



Establishing a Research Agenda for Scholarly Communication: A Call for Community Engagement

**by ACRL Scholarly Communications Committee
November 5, 2007**

Table of Contents

Executive Summary.....	3
Introduction.....	3
Themes & Research Opportunities	4
1) The Impact and Implications of Cyberinfrastructure.....	4
2) Changing Organizational Models.....	6
3) How Scholars Work.....	7
4) Authorship and Scholarly Publishing.....	8
5) Value and Value Metrics in Scholarly Communications.....	10
6) Adoption of Successful Innovations.....	12
7) Preservation of Critical Materials.....	13
8) Public Policy and Legal Matters.....	14
Conclusion and Invitation	16
Appendix A: Attendee List	17
Appendix B: ACRL Scholarly Communications Committee Roster 2007-2008	18
Bibliography	19

Executive Summary

The system of scholarly communication – which allows research results and scholarship to be registered, evaluated for quality, disseminated, and preserved – is rapidly evolving. Academic libraries and their parent institutions are adopting strategies, making plans, and taking action to respond to the changing environment and to influence its development. Believing that meaningful research can inform and assist the entire academic community in influencing and managing this evolution, the Association of College and Research Libraries (ACRL) convened an invitational meeting on July 21, 2007, to collectively brainstorm the evidence needed to inform strategic planning for scholarly communication programs.

Influencing a system as complex and dynamic as scholarly communication requires broad and deep understanding. The issues for investigation that emerged at the meeting range from cyberinfrastructure to changing academic organizational models to public policy. This report thematically summarizes and synthesizes the meeting's rich discussion, framing eight essential research challenges and opportunities. We invite those engaged in creating, supporting, and distributing scholarship to comment and extend the issues and possible research initiatives. Without substantive comment from librarians and their partners, the goal of outlining a community research agenda cannot be considered complete.

Introduction

The system of scholarly communication allows research results and scholarship to be registered, evaluated for quality, disseminated, and preserved. A complex and growing set of issues – environmental changes, challenges and opportunities – affect the evolution of infrastructure, products, and services that perform these core functions of scholarly communication.

Changes in scholarly communication affect diverse and well-known stakeholders, including North American academic libraries and their parent institutions. These stakeholders are taking actions such as experimentation, policy intervention, and exploring new market behaviors. In doing so, they seek to respond to the changing environment and to influence the rapid evolution of the conduct and sharing of scholarship.

In an ideal world, stakeholders would have timely and comprehensive data about the state and dynamics of scholarly discourse, the needs and expectations of stakeholders, and the impact of technological and organizational changes in the academy, as they implement new strategies and plans. Meaningful research questions and results can inform and assist the entire academic community in influencing and managing the evolution of scholarly communication.

Recognizing the value of a collaborative understanding, the Scholarly Communications Committee of the Association of College & Research Libraries (ACRL) organized an invitational meeting to discuss these issues with a selective group of principals from leading not-for-profit organizations attuned to North American academic libraries. The primary goal of the meeting was to identify foundational questions and evidence needed to inform strategic planning for scholarly communication programs. A related goal was to explore whether these organizations could pool their resources and co-operate to address and refresh the priority needs.

Representatives from ACRL, the Association of Research Libraries (ARL), the Council on Library and Information Resources (CLIR), the Coalition for Networked Information (CNI), Ithaka, the Andrew W. Mellon Foundation (Mellon), and Scholarly Publishing and Academic Resources Coalition (SPARC) met on July 21, 2007, in Washington, D.C. to discuss research needed in the area of scholarly communications.¹

¹See Appendix A for attendee list.

Each of the participating organizations has a unique role, specific mission, and an explicit record of addressing change in scholarly communication. Collectively they share the view that profound changes are occurring in scholarly communication, and they are particularly engaged in the role of academic libraries as stakeholders and change agents.

