Expanding the Academic Research Community - Building Bridges into Society with the Internet[1]

Aldo de Moor

CommunitySense, Tilburg, the Netherlands
ademoor@communitysense.nl

Abstract. Academic research is under threat from issues like a lack of resources, fraud, and societal isolation. Such issues weaken the academic research process, from the framing of research questions to the evaluation of impact. After (re)defining this process, we examine how the academic research community could be expanded using the Internet. We examine two existing science-society collaborations that focus on data collection and analysis and then proceed with a scenario that covers expanding research stages like research question framing, dissemination, and impact assessment.

1 Introduction

Academia is a pillar of the global knowledge society. Academics are traditionally based in universities. Once these were considered ivory towers by many, safely separated from society. Universities are increasingly pressed, however, to engage much more actively with society, both contributing to the wider life of that society and being more open to its impulses and energies (Jackson, 1999, p. 105). Instead of the hierarchical organization with isolated, discipline-focused faculties and departments, universities will become much flatter learning organizations, geared towards continuous and collective learning, knowledge sharing, and collaboration (Manlow, Friedman, & Friedman, 2010).

Such an increasing focus on collaboration has been going on within the academy for decades, culminating in virtual "collaboratories", or "laboratories without walls" where scientists are connected to each other, instruments, and data independent of time and location (Finholt, 2003). However, new forms of collaborative ties are increasingly being cemented between academics and other stakeholders in society. A case in point here is the growing prominence of the idea of "social innovation", which is essentially about the relationship networks and collaboration processes around new ideas that meet unmet needs (Mulgan, 2007). Knowledge institutions like universities play a key role in these collaborative coalitions, putting their theories and methods to

[1] Preprint of Denison, Tom, Sarrica, Mauro, and Stillman, Larry (Eds.) (forthcoming) Theories, Practices and Examples for Community and Social Informatics. Melbourne, Australia: Monash University Publishing.

good use, together with other stakeholders like governments, business, and civil society. However, the importance of academia in society goes way beyond such "economic" knowledge considerations. Through its teaching and research, it also helps people to think critically and become knowledgeable and empathetic citizens (Nussbaum, 2010). All the more reason to strengthen and expand the ties between the academy and society.

Despite many external pressures, some academic research problems may at least partially arise from the way much of the scientific collaboration process itself is organized. The research process - from asking research questions to measuring impact - is still often organized along traditional intra-academic lines, whereas more outreaching ways are demanded for involving stakeholders, organizing workflows, and using digital tools like social media. The purpose of this chapter is to examine the nature of this lack of extra-academic collaboration, to see how that contributes to current academic research problems, and to examine if expanding science-society alliances could make academic research more connected to society.

In this chapter, we first look at some of these core academic research issues (lack of resources, fraud, and societal isolation) from a collaborative perspective in Section 2. In Sections 3 and 4, we redefine the academic research process and discuss characteristics of a more community-based academic research paradigm. Section 5 outlines a socio-technical research infrastructure that could help expand the academic research community using the Internet. We end the chapter with a discussion and conclusions.

2 Academic research issues

Scientific research has brought great benefit to humanity and is conducted in a highly professional, distributed academic community. Although most scientific research is of very high quality, there are still issues for improvement in the academic research process. We outline three examples of general academic research issues, and in the next section will look at how they often manifest themselves in subsequent stages of the research process. Our goal is not to make a comprehensive inventory of these issues, nor to define precisely how they influence the research process. The exact causal mechanisms by which these issues affect the research process are still largely unknown, the issues are co-dependent in many ways, multiple issues affect particular research process stages simultaneously, and so on. Still, by zooming in how such academic research issues can happen to play out in different research process stages, it becomes easier to identify which (societal) stakeholders are missing and what roles they might play in helping to address these issues.

2.1 Lack of resources

Despite its major societal relevance, much of academia is not doing well. External pressures on research universities abound. Rising costs and declining budgets endanger the ability of these institutions to provide quality education, conduct basic science and engineering research that leads to innovations, and perform their public service

missions (National Science Board, 2012). Such underfunding leads to worrisome practices of young faculty being forced into "volunteerism", instead of being paid a reasonable salary, thus significantly eroding academic research capacity (Kendzior, 2012).

Key question: to what extent could extra-academic collaboration help increase *research capacity*?

2.2 Fraud

Science fraud is a much underestimated problem. One meta-study showed that 2% of scientists admitted to themselves having fabricated, falsified or modified data or results; up to one third admitted to other questionable research practices such as dropping data points based on a gut feeling and changing design, methodology or results of a study because of pressure from a funder; rising to up to 72% when asking scientists about the behaviour of others (Fanelli, 2009). In the Netherlands, a major fraud case recently occurred. The social psychologist Diederik Stapel turned out to have fabricated much of his research data during his distinguished career, with enormous impact on his direct research colleagues and the field of social psychology as a whole. A thorough committee investigation uncovered many examples of flawed science, including the fabrication, falsification, and unjust replenishment of data, the whole or partial fabrication of analysis results, and misleading presentation of organization or nature of the experiments. The committee also concluded that the field of social psychology as a whole, by its general uncritical attitude, made the scale and persistence of the intentional fraud - or at least unintentional sloppiness - possible (Levelt Committee, Noort Committee, & Drenth Committee, 2012). Although this criticism specifically concerns the field of social psychology, it is highly unlikely that all other fields are totally free of such flaws, given that they operate under similar pressures and constraints. By more involving other stakeholders with different interests, for example the communities being studied, in co-authoring and evaluating research results, the degree of fraud and sloppiness may be lessened. Of course, these stakeholders may not have the expertise to understand the full implications of sophisticated research methodologies. Still, they, if anybody, should be able to raise the alarm if data purported to be about their communities seem suspicious.

Key question: how to build better *checks and balances* so that fraud cannot grow to such large proportions and stay undetected for such a long time?

2.3 Societal isolation

Arguably the most fundamental issue is the "societal isolation" of much of academia. The mass-production university model has resulted in ever-increasing specialization, leading to a separation between the disciplines where there should be collaboration (Taylor, 2009). However, there is also the problem of the scientific community as a whole being too isolated from society. In their early days, universities had to fight

for their independence, then from meddling bishops, town governments, kings, emperor and pope (Jones, 1999). For many centuries, they were able to do their academic work in splendid isolation. However, since the 20th century, there has been increasing pressure on universities to move back from, for instance in the UK, private, grant-aided institutions doing their own thing to public agencies paid to deliver services wanted by government (Jackson, 1999). Although this seems like a step towards the desired more outward focus, unchecked state-controlled science can easily derail into dictates of what should be researched and how to go about this, as Soviet era research has unfortunately shown. In western science, such extreme state interference is rare. Universities increasingly try to close the gap with society by building voluntary connections with the outside world through grant research projects, research institutes, and communications departments and even science shops. Ever more, universities depend on these connections for broader political support from key local and regional stakeholders (Gurstein 2011). However, despite the promise, current academic research collaborations with the outside world are often constrained to a limited number of (funding) stakeholders, focusing on a narrow research scope, and with projects only lasting a limited period of time. The terms of this involvement are very much set by the academics and universities themselves.

