resources (OER)

- The site allows sharing different types of content including images, video and different types of content files

Past research on LabRoots

None

Scores, statistics and data provided

- Number of members the person follows
- Number of members who follow the person
- Publication list of the member

Sum up

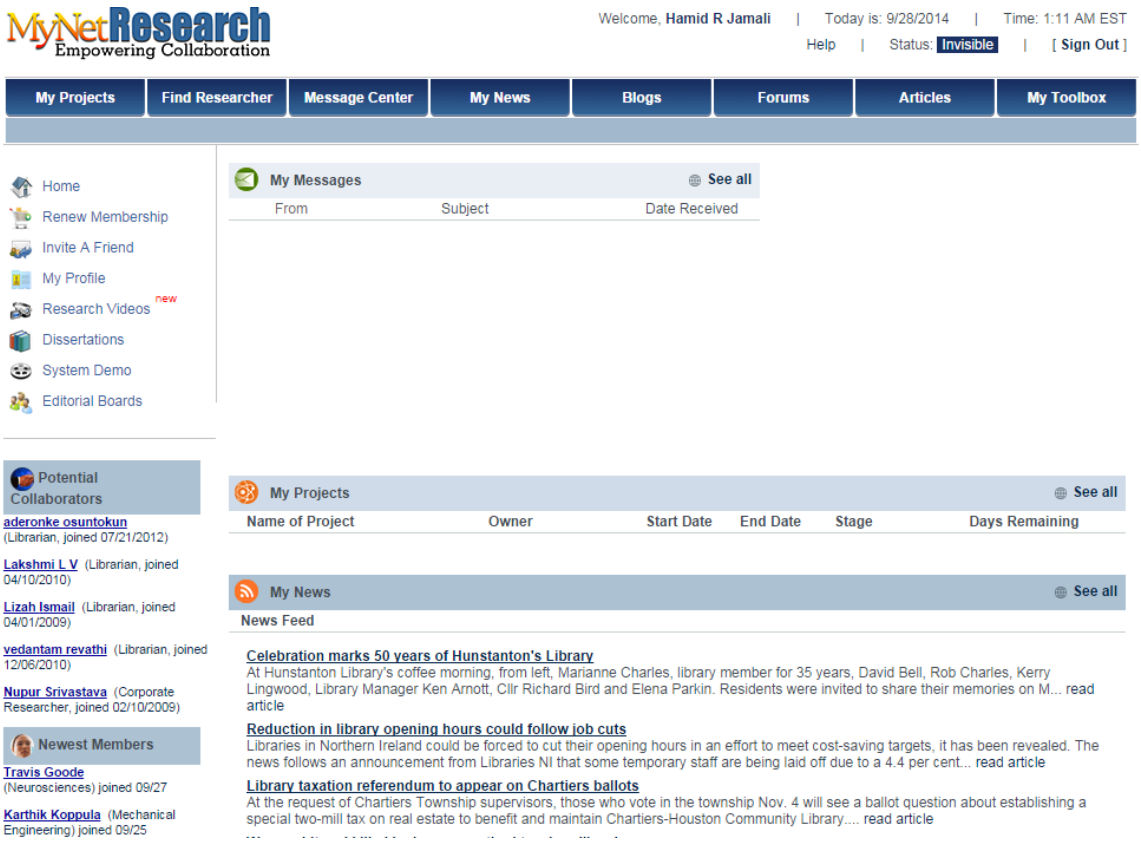
LabRoots is a social network site for scientists. Scientists can create a profile and post different type of items from videos and images to publications and other types of files. However, the system does not seem to provide any metrics (such as downloads, citations or views). Therefore, it is mainly good for reputations that are related to sharing and showcasing. Users can share data, publications, methodologies, lab notebooks and so on. They can also keep up with developments. They can mention on their profile if they have served their professional community, industry or government in the past. They can also create blog to write about their research.

15. MyNetResearch

Introduction

MyNetResearch.com is an online research portal which facilitates the research process. It helps researchers to manage their individual or collaborative research projects, find potential collaborators, store and share data, participate in forums, blogs and write short articles. Its main features include:

- Research Wiki: A collection of terms and definitions created by members contributing their expert knowledge.
- Research Forums: Provide an outlet for researchers to exchange their views on various research topics.
- Research Articles: Short articles written by researchers, who share their personal insights and knowledge of important research issues and techniques.
- Research Blogs: Sharing the human, personal side of the research enterprise with the wider community.
- Research News: Through RSS Feeds, members are only a mouse click away from the latest research news in their specialization.
- Research Tools: A Survey Manager, Grant Locator, Citation Analyzer, Bibliography Manager and other tools increase research productivity.



Facts

URL	www.mynetresearch.com
Launched	NA
Country	USA
Owner	MyNetResearch
Created by	NA
Number of members	20,687
Number of countries	NA
Number of publications	NA
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	1,609,465
Purpose	Helping collaboration
Type of site	Multidisciplinary academic Social Networking service
Target audience	Researchers
Type of research	All
Research areas	All
Language	English
Membership	Free basic/ paid premium ($49.95 a year)
Mobile App	No

Scholarship activities covered

Research

- R13. Getting help for solving topical problems
  - Forums and message centre features can be used for discussion and seeking advice
- R20. Disseminating research results, ideas and opinions informally via scholarly social networking sites
  - Users can add publications and upload full-text to be used by other members
- R21. Disseminating research results, ideas and opinions informally via blogs
  - The site allows users to create blog and write about their research, teaching and experience

Past research on MyNetResearch

None

Scores, statistics and data provided

None

Sum up

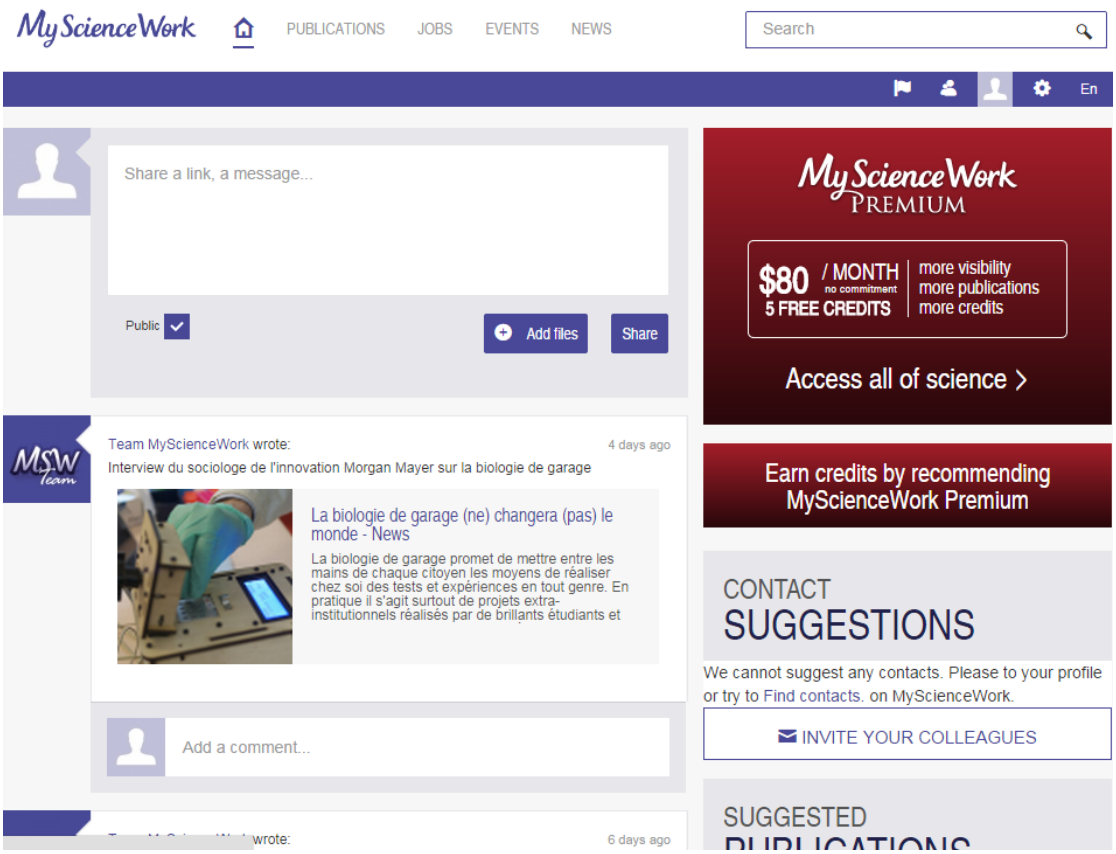
MyNetResearch provides a social network for academics. The site has some novel features compared to other academic social networks including wikis, blogs, bibliographic search and citation analyser. The reputation mechanisms it supports include disseminating research output through social networking sites as users can upload full-text of their publications onto the site. The site also allows knowledge exchange through its message centres and forums and this helps users build reputation by helping others solve problems. Users also can create blogs on the site to disseminate their research output.

16. MyScienceWork

Introduction

MyScienceWork is a communication platform and social network which centres on a database of more than 31 million publications (mainly open access) from over 2500 repositories and publisher databases from more than 30 disciplines. Users can join the network, search for people and publications. Users can annotate publications and make their annotation private, visible to their contacts or make it public.

The site has packages for events in order to better reach the audience, including video service, live tweeting and so on.



Facts

URL	www.mysciencework.com
Launched	2010
Country	Luxumburg
Owner	MyScienceWork
Created by	Virginie Simon, Tristan Davaille
Number of members	1,000,000
Number of countries	NA
Number of publications	31,057,000
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	97,951
Purpose	Networking and sharing
Type of site	Multidisciplinary academic social networking service
Target audience	Researchers
Type of research	All
Research areas	All
Language	English, Français, Português, Español, Italiano, Deutsch, Chinese, Russian
Membership	Free basic/ Paid premium ($80 a month)
Mobile App	No

Scholarship activities covered

Research

- R12. Keeping up with new developments
    - The site suggests publications and also has news and events updates in different formats (video, news, articles etc.)

Past research on MyScienceWork

None

Scores, statistics and data provided

None

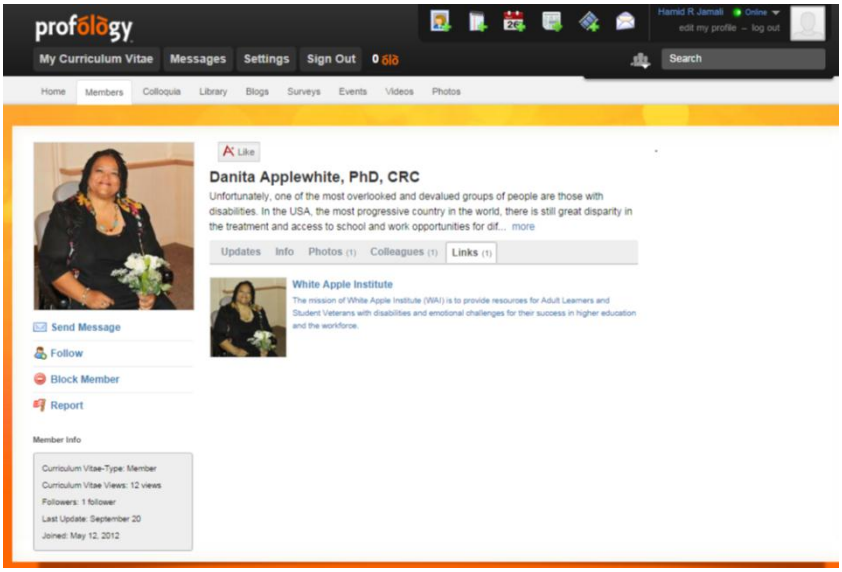
Sum up

MyScienceWork is a publication based social network for researchers. Users receive article suggestions and they can read and annotate those publications. Its main feature, with regard to reputation, is to keep up-to-date.