The Report & Invitation

This report thematically summarizes and synthesizes the meeting's rich discussion, framing essential research challenges and opportunities to engage others and to broaden the conversation.² It is intended primarily for those engaged in supporting the creation and distribution of scholarship and research. As such, it assumes that the reader will have more than passing familiarity with the rapid evolution of scholarly communication and will have an interest in framing and deepening the collective understanding of how to shape scholarly communication models to match current and emerging scholarly practices.

Eight themes emerged from the conversation. In non-prioritized order they are:

- 1) The impact and implications of cyberinfrastructure
- 2) Changing organizational models
- 3) How scholars work
- 4) Authorship and scholarly publication
- 5) Value and value metrics in scholarly communications
- 6) The adoption of successful innovations
- 7) Preservation of critical materials
- 8) Public policy and legal matters

Each theme is explored below through an introduction, a list of challenges that begin to illustrate the need for deeper understanding, and a set of specific research questions or opportunities. The research challenges vary in their scale and relative complexity, and are offered here to engage consideration, not as an exhaustive, prioritized, or definitive list.

The academic community and its key partners in the creation and communication of scholarship are invited to comment and extend the issues and possible research initiatives. The report is expected to provoke additional ideas and responses. Without substantive comment from librarians and their partners the goal of outlining a community research agenda cannot be considered complete. The planners hope this report and its comments can prompt new research ideas and pursuits.

Themes & Research Opportunities

Participants identified eight themes characterizing the changes transforming scholarly communications. Developing a deeper understanding of these challenges through research can enable academic stakeholders to influence and construct scholarly communication systems that optimally support the academic enterprise and the communities it serves.

1) The Impact and Implications of Cyberinfrastructure

Scholars and researchers in all disciplines require a robust digital infrastructure to conduct their research. Cyberinfrastructure – the “layer of enabling hardware, algorithms, software, communications, institutions, and personnel [that] should provide an effective and efficient platform for the empowerment of specific communities of researchers to innovate and eventually revolutionize what they do, how they do it, and

² Meeting attendees were given the opportunity to review this report to ensure that it accurately reflected the conversation, and they helped formulate its central themes.

who participates”³ – refers to the shift from small scale and individualistic inquiry to a process of large scale, collaborative research that has financial, political and organizational implications far beyond the implicit technological issues. Because cyberinfrastructure promises to “revolutionize what [scholars] do, how they do it, and who participates,”⁴ its deployment will affect every aspect of the communication of that scholarship. With its far-reaching impact on the nature and processes of research and scholarship, CI has also been framed as an important factor in the global competitiveness of the nation’s research enterprise.

Some people equate cyberinfrastructure to research computing and computational science. The initial thrust of investigation was instigated by the National Science Foundation (NSF), reinforcing the association of the term with high speed computing and the sciences.^{5 6} NSF continues to support the development of a national and regional computing infrastructure through its reports and funding programs. The impact on all disciplines is becoming apparent. The American Council of Learned Societies (ACLS) followed NSF in issuing a report on the opportunities and concerns from the perspectives of the humanities and social sciences.⁷ In late 2004 an ARL/CNI Forum⁸ presented an opportunity for the North American research library community to explore the topic.

Illustrative Challenges

Libraries often tailor services and collections to meet specific disciplinary needs, yet little is known about how institutional investments in cyberinfrastructure are affecting research at the discipline level. The distributed nature of cyberinfrastructure presents a challenge in determining the roles and contributions of individual institutions or their constituent parts, including libraries. Libraries have not always been at the table when research and high performance computing services have been discussed, priorities determined and funding distributed. Documenting and sharing information about investments in and management of cyberinfrastructure is needed. This work is urgent and important for libraries to redefine and assert their role in the creation, dissemination, and preservation of scholarship.

Research agendas and scholarly practice can be transformed by ubiquitous access to computing and network resources. How academic institutions choose to employ and distribute funding and computing resources will determine the future of scholarship and scholarly communication in all disciplines. How cyberinfrastructure is viewed, funded, and governed on campus will be a pressing issue for scholars, libraries, and IT to co-determine.