There is a legitimate need for society not only to provide the data (subjects), but also to get more reciprocally involved in framing, executing, and evaluating scientific research. Academics, however, are all too often viewed as part of the "nonproblem", producing unproblematic knowledge that can be distributed to and employed in society. This "outreach" model instead of “engagement” model should be replaced by more reciprocal partnerships of academics with stakeholders representing their own communities (Yapa, 2009). This need is obvious in research which directly studies society, as in for example, development research (Chambers, 1997). Still, societal involvement in the research process should not be limited to the social sciences. For example, medical research can have a huge potential impact on society as well. An example is the controversy about how research on lethal viruses should be conducted. Such decisions should not be left to the scientists involved alone, but currently this is too often the case (Enserink, 2011). To deal with such complex real-world problems, well-designed multi-stakeholder dialogues are needed (Payne & Calton, 2004).

All this causes many societal issues and interests to be represented insufficiently in academic research. The general problem is that experts intervene in human situations which are complex, uncertain, and unique, while their theories prescribe solutions in terms of simplified causal links. To more fully appreciate such complex real-world situations, these experts need to engage in skilled dialogue with all those stakeholders who (re)present the problems (Jordan, 1989, p.164). This dialogue and mutual learning needs to take place in the form of sustained collaborative partnerships between academic researchers and practitioners (Day & Schuler, 2004). For this dialogue, more long term research communities working on broad research problems and involving a wide range of societal stakeholders are needed.

Key question: how to make academic research communities more *embedded in society*, and have these include societal stakeholders collaborating on broader issues for longer periods of time?

3 (Re)defining the academic research process

Such major, interacting research process issues make it very hard to see the big picture of what is wrong with much of the current academic research process. Even more difficult is it to come up with concrete and comprehensive "socio-technical designs" of policies, organizational structures, and supporting technologies redressing these problems. To get somewhat of a grip on this complexity, we first give a characterization of the stages of the academic research process (Figure 1). For each stage, we mention its often associated stakeholders, typical research process flaws caused by - among other things - the lack of resources, fraud, and societal isolation issues noted earlier, and some directions for collaborative solutions. We use these research process stages as the linking pin between academia and society in the next section. Note that the actors, problems, and solutions mentioned are only selected examples, they are by no means a comprehensive treatment of all actors, problems, and solutions involved in all forms of academic research. Still, these examples should give the reader a flavor of the complexity of both the problem and solution space.

Research Stage	Actors	Problems	Solutions
Research question framing	Academics, funders	Limited scope	Collaborative research partnerships
Data collection and analysis	Academics, few stakeholders (only as patients)	Fraud; sloppy science; lab ≠ world	Citizen researchers
Authoring	Academics	Content, form and participation	Digital storytelling; group report authoring
Review	Academics (peers)	Peer review system outdated, overloaded, biased; promotes conformity	More collaborative process; post-publication review; external stakeholder participation
Dissemination	Publishers, libraries, university departments, academics	Restricted access; no associated data and stakeholder voices	Open access; open data; community/social media
Impact assessment	---	Non-existent assessment	Social media; long-term collaborative partnerships

Table 1. (Re)defining the academic research process

3.1 Research question framing

Research questions are often framed by academics or by the funders of their studies. Issues that do not meet existing disciplinary or funding priorities typically fall by the wayside. Such narrowly defined research questions do not generally examine the broader social, economic, political, historical or cultural context of the community being studied (Gurstein, 2011). One very current and important example concerns the lack of research attention given in the past few decades to the political concept of "the commons". Some say that through narrow neoliberal framing, attention was focused on promoting the profitability of transnational financial institutions instead of on promoting general welfare through reinvigorating the societal commons (MacLellan & Talpalaru, 2012). Had economic and financial academic research been more grounded in reality, and less constrained because of conflicts of interest, these larger societal interests might have been taken into account long before the arrival of the financial crisis (Scott, 2010). Through collaborative research partnerships such as being established in well-designed researcher-practitioner communities and social innovation consortia (Day & Schuler, 2004; Mulgan, 2007), more balanced research question framing can take place. One practical way to improve the societal impact of research, is by having students draw on the research skills that they are learning to address community-generated research questions (Strand et al. in Stoecker, 2008).

3.2 Data collection and analysis

As mentioned in the previous section, data collection and analysis are prone to many forms of fraud and sloppy science (Fanelli, 2009; Levelt Committee et al., 2012). Furthermore, academia often has an overly strong focus on rigor instead of relevance. This is not to say that rigor is not important, but that it has colonized relevance, disrupting the balance (Applegate, 1999). Lack of relevance is also increased by using artifical, ungrounded lab situations, using, for instance, students as the sole test subjects, and involving none or only few of the many stakeholders actually impacted by the research results. Furthermore, by seeing stakeholders as mere data subjects, instead of active participant researchers, data collection and analysis often leads to less than relevant results (Day & Schuler, 2004). Increasingly, however, "citizen researchers" get an active role in both data collection and analysis, as we shall see in Section 5. To ensure the necessary rigor, academics should properly calibrate their research designs, of course, so that the role and value of the citizen contributions is carefully circumscribed.

3.3 Authoring

Authoring is often restricted to academics writing articles for the academic record, such as journals, conference proceedings, and book chapters. Authoring, however, is much more than simply writing down ideas and findings in formalized text. Three main problems from a stakeholder-perspective concern content, form, and participation. Content and form are restricted to what is permissible in the particular discipli-

nary genre. Such genres function as sites of interaction enabling access to, structuring and framing participants' actions within groups or organizational contexts, leading to a complex interplay between the texts and the social contexts in which they are produced (Bawarshi & Reiff, 2010). Academic texts are typically in the form of highly stylized research papers. However, this excludes non-academic authorial voices such as those of citizens and other societal stakeholders. Unconventional approaches (from an academic genre point of view) such as digital storytelling and stakeholder group report authoring may help amplify such lesser-heard voices in the stakeholder community (Copeland & Miskelly, 2010; De Moor, 2010). Through new types of content and form, and involving more stakeholders in the re-presentation of reality, academic authoring genres can be enriched to reduce societal isolation and increase research capacity.