17. Profology

Introduction

Profology is a professional social networking service only for academic staff and administrators. Students are not allowed to join and it is created so lecturers and professors have a student-free environment to discuss and share their teaching experiences and issues related to their works.



Facts

URL	www.profology.com
Launched	NA
Country	USA
Owner	Profology
Created by	Bob Ertischek
Number of members	830
Number of countries	NA
Number of publications	NA
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	4,085,406
Type of site	Multidisciplinary academic social networking service
Purpose	Sharing and discussion teaching and academic issues
Target audience	higher education faculty, staff and administrator (non-students)
Type of research	All
Research areas	All
Language	English
Membership	Free
Mobile App	No

Scholarship activities covered

Research

- R13. Getting help for solving topical problems
    - Colloquia feature can be used for discussion and seeking advice, although mainly teaching issues are discussed in there
- R21. Disseminating research results, ideas and opinions informally via blogs
    - The site allows users to create blog and write about their research, teaching and experiences

Past research on Profology

None

Scores, statistics and data provided

- Number of CV views
- Number of followers

Sum up

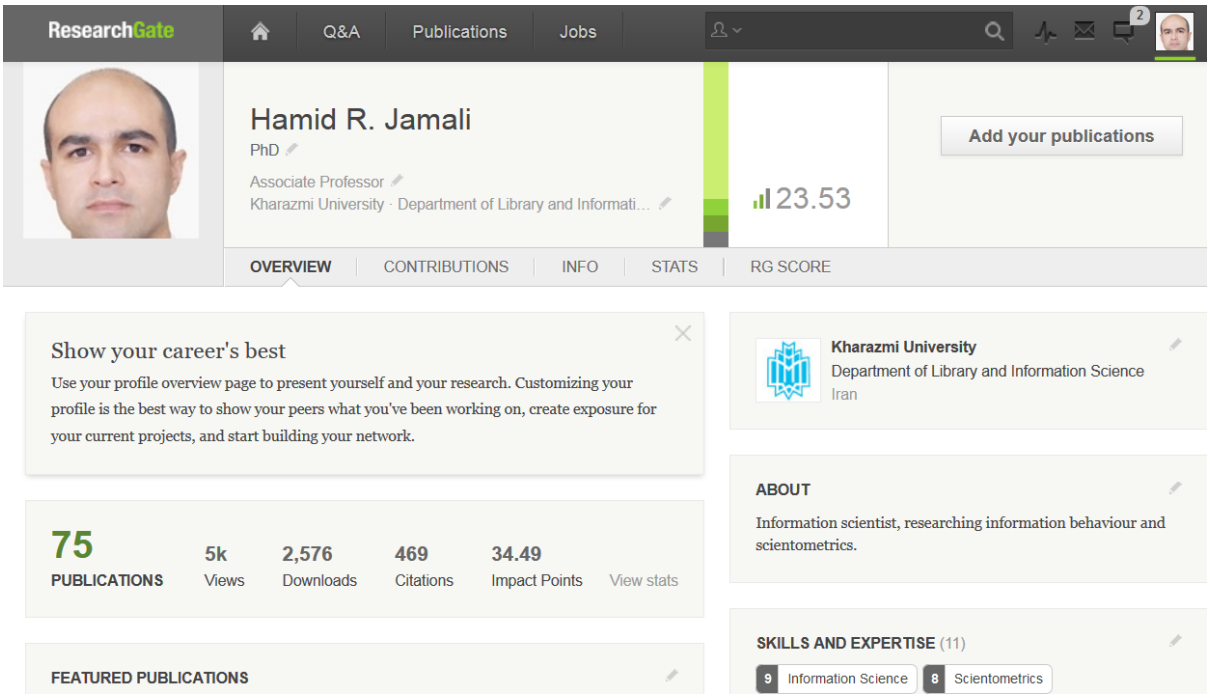
Profology has been mainly created for sharing and discussing teaching and academic matters in a student-free environment. Therefore it is a suitable platform for knowledge exchange and it supports building reputation by helping others solve problems and share own experience. It has a blog feature and users can use it to disseminate their research findings and write about their works.

18. ResearchGate

Introduction

ResearchGate is a social network launched in 2008 by two physicists (IjadMadisch and SörenHofmayer) and a computer scientist (Horst Fickenscher) and some (Johsnon, 2012) consider it as 'a Facebook for scientists'. In 2008 it had more than 800,000 researchers from 192 countries (Giglia, 2011) and now the site (www.researchgate.net/about) claims that it has more than five million members. It is based in Germany and some (e.g. Codina, 2009) consider it a mainly European service. The stated mission of RG is:

"We believe science should be open and transparent. This is why we've made it our mission to connect researchers and make it easy for them to share, discover, use, and distribute findings. We help researchers voice feedback and build reputation through open discussion and evaluation of each other's research."



Facts

URL	www.researchgate.net
Launched	2008
Country	Germany
Owner	ResearchGate
Created by	Ijad Madisch, Sören Hofmayer, Horst Fickenscher
Number of members	5 million
Number of countries	193
Number of publications	67 million
Number of full-text publications	14 million
Alexa Ranking (Sept 2014)	2,592
Type of site	Multidisciplinary academic social networking service
Purpose	Sharing publications, collaboration, connecting with colleagues, Q & A, Finding jobs
Target audience	Researchers/mainly academics
Type of research	All
Research areas	All
Language	English
Membership	Free
Mobile App	No

Scholarly activities covered

Research

- R4. Requesting/providing help in locating research literature
    - Publications, sharing, and bookmarking features of RG allows users to find and share literature
- R9. Releasing data to the scholarly community
    - RG allows sharing different types of content which could be used to share data (e.g. as an Excel file)
- R10. Releasing methodologies, research tools and protocols to the scholarly community
    - RG allows sharing different types of content which could be used to share research tools or protocols
- R11. Releasing laboratory notebooks to the scholarly community
    - RG allows sharing different types of content which could be used to share lab notebooks
- R12. Keeping up with new developments
    - Monitoring feature helps users keep up with new publications and events
- R13. Getting help for solving topical problems
    - Q & A feature of RG help users do this
- R14. Disseminating research results formally via traditional scholarly channels
    - Publication and sharing features can be used to list publications in traditional channels and disseminate them by uploading the full-text, the site gives citation and download statistics
- R15. Disseminating research results formally via Open Access scholarly channels
    - Publication and sharing features can be used to list publications in OA channels and disseminate them by uploading the full-text, the site gives citation and download statistics
- R16. Disseminating research results formally via enhanced Open Access scholarly channels

    - Publication and sharing features can be used to list publications in OA channels and disseminate them by uploading the full-text, the site gives citation and download statistics
- R17. Disseminating research results informally via active participation in conferences
    - Publication and sharing features can be used to list conference presentations and disseminate them by uploading the full-text, the site gives citation and download statistics
- R18. Disseminating research results informally via repositories/websites
    - Users can upload full-text of their publications including published or preprints on RG, the site gives citation and download statistics
- R20. Disseminating research results, ideas and opinions informally via scholarly social networking sites
    - Publication and sharing features can be used for this purpose, the site gives citation and download statistics
- R23. Participating in open peer reviewing
    - RG has recently added Open Review feature that could be used for this purpose
- R24. Monitoring one's impacts
    - RG statistics and scores shows impact of researchers

Application

- A8. Serving industry or government as an external consultant
    - Profile feature of RG allows users to list their experience and skills and show if they have served industry or government
- A9. Serving one's professional/disciplinary community
    - Profile feature of RG allows users to list their experience and skills and show if they have served their professional community

Integration

- I10. Producing Open Education Resources (OER)
    - Sharing feature of RG allows users to upload and share different types of content (e.g. powerpooint etc.) and this helps users to share freely on the web one's educational resources for everyone to use and reuse

Past research on ResearchGate

Thelwall & Kousha's (2013) assessed whether ResearchGate usage and publication data broadly reflect existing academic hierarchies and whether individual countries are set to benefit or lose out from the site. They used software to crawl the data related to institutions on ResearchGate and based on the statistics available from RG such as total publications, views, impact points, downloads and RG score they ranked institutions. The results show that rankings based on ResearchGate statistics correlate moderately well with other rankings of academic institutions, suggesting that ResearchGate use broadly reflects traditional academic capital. Moreover, while Brazil, India and some other countries seem to be disproportionately taking advantage of ResearchGate, academics in China, South Korea and Russia may be missing opportunities to use ResearchGate to maximise the academic impact of their publications.

A few survey studies have investigated the use of different social networks by researchers. A survey of 160 University of Delhi researchers found that 54% of researchers used ResearchGate (compared to 51% for Academia, 39% for LinkedIn and 35% for CiteULike (Madhusudhan, 2012). Another survey of 71 bibliometricians found that 21% used ResearchGate (compared to 68% for LinkedIn and 24% for Mendeley) (Haustein, Peters, Bar-Ilan, et al., 2013). A study of the web presence of about 1,500 highly cited scientists working at European institutions, however, found a minority to be represented in major social network sites: a fourth had LinkedIn profiles and even

less had Academia and Mendeley profiles, although ResearchGate was not checked (Mas Bleda, Thelwall, Kousha, &Aguillo, 2013).

Regarding the motivations for use of ResearchGate, a survey of 100 researchers in one Indian university (Chakraborty, 2012) found common reasons for using ResearchGate to be finding out about others' research (24%), keeping up-to-date (31%) and forming study groups (37%), with some social scientists but no scientists finding it to be useful.

A few studies such as Moeslein, Bullinger, & Soeldner (2009) Kubalik (2011) compared academic social networking sites such as ResearchGate and some others in terms of technical specification, interface, features and so on.

An international survey of 3000 researchers (Van Noorden, 2014) revealed that just under half visited ResearchGate regularly. ResearchGate was less popular among humanities and social sciences scientists. The two main activities on ResearchGate was joining just in case contacted and discovering peers.