Research Possibilities

- Collect systematic data about academic library expenditures on IT for academic computing. Ensure that data elements are clearly defined so that comparable data can be collected and compared. A starting point could be to examine how EDUCAUSE collects institution-wide data and compare relative library and IT investments in infrastructure. This useful model illustrates the challenge of creating definitions and guidelines to ensure consistency in data collection that lead to meaningful comparisons.

³ Revolutionizing Science and Engineering through Cyberinfrastructure. Report of the National Science Foundation Blue Ribbon Panel on Cyberinfrastructure. (2003) p.5.

http://www.communitytechnology.org/nsf_ci_report/

⁴ *ibid*

⁵ *ibid*

⁶ F. Bernan and H. Brady, “Final Report on the NSF SBE-CISE Workshop on Cyberinfrastructure and the Social Sciences.” (2005).

<http://vis.sdsc.edu/sbe/reports/SBE-CISE-FINAL.pdf>

⁷ Our Cultural Commonwealth: The Final Report of the American Council of Learned Societies Commission on Cyberinfrastructure for the Humanities and Social Sciences.

<http://www.acls.org/cyberinfrastructure/OurCulturalCommonwealth.pdf>

⁸ Libraries and Changing Research Practices: A Report of the ARL/CNI Forum on E-Research and Cyberinfrastructure. Diane Goldenberg-Hart, CNI, ARL Bimonthly Report 237. Dec. 2004. <http://www.arl.org/bm~doc/cyberinfra.pdf>

- Review funding patterns of the National Endowment for the Humanities (NEH), Institute of Museum and Library Services (IMLS), and the National Science Foundation (NSF) to identify past and planned funding for cyberinfrastructure projects. Examine the assumptions about related impacts on the communication and management of research results.
- Study institutions receiving grant funding to track the degree the institutions have absorbed the funded projects into their budgets. Determine what elements of cyberinfrastructure development and deployment have been sustained beyond grant funding and examine how costs can be identified and tracked.

2) Changing Organizational Models

Existing organizational models in the academy are collapsing or reforming in response to shifting values and behavioral changes, technological innovations, and new expectations. For example, more undergraduates are involved in research and listed as co-authors on published papers; interdisciplinary studies are proliferating, even between humanistic and scientific arenas; collaborations across institutions and fields are taking hold as normal practice; and libraries are taking on the role of publisher. These changes create enormous pressure to collapse existing structures and reform into new, often ad hoc groups within and between organizations. Organizational models are under stress not only across disciplines, but also across scholarly societies, academic departments and divisions, and other structures.

Informal modes of communication are proliferating with these changes, while formal modes are slow to adapt. Scholarly communication systems must evolve along with practice. Libraries need to seek out new methods and means of supporting scholars in this changing environment, including collaborative approaches to funding, new service definitions, and facilitation of emerging models.

Illustrative Challenges

Virtual organizations cross institutional boundaries and exist only electronically. They are typically created to accomplish a specific research agenda and are often disbanded when their tasks are complete.⁹ The challenge of supporting scholarly communication for virtual organizations is compounded when they comprise distributed user communities across multiple institutions. Knowledge is created and shared among participants, but there is often no explicit, permanent authority to disseminate, document and archive the virtual organization's output.

Similar issues arise regularly with the growth of interdisciplinary research and teaching agendas. New organizational structures arise at the intersections and subfields of interesting new learning and research agendas. Libraries may not recognize their importance and miss the opportunity to retool their services to assist the work that these centers generate. International collaborations pose more of these challenges. Institutions are extending their reach to a global constituency, to new international partnerships, and are encouraging ad hoc relationships based on individual research programs. These developments must be tracked and their growth aligned with the technical and organizational capacity to record and disseminate their scholarly output.