3.4 Review

Peer review is the core mechanism for separating the academic chaff from the wheat. In traditional blind peer review, submissions are sent to reviewers whose evaluations determine whether papers are accepted, while only the editor communicates with the authors. However, ever more pressing questions are being asked about the effectiveness of peer review. Academics are under increasing pressure to produce visible output, and reviewing is a time-consuming, but unacknowledged activity. It is also far from infallible: Stapel managed to author (at least) 55 fraudulent publications without any of the reviewers noticing (Levelt Committee et al., 2012, p.25). The current system rewards conformity and allows for considerable bias. Spurred on by technological developments such as the Internet, alternatives are being proposed such as reviews after publication and open, collaborative processes for selecting articles and jointly improving them (Jaschik, 2012). Such developments would also open up more the review process to stakeholders from outside academia to identify factual errors and assess analytical interpretations and implications made by the academic authors.

3.5 Dissemination

Academic dissemination, until recently, was confined to the publication of journals, books, and conference proceedings within the academic community, the publication channels being dominated by the scientific publishers and libraries. University departments like communication departments; science shops; and "academic fora" were the main outlets for disseminating summaries of these results to the outside world. However, the widespread adoption of the Internet has dramatically increased the options for dissemination of research results. Although the jury is still out on the best business models, open access publishing - where scientific publications will be available for free to anybody interested - will soon be the norm. For instance, the British government has mandated that all publicly funded scientific research must be open access by 2014 (Sample, 2012). Still, academic research dissemination will change beyond just wider access to publications. Amongst other purposes, datasets used in the publications will also be made available to double check for fraud and misinter-

pretation (Levelt Committee et al., 2012). Societal links will be further woven into the academic research publishing process when community media, such as digital storytelling resources[2] become linked to the open access publications. Such community media could tell the "real world stories" behind academic concepts. At the same time, they provide academics with valuable contacts and case material for future research. In Section 5.3, we will sketch a possible scenario in which this could be made to work.

3.6 Impact assesment

Impact assessment, which we define as the long-term evaluation of the validity of academic research after its recommendations have been implemented in the real world is usually left out of the academic research workflow. It is too removed from research time-frames and interests for most academics and their institutions to be bothered with. However, impact assessment is essential if the relevance of academic research is to be increased. With the increasing focus on social innovation, power and availability of social media, and more participatory and long-term involvement of external stakeholders in academic research projects, such assessment should become more prominent (Day & Schuler, 2004; De Moor, 2010). Again, digital storytelling could play an important role here since stakeholder conversations can be recorded and instantly revived years into the future.

4 Community-based academic research

"The academic/scientific community" is perhaps the largest, best organized, and most thriving professional community in the world. Although consisting of many sub-communities (disciplinary, university, journal, conference, research interest-based, etc.), there is an overarching sense of academic community. This is demonstrated by academia's truly global nature, its shared identity and social norms, its web of intense, interlocking conversations, and so on. Yet, communities which alongside "bonding" social capital (strong ties within groups) also have "bridging" social capital (weak ties across groups) are the most effective in organizing for collective action (Kavanaugh, Reese, Carroll, & Rosson, 2005). This bridging role of academia is still underdeveloped, as there remain many external societal communities that academic research should build enduring collaborative bridges into (Day & Schuler, 2004). When such inter-group bridging collaboration is supported by the Internet, both bonding and bridging capital is further increased, as the Internet helps maintain social relations, exchange information, and increase face-to-face interaction (Kavanaugh et al., 2005).

What is the role of these community-based partnerships mediating between science and society? Characteristically, they connect stakeholders from both the academic and societal spheres in new and meaningful ways, resulting in deep levels of collaboration

[2] See for instance the empowering PhotoVoice "participatory photography for social change" initiative: http://www.photovoice.org/

(Leavy, 2011, p.88). This is not to say traditional disciplinary academic research is without merit. It is still a foundation of science, and, especially in the natural sciences, the primary mode of operation. However, according to Leavy, disciplinary research is increasingly contextualized in transdisciplinary research when the research problem, issue, or question instead of the "home" discipline is at the center of the research process. This transdisciplinarity is not a method, but an approach involving the integration of multiple disciplines in a project aimed at a social, human, or "life-world" purpose. It leads to the development of new conceptual, theoretical, and methodological frameworks (Leavy, 2011, pp.24-33,52).

How this does expanded academic research process work? First, it is gradually moving in four steps from "research on communities" to "research by communities". In "research on communities", communities are seen as passive objects. "Research for communities" is done by outsiders, but presented as under the control or in the interest of the local community. In "research with communities", communities are engaged as partners with the (academic) researcher. Finally, the most empowering form of research – "research by communities" - is where the community undertakes main elements of the research, with the academic researcher only providing support (Gurstein, 2011). Of course, the exact level of engagement required depends on the situation, but the trend is one towards more control and peer status of the non-academic co-researcher. A case in point is the example where a partnership with community organizations and residents helped academics rethink their theory on poverty in totally different ways (Yapa, 2009).

In the remainder of this chapter, we investigate how the academic research community could be expanded through more structured Internet-mediated research process collaboration between science and society (Figure 1). What we are looking for are new and meaningful ways of establishing sustainable collaborative alliances between members from the "core" academic research community (such as academics, publishers, science funders, and various university institutional actors) and external stakeholders (including citizens, governments, business, NGOs etc.). The Internet, being a communications "network of networks" is to play an core enabling role in these collaborations.

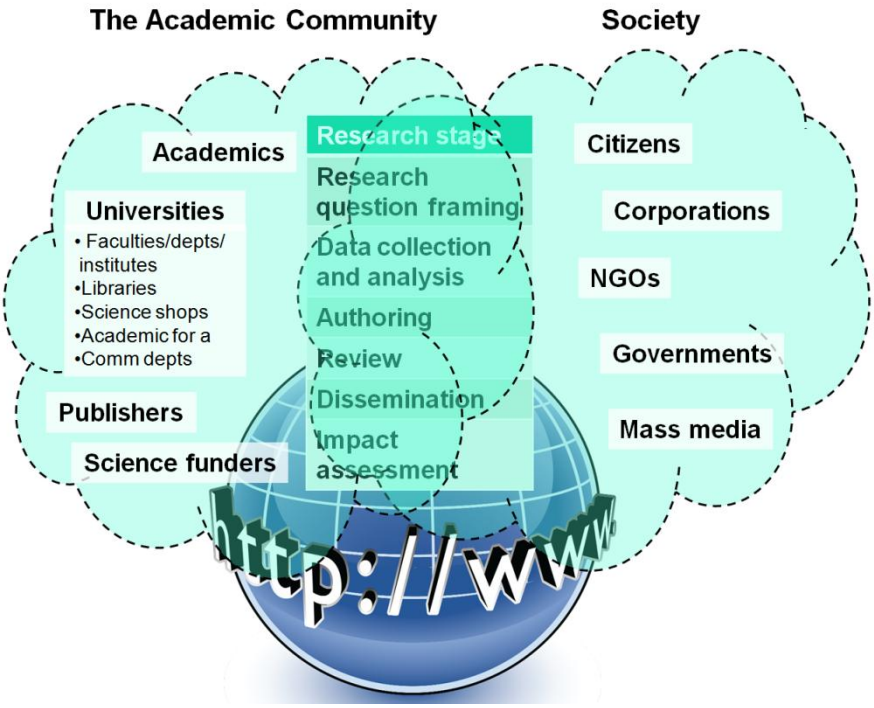

Figure 1. Expanding the academic research community

5 Expanding the academic research community with the Internet

A new paradigm is emerging in which the university is no longer a traditional one-way research and teaching organization, but a network of communities working on collective learning, knowledge sharing and collaboration. Social media can help in implementing these principles through supporting "the five Cs": communication, collaboration, community, creativity, and convergence (Manlow et al.,2010). It is often assumed that with the rise of social media, collaboration will self-organize. Nothing is less true. Collaboration, especially when ICT-mediated, requires careful socio-technical design to get from users merely reading and liking individual posts to becoming involved in complex, long-term, multi-stakeholder collaboration processes (Preece & Shneiderman, 2009).