Scores, statistics and data provided

- Publications
    - Number of publications by type (articles, conference papers etc)
    - Number of publication views by country & by institution, daily, weekly, and total
    - Number of full-text downloads daily, weekly, and total
    - Number of dataset downloads daily, weekly, and total
    - Number of full-text requests last week, and total
    - Number of Google referrals (for publications) daily, weekly
    - Number of Open Reviews
    - Number of Citations
    - Impact Points (aggregate of IF values of one's publications)
- Profile
    - Number of profile views by country & by institution, daily, weekly, and total
    - Number of Google referrals (for profiles) daily, weekly
- Number of questions
- Number of answers
- Number of Followers
- Number of Projects
- RG Score (a score with a secret algorithm that is calculated based on how other researchers interact with one's content, how often, and who they are).
- Global Institution Ranking based on different statistics of RG Score and Impact Point (Total, median, or 1st Decile, 9th Decile)

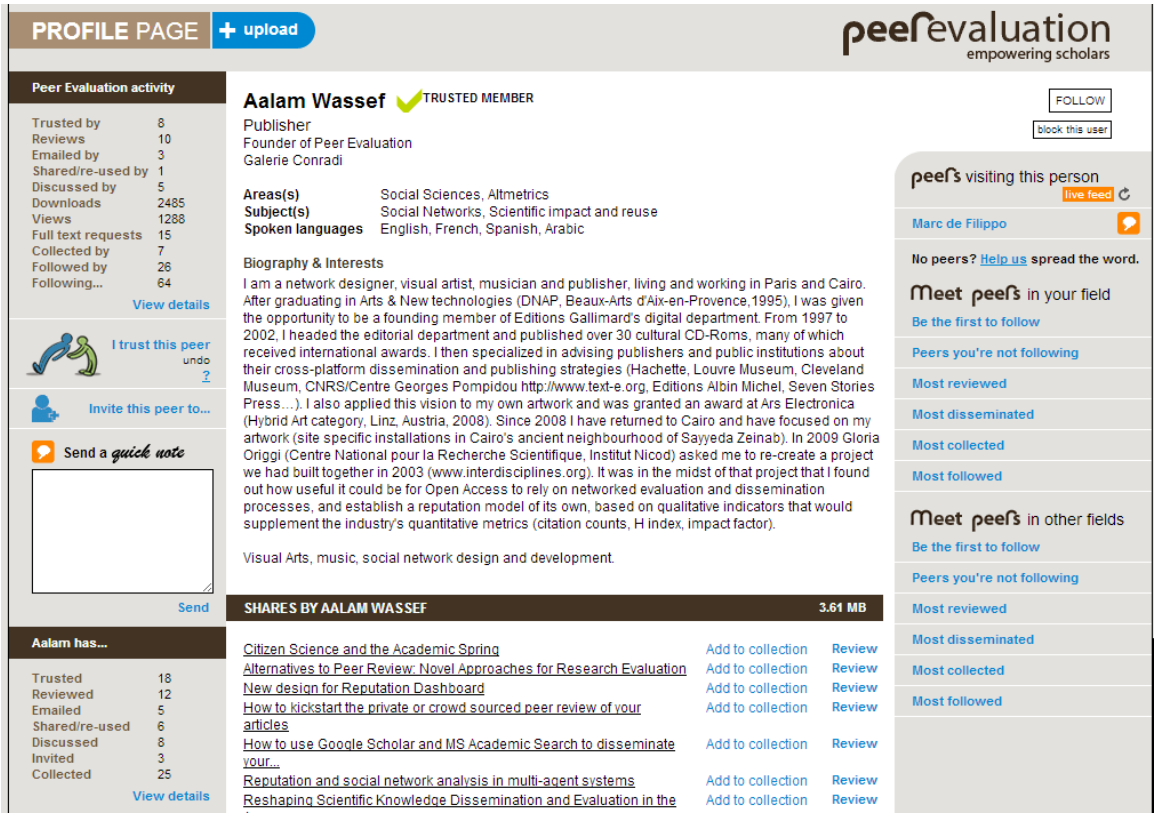
Sum up

ResearchGate is a very popular academic social network. It has relatively more features compared to its competitors such as Academia and therefore it supports more reputation mechanism. It is also one of the few platforms that gives scores (calculated based on different scholarship activities) to members and this makes it more suitable for building reputation. Because it allows members to create detail profile, upload files and monitor impact (i.e. citations, downloads and views) of their output it supports many of the research related scholarship activities, especially most of those that are related to the dissemination of research output through different channels. ResearchGate ticks many of the boxes for a good reputational mechanism. People tend to like it. You can see it developing.

19. peerevaluation

Introduction

peerevaluation is a platform for conducting an open review of research publications, data, working papers, articles, and media. It also promotes open access. Users can create profile, add items, review items and follow others.



Facts

URL	www.peerevaluation.org
Launched	2010
Country	USA
Owner	NA
Created by	Aalam Wassef
Number of members	NA
Number of countries	NA
Number of publications	NA
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	18,249,006
Purpose	Conducting an open review of publications
Type of site	Open Peer review system
Target audience	Researchers
Type of research	All
Research areas	All
Language	English
Membership	Free
Mobile App	No

Scholarship activities covered

Research

- R23. Participating in open peer reviewing
    - This is the main function and purpose of the site

Past research on peerevaluation

None

Scores, statistics and data provided

- Number of times trusted by others
- Number of Reviews written
- Number of Downloads for items
- Number of Views to items
- Number of times Followed by others
- Number of times Emailed by others
- Number of times each item is Shared/re-used by others
- Number of times an item is Discussed by others
- Number of Full text requests
- Number of times Collected by others
- Number of times Followed by others
- Number of Following
- Number of times Invited by others

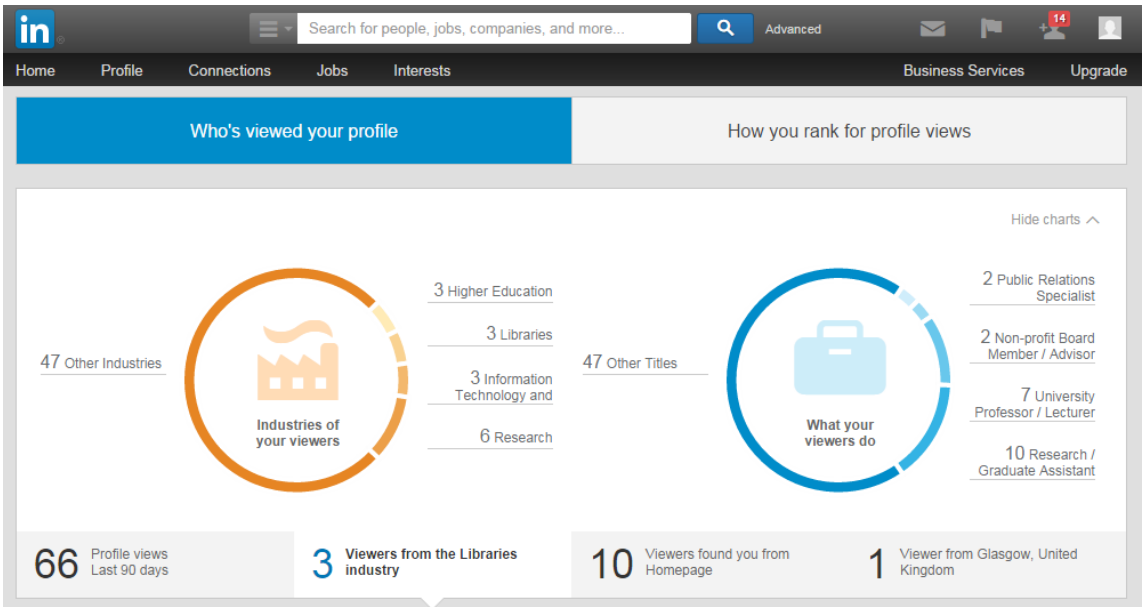
Sum up

peerevaluation is simply an open peer review system and researchers can build reputation on the site by being an active reviewer who writes quality reviews. Reviewers are trusted by members and the more a reviewer is trusted by members for his/her reviews, the better his/her reputation.

20. LinkedIn

Introduction

LinkedIn claims to be the world's largest professional network with 300 million members in over 200 countries and territories around the globe. Its mission is to connect the world's professional in order to make them more successful and productive. It is a professional social network in which people can connect, follow and contact each other, search for jobs and so on. LinkedIn does not provide academic-specific features. It later adapted to academics to some extent by giving users the option to list publications in their profile.



Facts

URL	www.linkedin.com
Launched	2002
Country	USA
Owner	LinkedIn
Created by	Reid Hoffman, Konstantin Guericke, Jean-Luc Vaillant, Allen Blue, Eric Ly
Number of members	300,000,000
Number of countries	200+
Number of publications	NA
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	12
Purpose	Networking of professionals
Type of site	Professional social networking service
Target audience	Professionals
Type of research	All
Research areas	All
Language	English and 22 Other languages
Membership	Free
Mobile App	Yes

Application

- A8. Serving industry or government as an external consultant
    - Users can demonstrate in their profiles the expertise and relevant roles they've taken in the past
- A9. Serving one's professional/disciplinary community
    - Users can demonstrate in their profiles relevant roles they've taken in the past

Past research on LinkedIn

Olsen (2008) did a qualitative (11 interviews with professionals in 2006) study on the use of LinkedIn in Norway in order to find out how professionals in Norway employ the social networking service. The study focused on how professionals in Norway perceived social networking services and how they employed LinkedIn as a professional networking tool. The interviews showed that there were two main types of networkers on LinkedIn: active and passive.

A longitudinal study (Archambault & Grudin, 2012) of Facebook, LinkedIn and Twitter based on random sampling between 2008 and 2011 showed that social networking went from being a niche activity to being very widely and heavily used. Growth in use and acceptance was not uniform, with differences based on gender, age and level (individual contributor vs. manager).

McCorkle & McCorkle (2012) studied the use of LinkedIn (i.e., an online professional social network) for teaching marketing subject in classroom as a means of developing important skills of Social Media/Networking, along with other supporting skills such as communication and creativity.

Gerard (2012) examined exploratory data from 154 respondents from undergraduate Capstone strategy courses in order to provide insights into some possible advantages and limitations of the free social networking system to offset networking challenges as well as to enhance those professional and career-based advantages associated with effective network management. He gave three LinkedIn related assignments to students. Some of the findings were that a large percentage of students cared about searching for or otherwise availing themselves of professional opportunities and managing publicly available professional information. The largest percentage of

respondents found activities such as collaboration, sharing and solving problems to be least important.

Kristin (2013) in an exploratory research study examined the effect of gender on LinkedIn profiles, including what types of information and how complete the content was that users posted about themselves. The data were obtained through a content analysis of thirty LinkedIn profiles. Results supported the hypotheses that women have fewer connections than men, women will have more complete profiles than men, and women will have more female connections than male connections.

Guillory and Hancock (2012) looked at how LinkedIn shapes patterns of deception in resumes. The general self-presentation goal to appear favourably to others motivates deception when one's true characteristics are inconsistent with their desired impression. Because LinkedIn makes resume claims public, deception patterns should be altered relative to traditional resumes. Participants (n=119) in a between-subjects experiment created resumes in one of three resume settings: a traditional (offline) resume, private LinkedIn profiles, or publicly available LinkedIn profiles. Findings suggest that the public nature of LinkedIn resume claims affected the kinds of deception used to create positive impressions, but did not affect the overall frequency of deception. Compared with traditional resumes, LinkedIn resumes were less deceptive about the kinds of information that count most to employers, namely an applicant's prior work experience and responsibilities, but more deceptive about interests and hobbies. The results stand in contrast to assumptions that Internet-based communication is more deceptive than traditional formats, and suggests that a framework that considers deception as a resource for self-presentation can account for the findings.