At the same time new economic realities may limit support for niche areas of inquiry or their new methods of scholarly communication when costs don't scale for broader applications.

⁹ "A virtual organization is created by a group of individuals whose members and resources may be dispersed geographically, yet who function as a coherent unit through the use of end-to-end cyberinfrastructure systems.... Such virtual organizations supporting distributed communities go by numerous names: collaboratory, co-laboratory, grid community, science gateway, science portal, and others." Cyberinfrastructure Vision for 21st Century Discovery. National Science Foundation Cyberinfrastructure Council. March 2007. <http://www.nsf.gov/pubs/2007/nsf0728/index.jsp> p. 2-3.

Research Possibilities

- Document the rate of growth of virtual organizations and clarify definitions and characterization. One approach would be to examine the portfolios of grant makers that are funding Virtual Organizations to identify the number that are being funded to generate an overview that can be used for extrapolation.
- Apply research on oral traditions to the development of virtual communities. This could provide useful insights into how they develop ways of sharing and preserving informal information.
- Conduct cost-benefit analyses for several institutions to determine the investment required to create and maintain a virtual organization dissemination or “publication” service.
- Perform economic modeling and simulation to explore questions about scaling the distribution of support across new and traditional research centers and new and traditional communication modes.

3) How Scholars Work

Given the advent of cyberinfrastructure and the shift of organizational boundaries, it is essential for librarians to understand how the values and work practices of scholars and researchers are changing. This knowledge is needed for well-established disciplines and for nascent interdisciplinary and inter-institutional collaborations. New research, presentation, and dissemination methodologies are being used with resulting implications for libraries and their institutions seeking to balance investments in commercial publications with support for new research and publication models. More understanding is needed about how scholars create knowledge and how libraries can participate in the process.

While the sciences have long used team approaches to research questions, collaborative practices have also been adopted by social scientists and humanists are beginning to follow suit, depending on new partners to achieve their aims. Tools developed in one area can be employed across disciplines, though scholars may not be aware of the possibilities that already exist when they begin to imagine their own tool kit. Current means to match up scholars to each other and to tools and methods are ineffective.

Illustrative Challenges

Librarians should monitor and engage in the ongoing development and evolution of the tools and techniques scholars employ. Additional new tools will emerge to support new forms of scholarly discourse (i.e. the increasingly online “conversation” of science and digitally-aided scholarship) and to synthesize research across disciplines. Tools may be employed across disciplines differently from their original intent and application. How can libraries assist scholars with identifying existing tools, adapting them to new needs, and sharing the resulting forms of scholarship? How can we assist scholars with finding each other when they have similar needs and common approaches? How do we track and support technological and methodological developments in the disciplines so that we can serve in this new role?

There are also challenges in understanding the relationship between new methods of inquiry and methods of teaching and learning. Changes in pedagogy create new expectations for how students will be working and library services that could support them. Libraries must improve the availability of materials for courses taught in an online environment, increase their involvement in the technology and techniques of online teaching, and offer services that match the needs of online courses.

Research Possibilities

- Identify best practices regarding the collection and stewardship of software and data.
- Conduct meta-analyses to synthesize the results of recent studies on how scholars create and share knowledge and how to support their work.¹⁰ Identify remaining knowledge gaps.
- Derive useful methodologies – including inventories, surveys, and ethnographic approaches – and apply them across a discipline or institutions to produce longitudinal data.
- Identify and analyze the tools and methods that scholars are developing themselves. Scholars are creating new interdisciplinary, informal, geographically unconstrained communities. Track and characterize these developments to reveal how they find each other. This may suggest new roles for libraries in matching work methods with communication habits and needs.

4) Authorship and Scholarly Publishing

Notions of authorship and what it means to “publish” the products of research and scholarship are rapidly evolving. Authors and publishers are leveraging new technologies such as interactive multimedia and online-only scholarly resources, but primarily for “in-progress” communication rather than “final, archival publication.”¹¹ Scholarly products are taking many new forms - databases and data sets; digital text and images; simulations, visualizations, and animations; curated online reference works; and specialized software – the stuff of digital scholarship. Blogs, wikis, and other new media are advancing scholarly discourse outside of comfortable definitions of “scholarly publishing.”