In this section, we show two such existing socio-technical collaborations: Galaxy Zoo which includes citizens as participant researchers in data analysis, and PatientsLikeMe, doing the same for data collection and analysis. We then include a not-so-hypothetical scenario for how a mix of existing organizational university infra-

structure and social media could help build similar sustainable alliances for other research workflow stages like research question framing, dissemination, and impact assessment.

5.1 Expanding data analysis: Galaxy Zoo

Galaxy Zoo[3] is part of The Zooniverse. This is a collection of web-based Citizen Science projects that use the efforts and abilities of volunteers to help reseachers deal with the flood of data that confronts them. Participants are asked to classify galaxies according to their shapes (Figure 2). The initial project resulted in the classification of nearly 900,000 galaxies. Started in 2007, 70,000 classifications an hour were done within 24 hours of launch. This has resulted in over 50 million classifications in the first year, contributed by over 150,000 people[4].

Interestingly, each galaxy is classified by many different, randomly assigned participants. This should help to considerably increase the reliability of data analysis, and to reduce errors and fraud, as compared to traditional ways of interpreting data by academics without citizen support. One mechanism by which this may happen, is simply the sheer number of citizen-researchers. Whereas in "academic-only" research many data points are only interpreted by one or two analysts, in massively-scaled research, such as Galaxy Zoo, numerous interpreters of the same data may be available, making it much harder to massage away undesirable data, for example. However, although citizens play such an important role in classification, they likely have a much smaller role to play in the subsequent interpretation of these data, given the theoretical complexity of astronomical research.

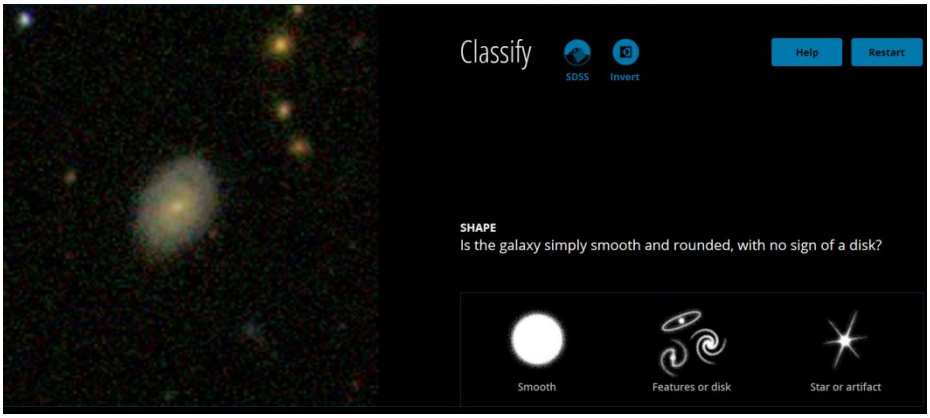

Figure 2. Classifying galaxies with Galaxy Zoo[5]

[3] http://www.galaxyzoo.org
[4] http://www.galaxyzoo.org/#/story, accessed June 9, 2013.
[5] Source: http://www.galaxyzoo.org/#/classify, image captured June 9, 2013.

5.2 Expanding data collection and analysis: PatientsLikeMe

PatientsLikeMe[6] (Figure 3) is a global data-driven social networking health site. It allows its members to share information about symptoms and treatments, initially only for rare and life-changing conditions, but as of early 2013 having over 200,000 patients on its platform and covering 1,800 diseases (Upbin, 2013). Patients can compare their conditions to those with similar afflictions. Members can participate free of charge in clinical trials. A commercial service exists for pharmaceutical companies to get in touch with patients of interest. Several collaboration partnerships have been set up with research and academic institutions. PatientsLikeMe calls itself "a for-profit company with a not just for profit attitude", carefully aiming to align individual, academic, and business interests.

From an academic research point of view, citizens act as data collecting and somewhat analyzing (from their personal perspective) researchers, as do research companies on the organization level. Compared to Galaxy Zoo, it is interesting to see how commercial stakeholders have been woven into the collaboration. Given the complexity of the data collection and analysis activities and the sensitivity of ethical issues like privacy, the collaborative network is quite a bit more complex than in the Galaxy Zoo case.

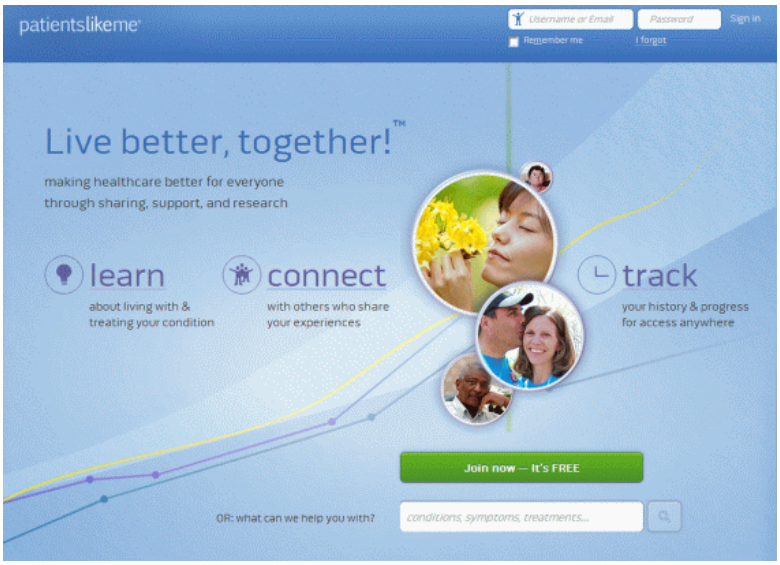

Figure 3. Collecting and analyzing patient data with PatientsLikeMe[7]

[6] http://www.patientslikeme.com
[7] Source: http://PatientsLikeMe.com, image captured June 9, 2013

5.3 Expanding research question framing, dissemination and impact assessment

Most science-society collaborations revolve around data collection and analysis, as in the cases of Galaxy Zoo and PatientsLikeMe. However, some stages of the research process depicted in Fig.1 are not yet covered, and if so only with few of many possible stakeholders involved, and then often only with low degrees of participation. Is there a way to expand the academic research in a scalable and sustainable way in these other stages as well? To sketch the opportunities for building new bridges, we briefly examine a hypothetical, but plausible scenario.