Bonson and Bednarova (2013) studied the extent of the use of LinkedIn by Eurozone companies and how these companies managed their online practices, what was their typical audience, and which were the potential factors influencing both extent and audience. A sample of 306 companies listed in the STOXX Europe 600 index, including 19 subsectors and 12 countries, was analysed. To measure the extent of LinkedIn usage, an index was defined and calculated on a scale from 0 to 5. Results showed that although the majority of the companies (79 per cent) used LinkedIn, they mainly focused on a particular group of stakeholders: current and potential employees. Their focus was thus mostly related to professional purposes such as providing information about employees and career opportunities. Just a few of them engaged in blogging or updating statuses. Only a very small number of companies were using this platform for marketing or other purposes. The findings also showed that the audience of a corporate LinkedIn channel was influenced by the extent of usage of that channel as well as by the size of the company.

Claybaugh and Haseman (2013) investigated the impact of trust - both at the individual level and network level - on the strength of association between members of LinkedIn. An online survey of a random sample of LinkedIn members was used to empirically test a model of trust adapted from previous literature. The findings indicated that dyadic tie strength is influenced by an individual's disposition to trust and by the trust belief between the respondent and the respondent's last connection made in LinkedIn. Trust in LinkedIn did not influence the relationship.

A survey of 3000 researchers (Van Noorden, 2014) showed that about 41 percent visited LinkedIn regularly and less than ten percent were not aware of the site. The top three reasons of using the site was to be present on the site just in case someone wanted to contact the person, and discover jobs and peers.

Scores, statistics and data provided

- Profile views broken down by
    - Geographic location (how many visitors from each country)

    - Date of view (when they visited the profile)
    - Subject domain and type of profession (e.g. librarian, higher education etc.)
    - Device or method of reaching the profile (by mobile, people with similar profile, people viewing homepages etc)
- User's rank among your connections based on the number of profile views

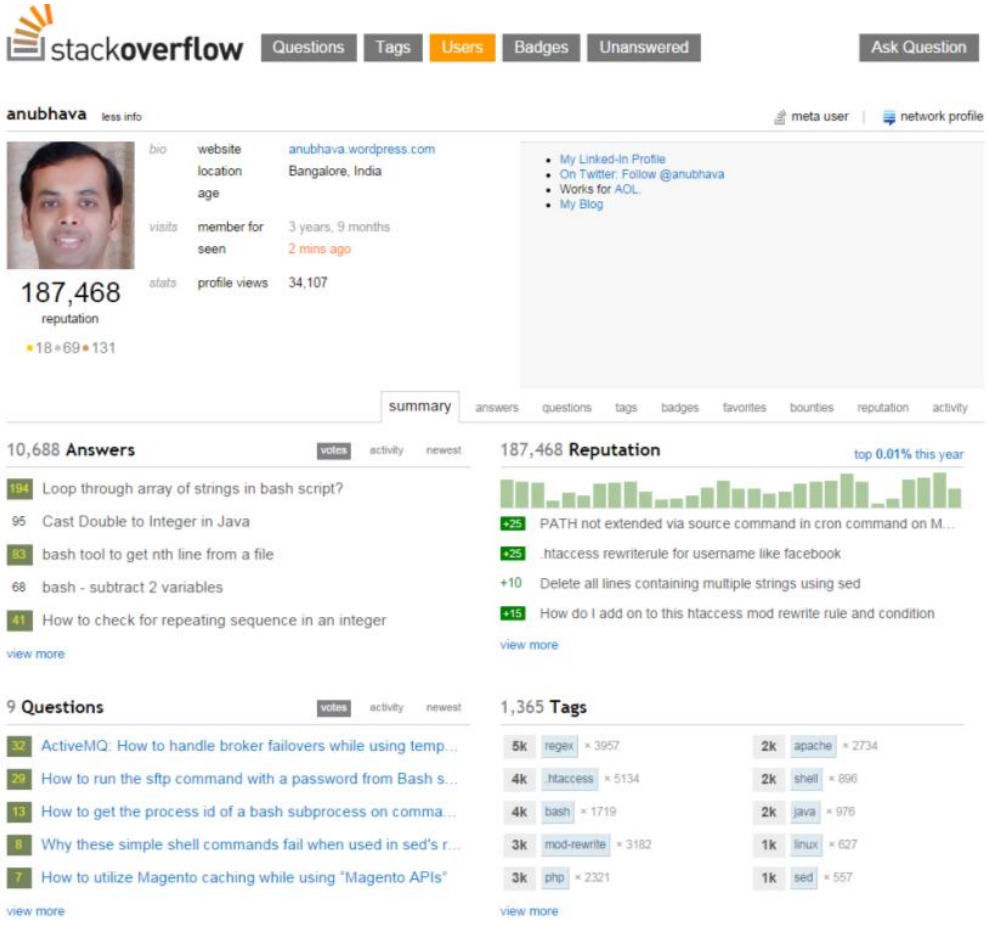
Sum up

LinkedIn is a social network for professionals in which people can create a profile and connect and network. LinkedIn is a very large network in terms of the number of members. As said above, it is not specifically designed for academics or researchers; however, they can list their publication, experiences, skills and past positions. Therefore, the reputation purpose it supports is to show if the person has had specific posts or positions which in turn indicate serving community or government or industry. Interestingly if you probably asked people to name a 'reputational system', they would probably mention LinkedIn.

21. stackoverflow

Introduction

stackoverflow is a question and answer site for programmers. Users ask and answer questions, vote and comment questions and answers and earn reputation and as they earn reputation they earn more privileges.



Facts

URL	http://stackoverflow.com
Launched	2008
Country	USA
Owner	Stack Exchange Inc
Created by	Joel Spolsky and Jeff Atwood
Number of users	3,500,000
Number of countries	NA
Number of questions	8,100,000
Number of answers	14,000,000
Alexa Ranking (Sept 2014)	48
Type of site	Q & A Site
Purpose	Getting answers to programming questions
Target audience	Programmers
Type of research	NA
Research areas	Computer Programming
Language	English
Membership	Free
Mobile App	Yes

Scholarship activities covered

Research

- R13. Getting help for solving topical problems
    - Users can achieve this by asking questions and giving answers to each other.

Past research on stackoverflow

Treude, Barzilay, and Storey (2011) manually categorised 385 questions in Stack Overflow to see the kinds of questions that are asked, and to explore which questions are answered well and which ones remain unanswered. Their findings indicated that Q&A websites are particularly effective at code reviews and conceptual questions. Two years later, Wang, Lo, and Jiang (2013) extended their work by developing a model of automatically categorising questions.

Nasehi et al. (2012) aimed to find out about the characteristics of the effective code examples as programmers learning how to use an API or a programming language often rely on code examples to support their learning activities. They conducted a qualitative analysis of the questions and answers posted to Stack Overflow. By analysing highly voted answers they identified characteristics of effective examples. They found that the explanations accompanying examples are as important as the examples themselves.

Vasilescu, Capiluppi, and Serebrenik (2012) looked at gender distribution of participation in Stack Overflow and their findings confirmed that men represent the vast majority of contributors to Stack Overflow. Moreover, men participate more, earn more reputation, and engage in the "game" more than women do. Scattered evidence suggests that women can be overly under-represented. Moreover, anecdotal evidence of Stack Overflow suggests that women withdraw from unfriendly online communities.

Bazelli, Hindle, and Stroulia (2013) analysed the personality traits of Stack Overflow authors by categorizing them into different categories based on their reputation. Through textual analysis of Stack Overflow posts, they found that the top reputed authors are more extroverted compared to

medium and low reputed users. Moreover, authors of up-voted posts express significantly less negative emotions than authors of down-voted posts.

Movshovitz-Attias et al. (2013) analysed 3.5 million questions and 6.9 million answers created by 1.3 million users in the years 2008--2012. They focused on the reputation system of site and the participation patterns of high and low reputation users. The contributions of very high reputation users to the site indicate that they are the primary source of answers, and especially of high quality answers. They found that while the majority of questions on the site are asked by low reputation users, on average a high reputation user asks more questions than a user with low reputation. They used some graph analysis methods for detecting influential and anomalous users in the underlying user interaction network, and found that they were effective in detecting extreme behaviors such as those of spam users. They maintained that the application of their method is that by considering user contributions over first months of activity on the site, we predict who will become influential long-term contributors.

Yang et al. (2014) proposed a novel metric for expert identification, which provides a better characterisation of users' expertise by focusing on the quality of their contributions. They identified two classes of relevant users, namely sparrows and owls, and they described several behavioural properties in the context of the Stack Overflow.

Scores, statistics and data provided

- Number of questions voted up by members
- Number of answers voted up by members
- Number of answers accepted (by one who has asked the question)
- Number of edits approved
- Reputation score (with details): higher reputation based on the four items above results in new privileges such as the ability to vote, comment, edit others' posts, and at the highest level one gain moderation privilege
- Badges received for participation on the site (in three levels: bronze, silver, and gold)
- Number of profile views

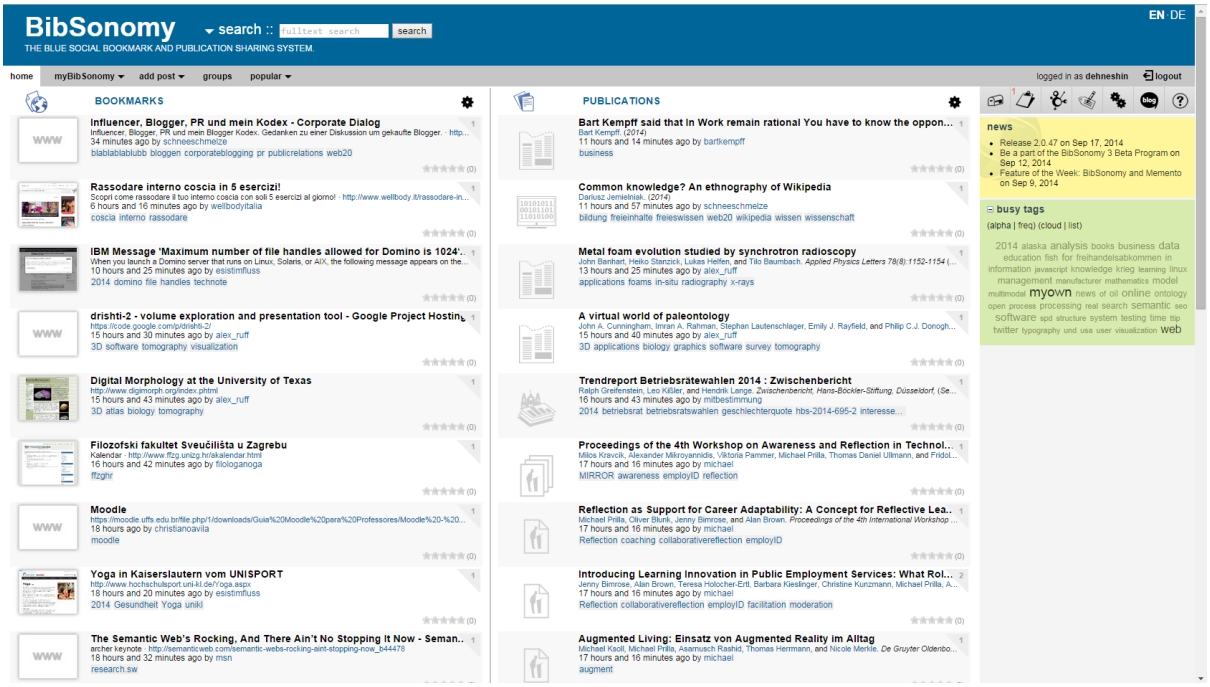
Sum up

stackoverflow is a Question and Answer (Q & A) site for programmers. It is not a chat or forum site for discussions. Its main purpose is simply to get quality answers to questions. Therefore, it helps exchange of tips and knowledge and helping each other solve problems. Members build reputation on this site by being active participants. The number of good questions asked, number of correct answers given and the number of favourable votes questions and answers receive contribute in the reputation a member builds.