When faculty employ and create new forms and techniques, evaluating their work against traditional measures is a particular challenge. Although studies document the conservatism and constraining influence of scholarly promotion and tenure review processes and reward systems, we do not yet have deep insight into how they can evolve to recognize and embrace new forms of scholarship. The problem is acute for the creators of digital scholarship, which rarely enters the formal publishing stream, yet is a creative, scholarly act that can influence and underpin both present and future research. But authorship of these programs is not yet rewarded as a form of scholarly communication of the first order in most disciplines.

New business models to evaluate and publish scholarly products are being developed, but their long-term sustainability and impacts are unknown. Driven in part by longstanding resource constraints, the academy needs to have deeper understanding about the effect of commercial publishers’ profit goals on access to and impact of scholarship. Similarly, we need salient data about alternatives to traditional publication and their potential for lower production costs. This data will allow universities to make

¹⁰ The analyses could cover, for example, recent work from: 1) the University of Virginia’s Scholarly Communications Institute; 2) the libraries of the University of Minnesota (*A Multi-Dimensional Framework for Academic Support: A Final Report*, 2006); 3) the University of Rochester (Foster, Nancy Fried and Susan Gibbons. *Understanding Faculty to Improve Content Recruitment for Institutional Repositories*. D-Lib Magazine (January 2005) <http://www.dlib.org/dlib/january05/foster/01foster.html>; 4) the University of California (King, C. Judson; Harley, Diane; Earl-Novell, Sarah *et al*, *Scholarly Communication: Academic Values and Sustainable Models*, Center for Studies in Higher Education, University of California, Berkeley, Paper CSHE 16.06, 2006 <http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1080&context=cshe>); 5) University of California, Office of Scholarly Communication, *Faculty Attitudes and Behaviors Regarding Scholarly Communication: Survey Findings from the University Of California*. Available at <http://osc.universityofcalifornia.edu/responses/activities.html>); 6) Ithaka (Schonfeld, Roger C. and Guthrie, Kevin M. *The Changing Information Services Needs of Faculty*. Educause Review 42, no. 4. 2007 <http://www.educause.edu/apps/er/erm07/erm0746.asp>); 7) OCLC (OCLC Membership Reports, *Environmental Scan: Pattern Recognition* (2003) <http://www.oclc.org/reports/escan/default.htm>).

¹¹ Diane Harley, Sarah Earl-Novell, Jennifer Arter, Shannon Lawrence and C. Judson King. “The Influence of Academic Values on Scholarly Publication and Communication Practices.” CSHE.13.06 (September 2006). <http://cshe.berkeley.edu/publications/publications.php?id=232>

investment decisions in a range of open access business models offered by commercial and non-profit publishers. Further, we need evidence on whether and how the focus on traditional publication for promotion and tenure can undermine broader distribution of research and the development of alternatives to high-priced publications. What data is most important to collect and how is it to be evaluated and shared? What influences scholars at different points in their careers and what questions should be asked to elicit meaningful responses about changes in authorship? How should librarians work with administrators, individual scholars, and scholarly societies to advance scholarship in new, meaningful and sustainable ways? What new services are required in this new environment and how should they be constituted?

Illustrative Challenges

We need to better understand and support new authoring formats and techniques. Perhaps templates and standards would facilitate the creation of scholarly work while also supporting its preservation; however, it is likely that scholars would resist placing constraints on their creative process. Current electronic journal systems such as DPubS¹² and Open Journals Systems¹³ may be extended and replicated to support genres other than "journals". Similarly, institutional repositories may have the potential for evolving into platforms for more sophisticated means to manage and disseminate digital scholarship.