In the scenario, we focus on the question whether we could create more and lasting connections between academia and external stakeholders through social (people) and technical (tool) "linking pins". A precondition for the scenario to be plausible is that it should be more about connecting existing webs of conversations than creating new ones (De Moor, 2012). This is essential since resources are scarce, and it is not possible nor desirable to start all kinds of separate research conversations from scratch. We next look at some social linking pins (the "science communicating" organizational units in the university) and two technical linking pins (social videos and social bookmarking sites).

Social linking pins: the university science-society communicators

Most individuals and organizational units in universities are in the business of communicating. Academics constantly communicate with stakeholders within and beyond the university, which is the essence of research as a collaborative process. Their organizational units (faculties and departments) also communicate with the outside world, but their core process is often intra-university communications, in order to structure and support the primary research and education process. However, there are units in most universities that specialize in science-society communications. Key examples are communications departments, academic fora/Studium Generale, and science shops. Science shops were established, for instance, in the Netherlands in the 1970s to build working relationships between universities and citizen groups that need answers to relevant questions (Leydesdorff & Ward, 2005). Likewise, Studium Generale[8] is a faculty-independent department at all Dutch universities that organizes lectures, discussions, courses, and progammes around science, art and culture. The activities are primarily aimed at university students and staff, but also accessible to outsiders. These organizational units are natural social linking pins with society[9].

[8] http://www.studiumgenerale.nl/. At Tilburg University, Studium Generale is called Academic Forum, which clearly indicates its bridging role.

[9] There are many more science-society communicators in universities. For instance, Tilburg University participates in TiSIL, a joint initiative of four regional higher education institutes in the region that aims to facilitate social innovation through the creation, dissemination, and application of interdisciplinary knowledge. Another such communicator is the Science Hub Brabant, which aims to interest primary school children in the province in scientific research.

Technical linking pins: video servers and social bookmarking sites

The Internet in general and social media in particular are especially powerful technologies to help connect, scale, and amplify conversations into meaningful webs (De Moor & Aakhus, 2013). Given our focus on feasibility, the supporting tools should act as "bridging technologies", connecting conversations rather than requiring many extra resources in order for collaborators to produce all content from scratch. The tools used should be widely available, not take too much effort to use, and connect existing online and offline conversations. We distinguish two such bridging technologies in this scenario: social videos (e.g. YouTube) and social bookmarking technologies (e.g. Diigo).

Digital storytelling

Digital storytelling is useful in boundary-crossing settings. Digital stories can help strengthen the sense of community, serve as boundary objects mediating relationships, and elicit stories from overlapping communities (Copeland & Miskelly, 2010). YouTube[10] is a videosharing website on which users can upload, view, share, and comment upon videos. It is available everywhere, very easy to use and free. As such, it meets the bridging technologies-criteria.

Social bookmarking

Research publications are classified, often by libraries, using formal taxonomies and ontologies. However, increasingly popular on the Web are "folksologies" in the form of social bookmarking sites. Such folksologies provide informal semantics and can be created and adopted by anybody on the Internet (Spyns, de Moor, Vandenbussche, & Meersman, 2006). Since different stakeholders can label the same resources (e.g. publications, video stories) with their own terminology, social bookmarking sites are a bridging technology par excellence. Diigo[11] is one of the most popular social bookmarking sites, allowing individuals, but also communities and organizations to upload, access, and share bookmarks with each other and the world.

Scenario: Connecting research question framing, dissemination, and impact assessment.

We outline a hypothetical but not too far-fetched scenario of a feasible “commnications architecture” using both the social and the technical linking pins mentioned above. It is set at Tilburg University, as this university has already an intensive collaboration between its different science-society communicators. In the scenario, we investigate what an expanded and more integrated collaborative research question framing, dissemination, and impact assessment process could look like.

[10] http://www.youtube.com
[11] http://www.diigo.com

Research question framing

2013. At Tilburg University, Academic Forum organizes a series of debates on the financial crisis. It will soon hold a debate on the key question: "What Caused the Financial Crisis and How to Prevent the Next One?" It invites several of its own university academics, as well as a politician, a banker, and somebody working for a concerned citizens-group.

The Science Shop, in the meantime, has several students doing final-year research projects on the crisis, supervised by the stakeholders invited for the debate. One student is doing a literature review for the academics involved. A university librarian has extracted a taxonomy of the most relevant scientific terms related to the topic of the crisis. Using the terms from this taxonomy, the student finds several publications related to the topic in the library database. The Academic Forum discussion leader uses these publications in the preparation of the debate.

The other students - supervised by the external stakeholders - work on their own reports. As part of their case research, they use digital storytelling techniques to interview stakeholders on how the crisis impacts them and how they think it should be solved. They upload the videos to YouTube. As part of their research chores, they also index video fragments on Diigo. To this purpose, they tag each fragment with the "official" taxonomy tags. However, they also add the informal terms used by the stakeholders to further index the fragments. They compare each other's markup on video fragments covering similar research concepts. Interestingly, they find that they have all used similar scientific taxonomy tags for fragments covering similar topics, but the informal terms used vary widely, as the banker, for instance, was using much more jargon than the citizen interviewed.

In preparing the debate, the Academic Forum discussion leader monitors what's hot in the mass media. Using the "ordinary language" terminology prevailing in newspapers and on TV, she searches Diigo on these terms. She finds two video interview fragments uploaded by the students that would really bring the message home to the audience, and selects them as introductory fragments for the debate.

As the debate takes place, it is videotaped as well. Afterwards, the Academic Forum research assistant uploads the video on YouTube and marks up the debate fragments on Diigo, using the same scientific taxonomy and informal folksonomy as used/produced by the Science Shop students. In particular, he distills some fragments that cover the key research questions which the participants agreed upon are still wide open.