22. BibSonomy

Introduction

Bibsonomy is a system for organizing and sharing bookmarks and lists of publications. It is basically a reference management service with some social media and networking features. Users can bookmark, tag and organize, rate and discuss publications. They can create and join groups for collaboration and message each other. It has many import and export formats.



Facts

URL	www.bibsonomy.org
Launched	2006
Country	Germany
Owner	KDE group of the University of Kassel
Created by	KDE group of the University of Kassel
Number of members	NA
Number of countries	NA
Number of publications	NA
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	5,308
Type of site	Reference management tools with social media feature
Purpose	Collect, organize and share bookmarks and publications
Target audience	Researchers
Type of research	All
Research areas	All
Language	English/ German
Membership	Free
Mobile App	No

Scholarship activities covered

Research

- R4. Requesting/providing help in locating research literature
    - Users can bookmark and share publication which helps users identify relevant papers
- R12. Keeping up with new developments
    - Users can see recent or popular items and can join and follow groups to keep up with developments
- R23. Participating in open peer reviewing
    - The site has a discussion feature where users can discuss and review items

Past research on bibsonomy

Stiller, Gade, and Petras (2011) investigated the occurrence of tags in different languages in a BibSonomy. Users of bibsonomy can assign tags (keyword labels) to items in different languages. This is called social tagging or folksonomy. Social tags assigned to URLs in multiple languages and users tagging these URLs multilingually were the main focus of the study. The results showed that multilingual tags occur for the same URL and that users tag in different languages. Furthermore, the results give indications that the language of the content of a URL does not imply that its tags are in the same language.

Borrego and Fry (2012) explored the possibility of using data from bibsonomy to measure the use of information by academic researchers. They maintained that social bookmarking data can be used to augment participative methods (e.g. interviews and surveys) and other, non-participative methods (e.g. citation analysis and transaction logs) to measure the use of scholarly information. Their results showed that published journal articles were by far the most popular type of source bookmarked, followed by conference proceedings and books. Commercial journal publisher platforms were the most popular type of information resource bookmarked, followed by websites,

records in databases and digital repositories. Usage of open access information resources was low in comparison with toll access journals. In the case of open access repositories, there was a marked preference for the use of subject-based repositories over institutional repositories. The results were consistent with those observed in related studies based on surveys and citation analysis, confirming the possible use of bookmarking data in studies of information behaviour in academic settings. The researchers maintained that the main advantages of using social bookmarking data are that is an unobtrusive approach, it captures the reading habits of researchers who are not necessarily authors, and data are readily available. The main limitation is that a significant amount of human resources is required in cleaning and standardizing the data.

Scores, statistics and data provided

- Popular tags, authors, concepts, discussions and posts
- Rating (5 star rating) of bookmarked items

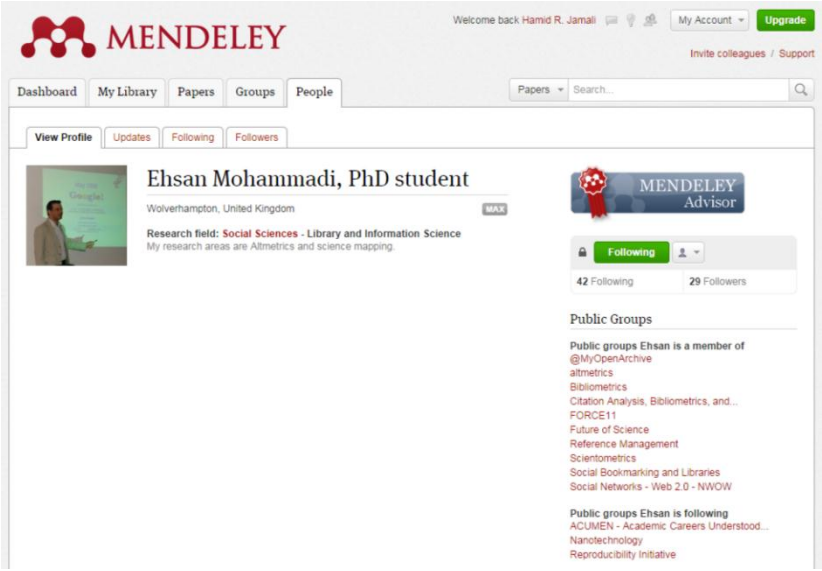
Sum up

A reference management tool with some social media features. In terms of reputation, it is good for participating in locating valuable research literature through crowdsourcing by bookmarking and commenting. Therefore, it is also useful as a tool for keeping up-to-date. Its commenting feature can be used in an open review system to appraise publications by others.

23. Mendeley

Introduction

Mendeley is a free reference manager and academic social network that helps users organize documents, collaborate with others online, and discover the latest research. It has an Institutional Edition which is a premium version of Mendeley with institutional needs in mind. It includes premium upgrades for researchers to increase their productivity and collaboration power and an analytical dashboard to enable librarians to better support their institutional information objectives and the researchers needs. Mendeley is available on the web and as a desktop software as well as a mobile devices app. Mendeley has been used a source of data for altmetrics, mainly for extracting readership size of articles.



Facts

URL	www.mendeley.com
Launched	2009
Country	UK
Owner	Elsevier
Created by	three German PhD students
Number of members	2,000,000
Number of countries	100+
Number of publications	NA
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	26,026
Type of site	Reference management tools with social media feature
Purpose	Managing and sharing research papers
Target audience	Researchers and academics
Type of research	All
Research areas	All
Language	English
Membership	Free for individuals/ paid premium for institutions
Mobile App	Yes

Scholarship activities covered

Research

- R4. Requesting/providing help in locating research literature
    - The site supports both the scientific purpose of the activity – the anchoring of an undertaking in the conceptual basis of the relevant scholarly field, and its reputational purpose – the achieving of enhanced disciplinary and trans-disciplinary visibility, via the utilisation of the peer-to-peer or crowd-sourcing-based options it offers for bookmarking, sharing and locating publications
- R12. Keeping up with new developments
    - Users can see recent or popular items and can follow each other in order to keep up with the developments

Past research on Mendeley

Jeng et al. (2012) using four factors borrowed from traditional social group theories, examined owners' group descriptions in Mendeley to study the applicability of traditional social group theories for large, loosely-formed online groups. The four factors included directive leader demands, achievement-oriented goal setting, affective ties, and self-presentation. They manually annotated the descriptions for 529 Mendeley groups, and correlated the appearances of the factors with two measures of the groups' outcomes: the changes in the numbers of group members and the changes of the articles shared within the groups between 2011 and 2012. Results suggested that, in general, all four factors were important in online groups, which indicates the usefulness of traditional group theories in the study of online groups. In addition, although a majority of the factors have helped the growth of group size being higher than average, several factors (e.g. self-presentation) have caused the increase of the shared articles within the groups to be smaller than average increase.

Coverage of journal articles seems to be high in Mendeley. For example a study found that 80% of PLoS articles are covered in Mendeley (Priem, Piwowar, Hemminger, 2012), another study (Zahedi, Costsas, and Wouteres, 2013) showed that Mendeley has the highest coverage of WoS articles (a random sample of 20,000 articles) among all social media and another study (Mohammadi and Thelwall, 2014) found out that 44% of social science articles and 13% of humanities articles from WoS in 2008 were covered in Mendely.

Mohammadi and Thelwall (2014) compared Mendeley readership counts with citations for different social sciences and humanities disciplines. The overall correlation between Mendeley readership counts and citations for the social sciences was higher than for the humanities. Low and medium correlations between Mendeley bookmarks and citation counts in all the investigated disciplines suggest that these measures reflect different aspects of research impact. Mendeley data were also used to discover patterns of information flow between scientific fields. Comparing information flows based on Mendeley bookmarking data and cross-disciplinary citation analysis for the disciplines revealed substantial similarities and some differences. Thus, the evidence from this study suggests that Mendeley readership data could be used to help capture knowledge transfer across scientific disciplines, especially for people that read but do not author articles, as well as giving impact evidence at an earlier stage than is possible with citation counts. Li and Thelwall (2012) also found positive correlations between Mendeley readership counts and bibliometric indicators for a sample of papers in the field of genomics and genetics.

Mohammadi et al. (2014) used data about Mendeley members in different subject areas and found out that the majority of readers for all disciplines were PhD students, postgraduates and postdocs but other types of academics were also represented. They also found out that many clinical medicine papers were read by medical professionals. The highest correlations between citations and Mendeley readership counts were found for types of users that often authored academic

papers, except for associate professors in some subject disciplines. Their conclusion was that Mendely readership can reflect usage similar to traditional citation impact, if the data is restricted to readers who are also authors, without the delay of impact measured by citation counts. They suggested that Mendeley statistics can also reveal the hidden impact of some research papers, such as educational value for non-author users.

Zahedi and Costas (2014) investigated the impact of publications read (saved) by the different users in Mendeley in order to explore the extent to which their readership counts correlate with their citation indicators. The potential of filtering highly cited papers by Mendeley readerships and its different users have been also explored. For the analysis of the users, they considered the information of the top three Mendeley 'users' reported by the Mendeley. Results showed that publications with Mendeley readerships tend to have higher citation and journal citation scores than publications without readerships. 'Biomedical & health sciences' and 'Mathematics and computer science' are the fields with respectively the most and the least readership activity in Mendeley. PhD students have the highest density of readerships per publication and Lecturers and Librarians have the lowest across all the different fields. precision-recall analysis indicated that in general, for publications with at least one reader in Mendeley, the capacity of readerships of filtering highly cited publications is better than (or at least as good as) Journal Citation Scores.

Bar-Ilan (2014) examined a sample of 100 European astrophysicists and their publications indexed by the citation database Scopus, submitted to the arXiv repository and bookmarked by readers in the reference manager Mendeley. Although it is believed that astrophysicists use arXiv widely and extensively, her results showed that on average more items are indexed by Scopus than submitted to arXiv. A considerable proportion of the items indexed by Scopus appear also on Mendeley, but on average the number of readers who bookmarked the item on Mendeley is much lower than the number of citations reported in Scopus. The comparisons between the data sources were done based on the authors and the titles of the publications.

Robinson-Garcia et al. (2014) analysed Altmetric.com. A set of publications have analyzed with doi number indexed in the Web of Science during the period 2011-2013 and collected their data with the Altmetric API. 19% of the original set of papers was retrieved from Altmetric.com including some altmetric data. 16 different social media sources from which Altmetric.com retrieves data have identified. However five of them cover 95.5% of the total set. Twitter (87.1%) and Mendeley (64.8%) have the highest coverage. A survey of 3000 researchers (Van Noorden, 2014) showed that about eight percent visited Mendeley regularly and their two main reasons for using it was to discover recommended papers and share links to authored contents.