We need to better understand the full necessary costs of access controlled models of publication as compared to a truly equivalent open access model to reveal where costs savings are possible and under what conditions. This could provide insights into which functions would be unnecessary in an open access model, and which would need to be included. For instance, what costs are saved by removing access/authorization controls? With the advent of new search and discovery tools, is equivalent marketing needed for both? This research could also suggest ideas to address the hypothesized free rider problem, in which users of openly available scholarships do not help cover the costs of its dissemination.

While we know that disciplinary repositories, open-access peer-reviewed journals, and community-supported reference sources can find content and audiences, we do not yet know, for example, how to distribute the cost of supporting projects like the Physics ArXiv across the many institutions reliant on its success. An understanding is required of the conditions under which an endowment model for publications, such as the one in place for the *Stanford Encyclopedia of Philosophy*¹⁴, can work and be cost effective over a long period. We would profit from exploring the relationship between author or "green" archiving of scholarly articles and the formal publications in which they also appear.

If research reveals that formal publications are of decreasing value or changing significance to scholars, what are the implications for research libraries? For example, what are the economics and funding models of the transition? Should librarians shift funding from journal subscriptions to systems that collect and disseminate new forms of content, and when?

Research Possibilities

- Investigate the leadership and management support needed to explore alternatives to the prevalent subscription model including a variety of open access publication models.
 - Engage economists to collaborate on research into these issues.
 - Document instances of successful shifts and new models to create a diverse collection of compelling examples that can be applied in new arenas.

¹² <http://dpubs.org/>

¹³ <http://pkp.sfu.ca/?q=ojs>

¹⁴ Edward Zalta, "The Stanford Encyclopedia of Philosophy: A university/library partnership in support of scholarly communication and open access." *C&RL News*, Vol. 67, No. 8. (September 2006).
<http://www.acrl.org/ala/acrl/acrlpubs/crlnews/backissues2006/september06/stanfordencyclopedia.cfm>.

- Create sophisticated modeling and simulation of current costs projected into the future to test the hypotheses regarding the sustainability of the present system.
- Explore models that effectively shift funding from collecting published works to supporting new forms of content and its dissemination.
- Study the costs of the entire publishing and distribution system for traditional, open access and hybrid models of journal publication. Explorations should include but not be limited to studying the costs of peer review.
- Examine the feasibility, and necessary characteristics of a trusted registry of new business models and experiments concentrating on collaboratively developed, non-profit information products and resources.
- Research and develop authoring tools, publishing templates and open source software packages for scholarly discourse, teaching and publishing. Examine the feasibility and characteristics of registries of such tools.
- Methods to identify, track and create metadata to document and promote publication of and access to large datasets.

5) Value and Value Metrics in Scholarly Communications

Determining and measuring the effectiveness of and the value that is derived from scholarly communication is challenging and often subjective. John Houghton's work¹⁵ on scholarly communication in Australia seeks to measure the economic and social returns to public sector investment in research and development and how those might rise with open access to published research findings. Analyses of citations *in* the published literature *to* the published literature lead to metrics such as the h-index, Eigenfactor¹⁶, and the heavily-used impact factor. Extant measures may suffer from being tightly coupled to traditional processes while also inhibiting the application of other measures of value. In the new digital environment, activities other than traditional or formal publication should be valued in the reward structure for scholarship. To this end, the Modern Language Association provides an example of examining current standards and emerging trends in publication requirements for tenure and promotion.¹⁷

Illustrative Challenges

Citation analysis relies on a 50 year old assumption that the number of citations represents value, but in today's environment this assumption is limiting. Other metrics could reflect the scholarly significance of new discoveries as they are developed and communicated. Effective metrics must be based on resources and practices that truly advance scholarly research. For example, it could be argued that journal articles have become totems to accrue and count for tenure and promotion but are not unique in their ability to advance scholarship and may be losing some effectiveness for this purpose.