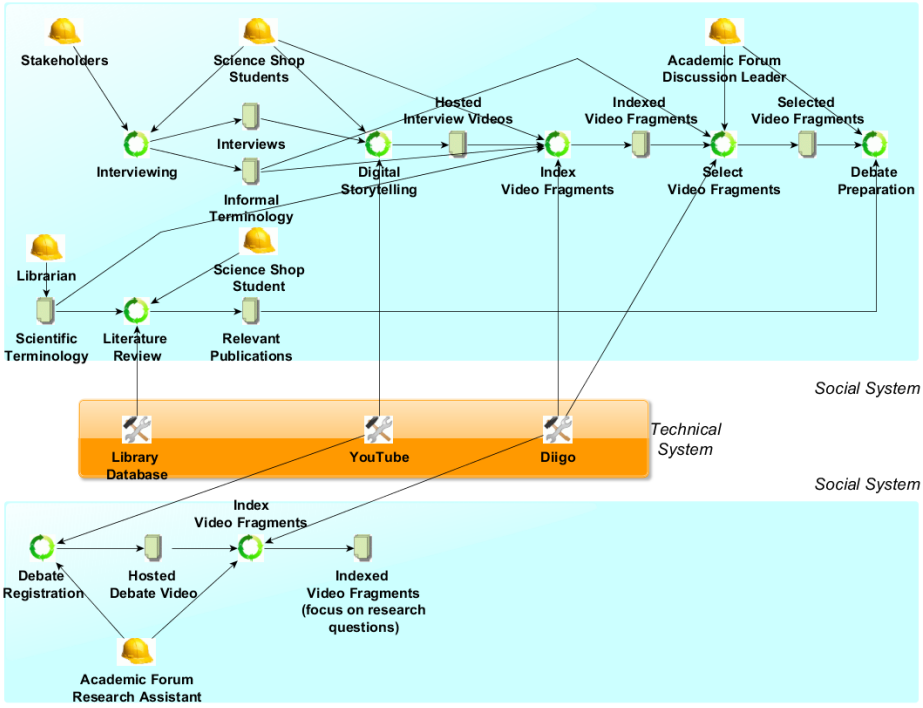

Figure 4. A partial communications architecture of the Research Question Framing stage

Figure 4 presents a (partial) communications architecture of the research question framing stage. Similar architecture diagrams could be drawn for the other stages. Clearly distinguished are the various roles (Stakeholders, Science Shop Students,…), key workflows (Interviewing, Digital Storytelling…), results (Interviews, Informal Terminology…) and tools used (Library Database, YouTube, and Diigo).

Several observations can be made. First of all, the architecture looks complex. This is because collaborative communication IS complex. Even though systematic design of academic research communication is essential for it to become of higher quality and have more impact, (extra-)academic communication flows are still mostly ad hoc. Whereas the business world invests heavily in solid communications systems and process architectures, the academic research community lags behind.

Second, most of the complexity in the architecture is not in the technical system (their inner workings can be considered black boxes from an architectural point of view), but in their usage context: the social system. Especially in academia, this social system is highly developed, as can be seen from this example. This social complexity should be reflected in its communication systems designs, but is often ignored. Putting it another way, careful socio-technical systems design for collaborative academic research communities generally does not necessarily involve large implementation budgets (all tools mentioned in this scenario are freely available tools in The Cloud). It is, however, about investing in collaboratively - with the community - making sense of how to use and configure these tools in the actual communication con-

text, while translating and embedding these concepts in their daily work processes, and generating a sense of ownership in the users.

Third, even though there is much complexity from an architectural point of view, this does not mean that the individual actors involved need to be aware of this overall complexity. Stakeholders play clearly defined roles and only need to be aware of their own, limited, usage context. For example, the Academic Forum discussion leader can select video fragments simply by searching in Diigo, while the production of these videos and indexing their fragments has already been done separately by Science Shop students. Still, somebody needs to be made responsible for the design of this overall communications architecture. Typically, this responsibility would assigned to management or the ICT department, in close collaboration with user representatives. End-users would not need to be exposed to these high-level architectural designs, as these can be translated into specific user manuals, task lists, or instruction videos, using their own informal terminologies. Finally, such complex designs would not have to be created from scratch, but could be shared and reused widely as open source reference models by the global academic community, since many of the general communications issues are the same.

Dissemination

Using Diigo, the Tilburg University communications department finds some indexed video fragments that are relevant to their PR purposes, and which they embed on the university website. Several lecturers also search the Diigo site using a mix of professional and informal search terms. A lecturer at the Department of Finance selects several video fragments to illustrate the consequences of risky investment strategies, while a colleague at the Department of Social Psychology uses some fragments (one of them the same) to illustrate the power of group dynamics in corporate decision making and leadership processes. As some students watch these video fragments in preparation for the lectures, they add comments to the videos on YouTube, enriching their meaning for future viewers.

Over time, the growing research video and social bookmarking resources on YouTube and Diigo are also discovered by many external stakeholders. Journalists find them a useful way to quickly identify video material (and possible interviewees for TV shows and newspaper articles), NGOs use them to build activist campaigns around particular issues, companies use selected videos in-house in their Corporate Social Responsibility programs, while school kids use the fragments in their digital homework assignments. In the meantime, through social media like Twitter, Facebook, and blogs, tangential conversations take off, as many stakeholders use the fragments to argue pro or contra the points of view within and across their own communities.

Impact assessment

2023. After the financial crisis was finally kind of overcome in 2018, irresponsible investment behaviors returned with a vengeance. As the global economy had not been

reformed in a fundamental way, another crisis hit, even harder than the 2008 one. Academic Forum decides to organize another debate on "What Caused the Financial Crisis and How to Prevent the Next One?", inviting the head of the National Financial Audit department, who used to be an academic himself. The Research That Matters-video server is accessed by a reporter preparing a major article for one of the main (digital) national newspapers. It is by now a well-established societal resource, being used for many different purposes by a wide variety of organizations and individuals. While Academic Forum is still in the process of preparing the debate, the reporter finds an interesting 2013 video fragment in which the auditor-then-banker had a completely opposite point of view on what should be done to combat the crisis. She prepares some thorny questions for her planned interview with the auditor who manages to answer most questions satisfactorily. However, a few questions remain unanswered, which form a perfect starting point for the next Academic Forum debate, first replaying those relevant pieces of video from way back...

6 Discussion

There is no ONE way of doing academic research. There are numerous different paradigms, disciplines, methodologies, traditions, and geographical/cultural factors determining how specific academic sub-communities operate. The examples in this chapter of academic research issues, process stages, and socio-technical solution designs, were necessarily anecdotal. They do not apply in the same way, or at all, to each of the myriad forms academic research is organized and conducted. Still, the gist of the argument is that all research has certain problematic issues, that all research is done in stages that need to be adequately defined and calibrated, and that all research needs a well-designed socio-technical collaboration infrastructure. Instead of prescribing a single comprehensive, one-size-fits-all approach, this chapter was merely meant to sensitize the reader to the kind of issues involved, and how to possibly address them, applying a possibly similar but certainly not the exact same analytical approach to their own field.