Scores, statistics and data provided

- Number of followers each member has
- Number of people followed by the member
- Number of readers for each publication (number of members have an item in their collection)
- Ranking of publication outlets by readership (e.g. Nature is the top outlet by the number of readership)

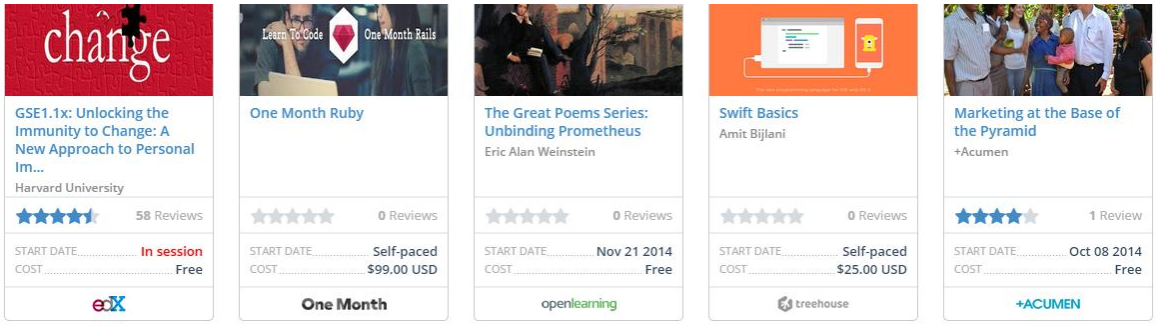
Sum up

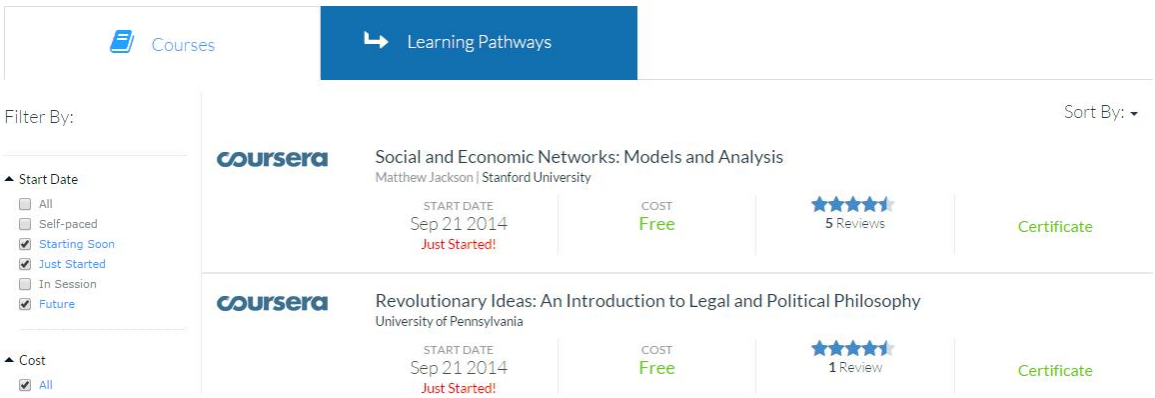
Mendeley is a very popular/high profile reference management tool with some social media features. Because it provides readership statistics (numbers of time an item is bookmarked or included in users' libraries). As a result Mendeley readership statistics are widely used as a source of altmetrics data. The reputation mechanisms Mendeley supports are related to keeping up-to-date and helping through crowdsourcing to locate literature. However, readership statistics of Mendeley indirectly can show how popular an author or an authored item is.

24. Coursetalk

Introduction

Coursetalk is “the leading search, discovery and sharing site for learners to explore the broadest array of online courses offered on the planet”. It is basically a search service for MOOC’s and open enrolment courses freely available to everyone. Its main feature is the possibility to review course and course providers. Users can rate and review courses and the service then rates courses and course providers (such as Coursera and Edx) and this helps students choose a better course. Professors can get feedback on their online courses. Users receives points, rewards and badges for their participation on the site and courses receive reviews. The services has a course recommendation system.





Facts

URL	www.coursetalk.com
Launched	2012
Country	USA
Owner	Coursetalk
Created by	NA
Number of members	NA
Number of courses	44,524
Number of Course providers (platforms)	46
Number of institutions	451
Alexa Ranking (Sept 2014)	68,573
Purpose	Rating of courses and platforms to help choose better courses
Type of site	Review system for MOOCs
Target audience	Academics (students, parents, lecturers, MOOC providers)
Type of research	All
Research areas	All
Language	English
Membership	Free
Mobile App	No

Scholarship activities covered

Teaching

- T4. Producing and delivering a teacher focussed, online, institution-based, either access controlled or freely accessible course/ learning programme
    - The site supports reputational mechanism for this activity as people can review courses and rate them and monitor their quality
- T5. Co-producing and co-teaching a teacher focussed, online, institution-based, either access controlled or freely accessible course/ learning programme
    - The site supports reputational mechanism for this activity as people can review courses and rate them and monitor their quality
- T6. Conducting a social networks based, participatory MOOC (massive open online course)
    - The site supports reputational mechanism for this activity as people can review courses and rate them and monitor their quality

Past research on CourseTalk

None

Scores, statistics and data provided

- Number of reviews and rating (as starts) for instructors (see screenshot above)
- Number of reviews and rating (as starts) for courses
- Number of reviews and rating (as starts) for course providers
- List of top reviewers by number of reviews
- Number of votes for each review

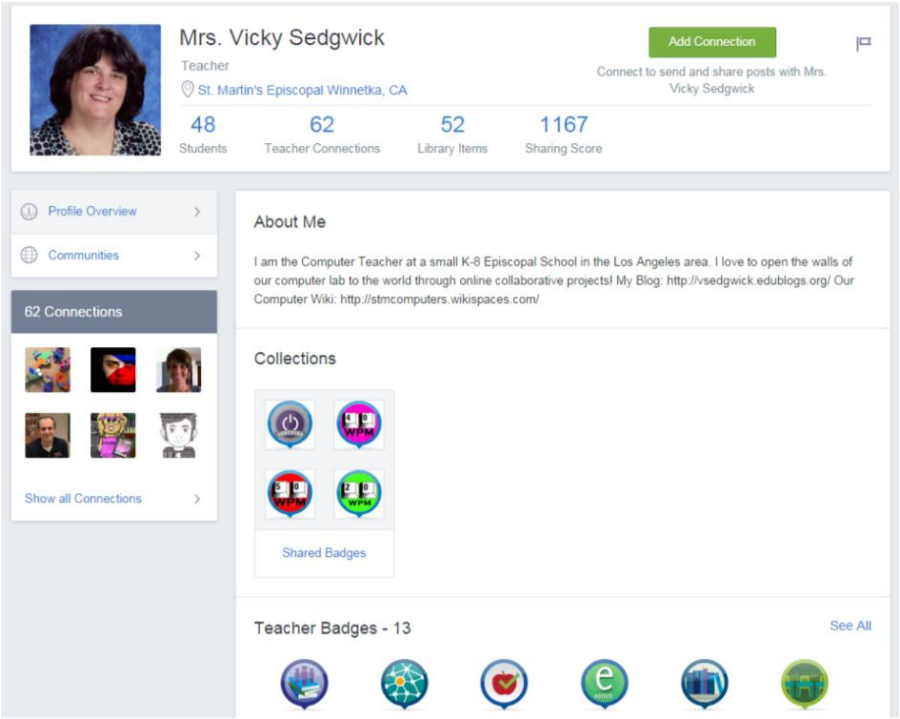
Sum up

Coursetalk is an open review and rating system for MOOCs and online learning platforms. Lecturers, course providers and institutions can build a reputation by receiving a good rating and favourable reviews. Students and reviewers can also build reputation by being active reviewers.

25. Edmodo

Introduction

Edmodo is a social learning platform or an educational social networking service originally created for K-12 level, but also used for higher education. Users can be lecturers, students, or parents. Lecturers can use it as an online learning platform to create and offer courses, quizzes, exams, and assignments, and to grade and annotate assignments and use a wide range of apps for teaching purposes. Students join courses, upload or turn in assignments and do quizzes. Parents can join and see their children's assignments and grades. It has other features such as calendar and events. Users can receive badges from Edmodo based on their activity.



Facts

URL	www.edmodo.com
Launched	2008
Country	USA
Owner	Edmodo
Created by	Nic Borg, Jeff O'Hara, Crystal Hutter
Number of members	41,889,098
Number of countries	NA
Number of publications	NA
Number of full-text publications	NA
Alexa Ranking (Sept 2014)	10,569
Type of site	Social learning platform
Purpose	Create a K-12 social learning platform
Target audience	Students, teachers and lecturers
Type of research	All
Research areas	All
Language	English, Spanish, Portuguese, German, Greek, French, Turkish, Dutch, Chinese
Membership	Free
Mobile App	Yes

Scholarship activities covered

None

Past research on Edmodo

The literature of Edmodo are not related to reputation, however, a number of studies on students confirmed its popularity and effectiveness as a supplementary educational tool (Enriquez, 2014; Paliktzoglou and Suhonen, 2014; Balasubramanian, Jaykumar, and Fukey, 2014) and that it increases students' engagement and responsible learning (Sanders, 2011). A qualitative study compared students' interactions in Edmodo versus in Facebook (Curran-Sejkora, 2013). The conclusion was that Edmodo and Facebook can be compared in three categories: accessibility, functionality, and environment.

A study on teachers (Kongchan, 2008) also revealed that Edmodo was perceived to be a wonderful and user-friendly social learning network. The finding of another study on teachers (Batsila, Tsihouridis and Vavougios, 2014) showed that teachers think it is very motivating for learners and that they believe it supports their work and they like most of its features.
Thien et al. (2013) studied learning management systems including Blackboard, Moodle, Edmodo and found out that active changes and promising results were shown when Edmodo had been used in various courses with several hundreds of students.

Scores, statistics and data provided

- Number of students a teacher has
- Number of teacher connections a teacher has
- Number of library items a teacher has in his/her library (on the site)
- Sharing score (How often the resources a teacher has shared are added to libraries and viewed by other users)

- Different types of badges (badges are awarded based on Edmodo activity automatically, e.g. if teacher attend a training course on how to use Edmodo it receives a badge for that, or if s/he has more than a certain number of teacher connection it receives another badge)

Sum up

Edmodo is a platform which offers courses and creates class rooms. It has features and tools to help lecturers facilitate/improve teaching. However, there is no review or rating activity taking place on Edmodo. Although, teachers can receive badges from the platform, these badges are more related to their activities on the site (e.g. number of teacher connections and so on) rather than the quality of their teaching activities.

III. SUMMARY

The twenty-five platforms studied cover a range of scholarship activities that provide an opportunity to build, maintain or showcase scholarly reputation and eventually help build a new scholarly reward system (58 different activities, see the list in Annex 2). The following five tables illustrate the activities that are covered by each platform. Overall, from 58 different activities, the platforms support 27 reputation building, maintaining and showcasing activities. Out of these, 16 are research related activities. The remaining 31 activities are not covered at all.