We have outlined a conceptual framework for analyzing science-society collaborations grounded in sustainable stakeholder relations, their interactions being catalyzed by the Internet. Such collaborations can help the development of reciprocal relationships between universities and external stakeholders that are respectful, productive and mutually advantageous (Gurstein, 2011). These new ways of working together also provide excellent examples of open and social innovation. Open innovation comprises complex, interconnected webs of interacting individuals and organizations focused on producing knowledge-intensive innovative outputs (West & Lakhani, 2008). By clarifying and connecting the webs of conversations between these stakeholders, viable new collaborations can be established (De Moor & Aakhus, 2013). The related field of social innovation is about "new ideas meeting unmet needs"; how these innovations progress from idea generation through prototyping and piloting, to scaling up and learning; and how effective alliances can be created that cut across organizational, sectoral or disciplinary boundaries (Mulgan, 2007). Universities de-

veloping the kind of collaborations introduced in this chapter could (and should) be at the forefront of these innovation domains. To do so, from the stakeholders involved key "collaboration patterns" can be elicited that capture reusable socio-technical lessons learnt. Such patterns represent good and best practices about what research processes done by whom and supported by which tools in what way. They could also be of great help in precisely defining necessary and acceptable checks and balances in the intricate webs of collaborative relationships, workflows, and supporting technical systems (De Moor, 2012).

Another field of inquiry to tap into when developing these multi-stakeholder collaborations is community-based research theory and practice. Community-based research serves community-identified needs, is sensitive to the cultural understandings of the community, and supports action around some community-identified issue (Strand et al. in (Stoecker 2008)). There is a rich community-based research literature and working experience in such overlapping fields as Community-Based Participatory Research and Community Informatics (e.g. Williamson & DeSouza, 2007; DCRT, 2011; Denison & Stillman, 2012). Community-based research concepts, methodologies, ethical principles, and facilitation processes will be very useful in expanding the community-based academic research process. Many institutional barriers need to be overcome to shift the balance of power to the community in a community-academy partnerships (Stoecker, 2008). Socio-technical communications architectures like the scenario proposed in this chapter should contribute to lowering these barriers, provided that the architectures are grounded in these community-based research concepts and validated by the community.

How to produce such legitimate communications architectures is still an open question, and could be an interesting extension of community-based research. One particularly promising starting point could be service-learning by students that focuses on serving the ICT needs of community organizations. According to Loving, Stoecker & Reddy (2011), these ICTs can be analyzed according to a ladder (or "step stool") of control. The lowest rung is that the end-user can put a technology into practice, the next one that the end-user can also shape it, and the top of the ladder that the user can even build the tools themselves. Loving et al. then observe several problems with student service learning projects, including insufficient assessment of the organization's ICT goals, rushing to tool selection and implementation, limited student technical development expertise, and the community organizations having unrealistic technical expectations. When students limit their service development to building organizational social media capacity, the projects tend to be more successful, but the authors wonder whether this is enough. From what has been argued in this chapter, we think there is a promising way forward, however. A fourth rung should be added to the ladder: designing the overall socio-technical communication and collaboration system architecture of the community. Much more than in technical wizardry, students' expertise is – or should be – in matching the highly complex and subtle information and communication needs of communities with a wide array of virtual and physical ICTs. Instead of acting as a software engineer, the key role of the students would then be much more that of *systems architect*. Eliciting, interpreting, and translating collaboration patterns that capture socio-technical community needs and con-

straints should be their core business. By collecting these patterns in bodies of work like pattern languages, such as the Liberating Voices Pattern Language (Schuler, 2008), reusable best practices should emerge. By co-creating, configuring, and translating these patterns together with the community, more sensemaking, ownership of and empowerment by the ICTs could be realized in the community. Furthermore, such patterns could also be useful in formulating research hypotheses for more traditional academic research outcomes, such as papers and controlled experiments, as they provide tentative relations between independent and dependent variables. These hypotheses could then be tested in various forms of follow-up empirical research.

Opening up the academic research community is essential. More aligned ways of academics working together with societal stakeholders will help deal with such priorities as increasing research capacity, combating fraud, and lessening the societal isolation of much academic research. However, many of current institutional reforms still look inward. For example, following the Stapel fraud case, the investigation committees made many strong recommendations, including having an independent confidential counsellor for integrity, every PhD student being supervised by at least two (co)supervisors, doing more replications of studies, etc. (Levelt Committee et al., 2012). No expanded science-society academic research collaborations were explicitly proposed, however. In the future, with universities increasingly grounded in and networked with society, more attention will undoubtedly be paid to developing more complete and sound criteria for balanced science-society collaboration systems.

Universities rightly pay much attention to improving their primary processes of research and education. However, there is growing pressure to establish sustainable collaborative partnerships with external stakeholders. As suggested, universitary science-society communicators like science shops, academic fora, social innovation labs, and communications departments will play an increasingly important roles as "brokers" of enduring collaborative relationships. These organizational units are sensitive to both academic and societal needs and preferences, and as such should act as an indispensable bridge. Also, it is important to realize that using the Internet alone is not enough: the many face-to-face events and meetings these science brokers organize bring many diverse stakeholders together. Such physical happenings remain essential for stimulating conversation, building social capital, and trust. Aligning physical and virtual communications is therefore a prerequisite for successful collaboration (De Moor, 2012).

7 Conclusions

We live in in a transitional time between a in many ways hierarchical, inward-looking, mono-disciplinary-based way of doing science, and the rapidly approaching era of more collaborative, outward-looking and society-focused grounding of academia. By zooming in on the appropriate research issues and process stages, communication architectures for more effective collaborations between stakeholders within and outside of academia can be designed. Each of these socio-technical designs is a strand in the tapestry of strengthened relationships between science and society. Of course,

implementing these designs is no panacea, but one by one they will contribute to academic research that is more embedded, sustainable, and relevant.

References

Applegate, L. M. (1999). Rigor and Relevance in MIS research - Introduction. *MISQ*, *23*(1), 1–2.

Bawarshi, A. S., & Reiff, M. J. (2010). Genre Research in Academic Contexts. In *Genre: An Introduction to History, Theory, Research, and Pedagogy* (pp. 107–131). Anderson, SC: Parlor Press.

Chambers, R. (1997). Whose Reality Counts? Putting the First Last. London: Intermediate Technology Publications.

Copeland, S., & Miskelly, C. (2010). Making Time for Storytelling - The Challenges of Community Building and Activism in a Rural Locale. *International Journal of Media, Technology and Lifelong Learning*, *6*(2), 192–207.

Day, P., & Schuler, D. (2004). Integrating Practice, Policy and Research. In P. Day & D. Schuler (Eds.), *Community Practice in the Network Society: Local Action, Global Interactions*. NY: Routledge.

Durham Community Research Team (DCRT) (2011). Community-Based Participatory Research - Ethical Challenges. Centre for Social Justice and Community Action, Durham University.

de Moor, A. (2010). Reconstructing Civil Society with Intermedia Communities. *AI & Society*, *25*(3), 279–289.

de Moor, A. (2012). Creativity Meets Rationale: Collaboration Patterns for Social Innovation. In Carroll, J. (Ed..), *Creativity and Rationale: Enhancing Human Experience by Design*. Berlin:Springer.

de Moor, A., & Aakhus, M. (2013). "It's the Conversation, Stupid!" - Social Media Systems Design for Open Innovation Communities. In J. E. Lundström, M. Wiberg, S. Hrastinski, M. Edenius, & P. J. Ågerfalk (Eds.), *Managing Open Innovation Technologies* (pp. 17–33). Berlin:Springer Berlin.

Denison, T., & Stillman, L. (2012). Academic and Ethical Challenges in Participatory Models of Community Research. Information. *Communication and Society*, *15*(7), 1037–1054.

Enserink, M. (2011, November). Scientists Brace for Media storm Around Controversial Flu Studies. *ScienceInsider*. Retrieved from http://news.sciencemag.org/scienceinsider/2011/11/scientists-brace-for-media-storm.html.

Fanelli, D. (2009). How Many Scientists Fabricate and Falsify Research? A Systematic Review and Meta-Analysis of Survey Data. *PLoS ONE*, *4*(5): e5738. doi:10.1371/journal.pone.0005738.

Finholt, T. A. (2003). Collaboratories as a New Form of Scientific Organization. *Economics of Innovation and New Technology*, *12*(1), 5–25.

Gurstein, M. (2011). Evolving Relationships: Universities, Researchers and Communities. *The Journal of Community Informatics*, *7*(3).

Jackson, R (1999). The Universities, Government and Society. In Smith, D. C., & Langslow, A. K. (Eds.), *The Idea of a University* (pp.91-105). London: Jessica Kingsley Publishers.

Jaschik, S. (2012, January). Humanities Scholars Consider the Role of Peer Review. *Inside Higher Ed*. Retrieved from http://www.insidehighered.com/news/2012 /01/06/humanities-scholars-consider-role-peer-review.

Jones, D. R. (1999). Review of "Olaf Pedersen (1998), The First Universities: Studium Generale and the Origins of University Education in Europe". *History of Education Quarterly, 39*(3), 363-365.

Jordan, B. (1989). The Common Good: Citizenship, Morality and Self-Interest. Oxford: Basil Blackwell.

Kavanaugh, A. L., Reese, D. D., Carroll, J. M., & Rosson, M. B. (2005). Weak Ties in Networked Communities. *The Information Society, 21*(2), 119–131.

Kenzior, S. (2012, August). The Closing of American Academia. *Al Jazeera*. Retrieved from http://www.aljazeera.com/indepth/opinion/2012 /08/2012820102749246453.html

Leavy, P. (2011). Essentials of Transdisciplinary Research: Using Problem-Centered Methodologies. Walnut Creek, CA: Left Coast Press.

Levelt Committee, Noort Committee, & Drenth Committee. (2012). Flawed science: The Fraudulent Research Practices of Social Psychologist Diederik Stapel. Retrieved from http://www.tilburguniversity.edu/nl/nieuws-en-agenda/ finalreportLevelt.pdf

Leydesdorff, L., & Ward, J. (2005). Science Shops: A Kaleidoscope of Science–Society Collaborations in Europe. *Public Understanding of Science*, *14*(4), 353–372.

Loving, K., Stoecker, R., & Reddy, M. (2011). Service-Learning, Technology, Nonprofits, and Institutional Limitations. In M. A. Bowdon & R. G. Carpenter (Eds.), *Higher Education, Emerging Technologies, and Community Partnerships: Concepts. Models, and Practices* (pp. 129–139). Hershey, PA: IGI.

MacLellan, M., & Talpalaru, M. (Eds.). (2012). *Remaking the Commons. Reviews in Cultural Theory, 2.3*, 1–6.

Manlow, V., Friedman, H., & Friedman, L. (2010). Inventing the Future: Using the New Media to Transform a University From a Teaching Organization to a Learning Organization. *Journal of Interactive Learning Research, 21*(1), 47–64.

Mulgan, G. (2007). Social Innovation: What Is It, Why It Matters, How It Can Be Accelerated. London: The Young Foundation.

National Science Board (NSB) (2012). Trends and Challenges for Public Research Universities - Diminishing Funding and Rising expectations. National Science Board. Retrieved from http://www.nsf.gov/nsb/sei/companion2/files/nsb1245.pdf

Nussbaum, M. C. (2010). Not For Profit: Why Democracy Needs the Humanities. Princeton, NJ: Princeton University Press.

Payne, S. L., & Calton, J. M. (2004). Exploring Research Potentials and Applications for Multi-stakeholder Learning Dialogues. *Journal of Business Ethics, 55*(1), 71–78.

Preece, J., & Shneiderman, B. (2009). The Reader-to-Leader Framework: Motivating Technology-Mediated Social Participation. *AIS Transactions on Human-Computer Interaction, 1*(1), 13–32.

Sample, I. (2012, July 15). Free Access to British Scientific Research Within Two Years. *The Guardian*. Retrieved from http://www.guardian.co.uk/science/2012/jul/15/free-access-british-scientific-research

Schuler, D. (2008). Liberating Voices: A Pattern Language for Communication Revolution. Cambridge, MA: MIT Press.

Scott, A. O. (2010, October). Review of "Inside Job" - Who Maimed the Economy, and How. *The New York Times*. Retrieved from http://www.nytimes.com/2010/10/08/ movies/08inside.html?_r=0

Spyns, P., de Moor, A., Vandenbussche, J., & Meersman, R. (2006). From Folksologies to Ontologies: How the Twain Meet. In R. Meersman & Z. Tari (Eds.), *On the Move to Meaningful Internet Systems 2006: CoopIS, DOA, GADA, and ODBASE* (pp. 738–755). Berlin:Springer.

Stoecker, R. (2008). Challenging Institutional Barriers to Community-Based Research. *Action Research*, *6*(1), 49–67.

Strand, K. J., Cutforth, N., Stoecker, R., Marullo, S., & Donohue, P. (2003). Community-Based Research and Higher Education: Principles and Practices (1st ed.). San Francisco, CA: Jossey-Bass.

Taylor, M. C. (2009, April). End the University as We Know It. *The New York Times*. Retrieved from http://www.nytimes.com/2009/04/27/opinion/27taylor.html

Upbin, B. (2013, March). PatientsLikeMe Is Building a Self-Learning Healthcare System. *Forbes*. Retrieved from http://www.forbes.com/sites/bruceupbin/2013/03/01/building-a-self-learning-healthcare-system-paul-wicks-of-patientslikeme/

West, J., & Lakhani, K. R. (2008). Getting Clear About Communities in Open Innovation. *Industry & Innovation*, *15*(2), 223–231.

Williamson, A., & DeSouza, R. (Eds.). (2007). Researching with Communities: Grounded Perspectives on Engaging Communities in Research. Auckland, New Zealand: Muddycreekpress.

Yapa, L. (2009). Transforming the University through Community Engagement. *Journal of Higher Education Outreach and Engagement*, *13*(3), 131–146.