ResearchGate and Academia support the reputational purposes of the largest number of activities, seventeen and eleven respectively. *labfolder* and Edmodo, on the other hand, did not support the reputation building, maintaining or showcasing purpose of any activity at all.

From these case studies we can see that activities that are related to **research** (the scholarship of discovery) are better covered than other activities. Moreover, among research activities those related to **releasing and disseminating research outputs** via different channels are well supported.

Among **teaching activities** (the scholarship of teaching), three activities related to the production and delivery of online courses are covered by one platform. The reputational purpose that is covered by the platform for all of the three activities is to **monitor and evaluate the quality and effectiveness of the learning experience**.

From ten activities related to **the scholarship of application**, the reputational purposes of two activities (**serving industry or government**, or one's **professional/disciplinary community**) are covered.

Reputational purpose of only one activity from the ten activities of the **scholarship of integration** is covered which is about **sharing freely on the web one's educational** resources (producing open education resources). Finally, citizen science platforms cover all of the five activities related to the scholarship of co-creation.

Table 1: Activities that provide an opportunity to build, maintain or showcase scholarly reputation related to the Scholarship of Research (see Annex 1 for the codes of the activities)

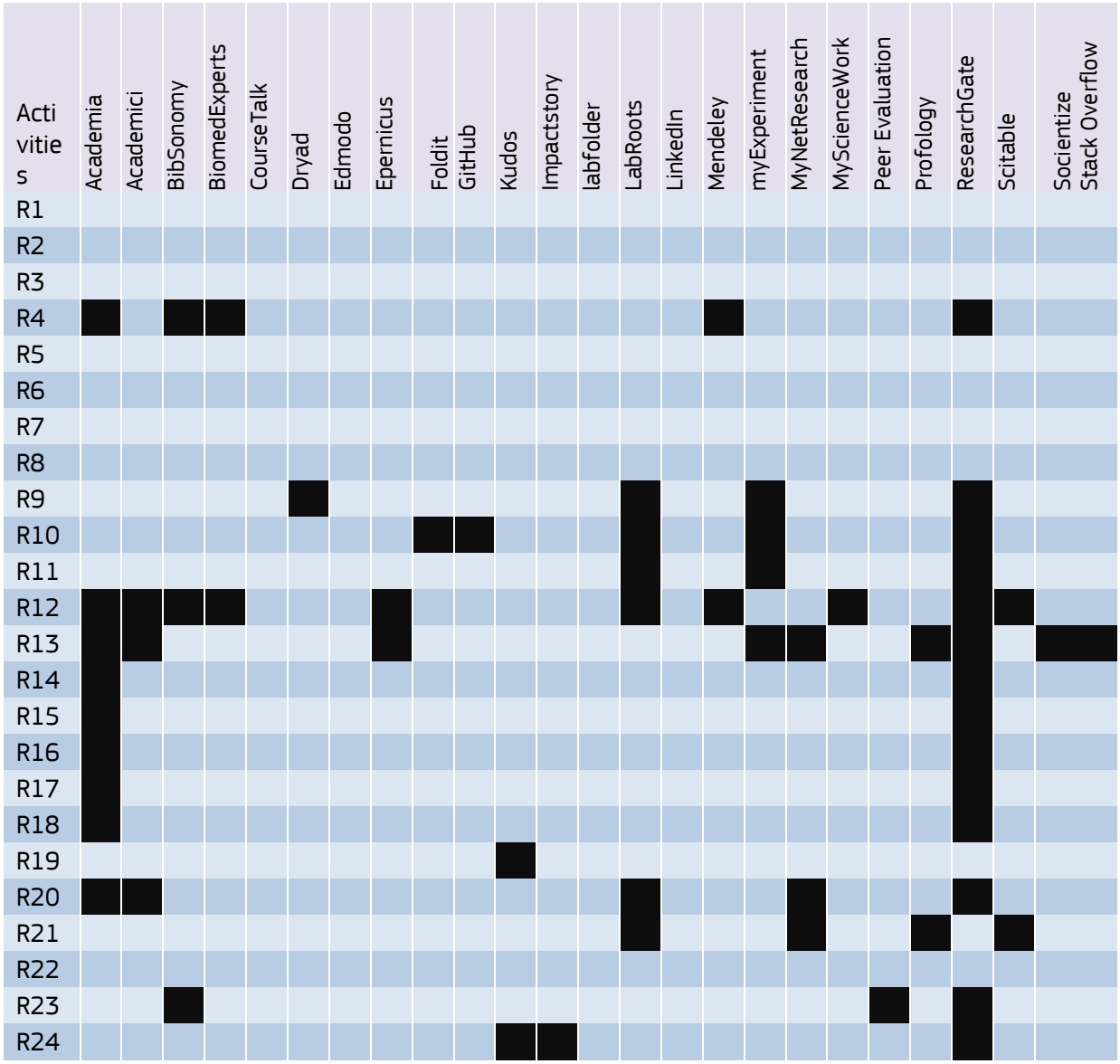


Table:. Activities that provide an opportunity to build, maintain or showcase scholarly reputation related to the Scholarship of Teaching (see Annex 1 for the codes of the activities)

Activities	Academia	Academici	BibSonomy	BiomedExperts	CourseTalk	Dryad	Edmodo	Epernicus	Foldit	GitHub	Kudos	Impactstory	labfolder	LabRoots	LinkedIn	Mendeley	myExperiment	MyNetResearch	MyScienceWork	Peer Evaluation	Profology	ResearchGate	Scitable	Socientize	Stack Overflow
T1																									
T2																									
T3																									
T4					■																				
T5					■																				
T6					■																				
T7																									
T8																									
T9																									

Table 3: Activities that provide an opportunity to build, maintain or showcase scholarly reputation related to the Scholarship of Application (see Annex 1 for the codes of the activities)

Activities	Academia	Academici	BibSonomy	BiomEdexperts	CourseTalk	Dryad	Edmodo	Epernicus	Foldit GitHub	Kudos	Impactstory	labfolder	LabRoots	LinkedIn	Mendeley	myExperiment	MyNetResearch	MyScienceWork	Peer Evaluation	Profology	ResearchGate	Scitable	Socientize Stack Overflow
A1																							
A2																							
A3																							
A4																							
A5																							
A6																							
A7																							
A8	■	■						■						■	■						■		
A9	■	■						■						■	■						■		
A10																							

Table 4: Activities that provide an opportunity to build, maintain or showcase scholarly reputation related to the Scholarship of Integration (see Annex 1 for the codes of the activities)

Activities	Academia	Academici	BibSonomy	BiomEdexperts	CourseTalk	Dryad	Edmodo	Epernicus	Foldit	GitHub	Kudos	Impactstory	labfolder	LabRoots	LinkedIn	Mendeley	myExperiment	MyNetResearch	MyScienceWork	Peer Evaluation	Profology	ResearchGate	Scitable	Socientize	Stack Overflow
I1																									
I2																									
I3																									
I4																									
I5																									
I6																									
I7																									
I8																									
I9																									
I10																									

Table 5: Activities that provide an opportunity to build, maintain or showcase scholarly reputation related to the Scholarship of Co-creation (see Annex 1 for the codes of the activities)

Activities	Academia	Academici	BibSonomy	BiomEdexperts	CourseTalk	Dryad	Edmodo	Epernicus	Foldit	GitHub	Kudos	Impactstory	labfolder	LabRoots	LinkedIn	Mendeley	myExperiment	MyNetResearch	MyScienceWork	Peer Evaluation	Profology	ResearchGate	Scitable	Socientize	Stac kOverflow
C1																									
C2																									
C3																									
C4																									
C5																									

IV. REFERENCES

Archambault, A., & Grudin, J. (2012). A longitudinal study of facebook, linkedin, & twitter use. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems: 2741-2750 retrieved from http://research.microsoft.com/en-us/um/people/jgrudin/publications/newwave/chi2012sns.pdf?origin=publication_detail

(accessed 17 September 2014).

Bar-Ilan, J. (2014). Astrophysics publications on arXiv, Scopus and Mendeley: a case study. *Scientometrics*, 100 (1): 217-225.

Batsila, M., Tsihouridis,C., & Vavougios, D.(2014). Entering the Web-2 Edmodo World to Support Learning: Tracing Teachers' Opinion After Using it in their Classes. *International Journal of Emerging Technologies in Learning*, 9 (1): 53

Bazelli,B., Hindle,A., & Stroulia,E.(2013). On the Personality Traits of StackOverflow Users. Software Maintenance (ICSM), 2013 29th IEEE International Conference on: 460-463.

Bonson, E. & Bednarova, M.(2013). Corporate LinkedIn practices of Eurozone companies. *Online Information Review*, 37 (6): 969-984.

Borrego, A., & Fry, J. (2012). Measuring researchers' use of scholarly information through social bookmarking data: A case study of BibSonomy. *Journal of Information Science*, 38 (3): 297-308

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.

Carrier, S. (2008). The Dryad repository application profile: Process, development, and refinement. A Master's paper for the M.S. in I.S. degree. School of Information and Library Science of the University of North Carolina at Chapel Hill.

Chakraborty, N. (2012). Activities and reasons for using social networking sites by research scholars in NEHU: A study on Facebook and ResearchGate. *Planner*, 19-27.

Claybaugh, C.C. & Haseman, W. (2013). Understanding professional connections in LINKEDIN—a question of trust. *Journal of Computer Information Systems*, 54 (1):94-105.

Codina L. (2009). Science 2.0: Social network and online applications for scholars. Acssess, 2014. Available at: http://www.upf.edu/hipertextnet/en/numero-7/ciencia-2-0.html

Dabbish, L., Stuart, C., Tsay, J., Herbsleb, J. (2012). Social coding in GitHub: transparency and collaboration in an open software repository. CSCW 12 Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work: 1277-1286.

Gerard,J.(2012). Linking in With LinkedIn®: Three Exercises That Enhance Professional Social Networking and Career Building. *Journal of Management Education*, 36 (6): 866-897.

Enriquez, M.A.S. (2014). Students' Perceptions on the Effectiveness of the Use of Edmodo as a Supplementary Tool for Learning. DLSU Research Congress, De La Salle University, Manila, Philippines.

Giglia, E. (2011). Academic social networks: It is time to change the way we do research. *European Journal of Physical and Rehabilitation Medicine*. 47: 345-9.

Guillory, J. & Hancock, J. (2012). The Effect of Linkedin on Deception in Resumes. *Cyber Psychology, Behavior & Social Networking*, 15 (3): 135-140

Haustein, S., Peters, I., Bar-Ilan, J., Priem, J., Shema, H., & Terliesner, J. (2013). Coverage and adoption of altmetrics sources in the bibliometric community. arXiv preprint arXiv:1304.7300.

Jeng,W., He,D., Jiang,J., Zhang,Y.(2012).Groups in Mendelley: owner's descriptions and group outcomes. *Proceedings of the American Society for Information Science and Technology*, 49 (1): 1-4.

Johnson B. (2012). How ResearchGate plans to turn science upside down. Available at: http://newsle.com/article/0/11920639.html

Kelly, B., & Delasalle, J. (2012). Can LinkedIn and Academia.edu Enhance Access to Open Repositories?. In: OR2012: the 7th International Conference on Open Repositories, 2012-07-09 - 2012-07-13, Edinburgh, Scotland. Retrieved from http://opus.bath.ac.uk/30227/1/or12-136-final.pdf (accessed 17 September 2014).

Kristin,P. (2013). The New Boys Club: The Effect of Gender on LinkedIn Profiles. *Sociological Viewpoints*, 29(1): 17-58.

Kongchan,C.(2008). How a Non-Digital-Native Teacher Makes Use of Edmodo. 5th Intenational Conference ICT for language learning

Kubalik, J., Matousek, K., Dolezal, J., & Necasky, M. (2011). Analysis of portal for social network of IT professionals. *Journal of Systems Integration*, 2(1), 21-28.

Li, & Thelwall, M. (2012). F1000, Mendeley and Traditional Bibliometric Indicators. 17th International Conference on Science and Technology Indicators (Vol. 3, pp. 1–11).

Madhusudhan, M. (2012). Use of social networking sites by research scholars of the University of Delhi: A study. *International Information and Library Review*, 44(2), 100-113.

Marlow, J., Dabbish, L., Herbsleb, J. (2013). Impression formation in online peer production: activity traces and personal profiles in github. CSCW 13 Proceedings of the 2013 conference on Computer supported cooperative work.

Mas Bleda, A., Thelwall, M., Kousha, K. & Aguillo, I. (2013). European highly cited scientists' presence in the social web. In J. Gorraiz, E. Schiebel, C. Gumpenberger, M. Hörlesberger and H. Moed (Eds.), 14th International Society of Scientometrics and Informetrics Conference (ISSI 2013), (pp. 98-109). Vienna: Austria.

McCorkle,D., McCorkle,Y.(2012). Using Linkedin in the Marketing Classroom: Exploratory Insights and Recommendations for Teaching Social Media/Networking. Marketing education review,22(2):157-166.

Menendez, M., Angeli, A. de, & Menestrina, Z. (2012). Exploring the virtual space of Academia. In: 10th International Conference on the Design of Cooperative Systems (pp. 49-63). http://coop-2012.grenoble-inp.fr/pdf_papers/menendez_25.pdf

Moeslein, K. M., Bullinger, A. C., & Soeldner, J. (2009). Open collaborative development: Trends, tools, and tactics. In Human-Computer Interaction. New Trends (pp. 874-881). Springer Berlin Heidelberg.

Mohammadi, E., Thelwall, M. (2014). Mendeley readership altmetrics for the social sciences and humanities: Research evaluation and knowledge flows. *Journal of the Association for Information Science and Technology*, 65 (8): 1627-1638.

Mohammadi, E., Thelwall, M., Haustein, S., & Larivière, V. (2014, in press). Who reads research articles? An altmetrics analysis of Mendeley user categories. *Journal of the Association for Information Science and Technology*.

Movshovitz-Attias, D., Movshovitz-Attias, Y., Steenkiste, P., & Faloutsos, C. (2013). Analysis of the reputation system and user contributions on a question answering website: StackOverflow. ASONAM '13 Proceedings of the 2013 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining: 886-893.

Nasehi, S.M., Sillito, J., Maurer, F., & Burns, C. (2012). What makes a good code example?: A study of programming Q&A in StackOverflow. Software Maintenance (ICSM), 2012 28th IEEE International Conference on: 25-34.

Olsen,L.E.(2008). Professional networking online. A qualitative study of LinkedIn use in Norway. Master thesis. The university of Bergen. Retrieved from https://bora.uib.no/handle/1956/2935(accessed 17 September 2014).

Paliktzoglou, V. & Suhonen, J.(2014). Microblogging in Higher Education: The Edmodo Case Study among Computer Science Learners in Finland. *Journal of Cases on Information Technology*, 16(2): 39-57.

Priem, J., Piwowar, H. A., & Hemminger, B. M. (2012). Altmetrics in the wild: Using social media to explore scholarly impact. Arxiv preprint arXiv:1203.4745.

Robinson-Garcia, N, Torres-Salinas, D., Zahedi, Z., Costas, R. (2014). New data, new possibilities: exploring the inside of altmetric.com. *El Profesional de la Información*,23 (4).359-366

Sanders, K.S. (2011). An examination of the academic networking site Edmodo on student engagement and responsible learning. Ph.D. thesis, University of South Carolina.

Spiroski, M. (2010). Macedonian Biomedical Scientists Are Not Adequately Represented in BiomedExperts Database. *Macedonian Journal of Medical Sciences*, 1(1): 13-17.

Stiller, J., Gade, M., & Petras, V. (2011). Is tagging multilingual?: a case study with BibSonomy. Proceedings of the 11th annual international ACM/IEEE joint conference on Digital libraries: 421-422.

Thelwall, M. & Kousha, K. (in press 2014). ResearchGate: Desseminating, Communicating and Measurinig Scholars. *Journal of the American Society for Information Science and Technology*. Available at: http://dx.doi.org/10.1002/asi.23236

Thelwall, M., & Kousha, K. (2014). Academia. edu: Social Network or Academic Network?. *Journal of the Association for Information Science and Technology*, 65(4), 721-731.

Thien,P.C. and etal.(2013). Applying Edmodo to Serve an Online Distance Learning System for Undergraduate Students in Nong Lam University, Vietnam. Proceedings of the IETEC'13 Conference, Ho Chi Minh City, Vietnam:

Treude, C. , Barzilay, O. , & Storey, M.A. (2011). How do programmers ask and answer questions on the web? (NIER track). Proceedings of the 33rd International Conference on Software Engineering: 804-807.

Van Noorden, R. (2014) Online collaboration: Scientists and the social network, *Nature*, 512 (14 August), 126-129. http://www.nature.com/news/online-collaboration-scientists-and-the-social-network-1.15711

Vasilescu, B., Capiluppi, A., Serebrenik, A.(2012). Gender, Representation and Online Participation: A Quantitative Study of StackOverflow. Social Informatics (Social Informatics), 2012 International Conference on: 332-338.

Wang, S., Lo, D., & Jiang, L. (2013). An empirical study on developer interactions in StackOverflow. Proceedings of the 28th Annual ACM Symposium on Applied Computing: 1019-1024.

White, H. C., Carrier, S., Thompson, A., Greenberg, J., & Scherle, R. (2008, August). The Dryad Data Repository. In International Conference on Dublin Core and Metadata Applications-Metadata for Semantic and Social Applications 22-26 September 2008, Berlin (DC-2008). Humboldt-Universität zu Berlin. Chicago

Yang, J., Tao, K., Bozzon,A ., & Houben, G.J. (2014). Sparrows and Owls: Characterisation of Expert Behaviour in StackOverflow. In User Modeling, Adaptation, and Personalization: 266-277.

Zahedi, Z., & Costas, R. (2014). Assessing the impact of publications read (saved) by the different Mendeley users: is there any different pattern among users?. IATUL annual conference proceedings, 35:1-12.

Zahedi, Z., Costas, R., & Wouters, P. (2013). How well developed are Altmetrics? Cross-disciplinary analysis of the presence of "alternative metrics" in scientific publications. 14th International Society of Scientometrics and Informetrics Conference (ISSI) (pp. 876–884). Vienna: Austrian Institute of Technology.

V. ANNEX 2. LIST OF SCHOLARSHIP ACTIVITIES

SCHOLARSHIP OF	CODE	ACTIVITY
Research	R1	Identifying a researchable topic
Research	R2	Planning a research project
Research	R3	Building upon previous knowledge
Research	R4	Requesting/providing help in locating research literature
Research	R5	Producing research output
Research	R6	Producing research output collaboratively
Research	R7	Producing research output collaboratively in large-scale projects
Research	R8	Producing research output by committed amateur experts
Research	R9	Releasing data to the scholarly community
Research	R10	Releasing methodologies, research tools and protocols to the scholarly community
Research	R11	Releasing laboratory notebooks to the scholarly community
Research	R12	Keeping up with new developments
Research	R13	Getting help for solving topical problems
Research	R14	Disseminating research results formally via traditional scholarly channels
Research	R15	Disseminating research results formally via Open Access scholarly channels
Research	R16	Disseminating research results formally via enhanced Open Access scholarly channels
Research	R17	Disseminating research results informally via active participation in conferences
Research	R18	Disseminating research results informally via repositories/websites
Research	R19	Disseminating research results informally via social media
Research	R20	Disseminating research results, ideas and opinions informally via scholarly social networking sites
Research	R21	Disseminating research results, ideas and opinions informally via blogs
Research	R22	Peer reviewing
Research	R23	Participating in open peer reviewing
Research	R24	Monitoring one's impact
Teaching	T1	Designing a course/learning programme
Teaching	T2	Producing and delivering a teacher focussed, face-to-face, institution-based, often access controlled course/ learning programme
Teaching	T3	Co-producing and co-teaching a teacher focussed, face-to-face, institution-based, often access controlled course/learning programme
Teaching	T4	Producing and delivering a teacher focussed, online, institution-based, either access controlled or freely accessible course/ learning programme
Teaching	T5	Co-producing and co-teaching a teacher focussed, online, institution-based, either access controlled or freely accessible course/ learning programme
Teaching	T6	Conducting a social networks based, participatory MOOC (massive open online course)
Teaching	T7	Pursuing the Open-Notebook Science model in the classroom
Teaching	T8	Tutoring/mentoring students on an individual basis
Teaching	T9	Advancing learning theory through classroom research
Application	A1	Identifying a researchable topic focussing on practical problems experienced by public/practitioner audiences

Application	A2	Identifying a researchable topic focussing on practical problems experienced in organisational/industrial settings
Application	A3	Planning a research project focussing on practical problems experienced by public or practitioner audiences
Application	A4	Producing an application oriented research output
Application	A5	Producing a community-interest driven, application oriented research output
Application	A6	Producing an application oriented research output through a PPSR (public participation in scientific research) project
Application	A7	Participating in the commercialisation of one's inventions/discoveries (for example, by filing patents)
Application	A8	Serving industry or government as an external consultant
Application	A9	Serving one's professional/disciplinary community
Application	A10	Popularising scientific knowledge
Integration	I1	Identifying a topic for a comprehensive literature review/textbook
Integration	I2	Identifying a researchable multiple-faceted topic
Integration	I3	Planning a comprehensive literature review/textbook project
Integration	I4	Planning an integrative research project
Integration	I5	Producing a literature review/textbook via traditional strategies
Integration	I6	Producing a literature review/textbook via open strategies
Integration	I7	Producing an integrative research output
Integration	I8	Producing an integrative, often multi- or inter-disciplinary research output collaboratively
Integration	I9	Producing an integrative, often multi- or inter-disciplinary research output collaboratively in large-scale, distributed projects
Integration	I10	Producing Open Education Resources (OER)
Co-creation	C1	Participating as a consultant in a PPSR (public participation in scientific research) project
Co-creation	C2	Leading a Contributory PPSR (public participation in scientific research) project
Co-creation	C3	Leading a Collaborative PPSR (public participation in scientific research) project
Co-creation	C4	Collaborating in a Co-Created PPSR (public participation in scientific research) project
Co-creation	C5	Conducting a PPSR (public participation in scientific research) project in the classroom or in a web based course/learning programme

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