"Open notebook science" and "open data" are examples of new research and communication practices that might be advancing scholarly research as much or more than what is possible through scholarly

¹⁵John Houghton, Peter Sheehan, and Colin Steele, *Research communication costs in Australia: Emerging Opportunities and Benefits*. Melbourne: Centre for Strategic Economic Studies, Victoria University, Sept. 2006. <http://dspace.anu.edu.au/handle/1885/44485>.

¹⁶<http://www.eigenfactor.org/> is a non-commercial academic research project that aims to develop novel methods for evaluating the influence of scholarly periodicals and for mapping the structure of academic research. Carl Bergstrom, "Eigenfactor: Measuring the value and prestige of scholarly journals" *C&RL News*, Vol. 68, No. 5 (May 2007). <http://www.acrl.org/ala/acrl/acrlpubs/crlnews/backissues2007/may07/eigenfactor.cfm>

¹⁷MLA Report on Evaluating Scholarship for Tenure and Promotion. December 2006. http://www.mla.org/tenure_promotion

publication.¹⁸ The relationship between the reward system and indicators of the progress of knowledge is more tenuous. What resources and practices truly advance scholarly research? Even where robust indicators of the progress of knowledge exist, their relationship with the current reward system may be tenuous. How can the value and impact of communication practices be assessed and documented? How could these assessments be assimilated into the reward system?

Libraries should adopt a stronger role that more directly advances scholarly research beyond satisfying tenure and promotion practices. A starting point is work reported by King and Harley regarding formal vs. informal scholarly communications.¹⁹ Given that scholars are finding new ways to register, seek comment, refine, evaluate, and certify their work, how can those processes be tracked, recorded, measured, and reported as part of the value-chain in scholarship?

Should informal communications be captured and preserved by libraries, and if so, how? A useful analogy is to consider that presentations, preprints and letters and other informal communications are the conversations of science, while publications are the minutes.²⁰ In some disciplines, journals are becoming less important to scholars than their professional meetings and informal networks where their accomplishments are recognized. How can librarians better characterize and, measure the contributions of these informal communications, and thereby make wise decisions about organized access to them?

Libraries also need to determine the value of their own services as contributions to the communication of scholarship. Which services, such as institutional repositories, should be evaluated, and what tools and measures exist for this purpose?

Research Possibilities

- Identify and evaluate the range of metrics currently used to measure the value and impact of scholarly publishing. There is citation analysis and its derivatives;²¹ but there are other measures being developed, including those that combine usage/readership and citation, such as those by the MESUR project at Los Alamos National Laboratory,²² and the UKSG Serials Group.²³ A literature review to collect these efforts would provide a central reference point.
- Explore additional measurements that incorporate new kinds of indicators of value and covering a broader range of communication activities. New measures should address increased research efficiency and productivity, variations between disciplines, advancement of the process of research. Other metrics may:
 - characterize the value of Open Data and Open Notebook Science (disseminating source data, research methods, and negative experimental or clinical results) to advancing research and knowledge.
 - correspond to technology transfer or other uses of new knowledge beyond generating further research, for instance, number of views, number of patents.
 - show how informal communications are advancing the process of research

¹⁸ Jean-Claude Bradley, "Open Notebook Science Using Blogs and Wikis." Presented at the American Chemical Society Symposium on Communicating Chemistry, 27 March 2007. <http://precedings.nature.com/documents/39/version/1>.

¹⁹ C. Judson King, Diane Harley, Sarah Earl-Novell, Jennifer Arter, Shannon Lawrence and Irene Perciali, "Scholarly Communication: Academic Values and Sustainable Models." Berkeley: Center for Studies in Higher Education, University of California, Berkeley, 7 July 2006. http://cshe.berkeley.edu/publications/docs/scholarlycomm_report.pdf

²⁰ J. Veltrop, "Keeping the Minutes of Science," Ed. Milton Keynes. *Proceedings of Electronic Libraries and Visual Information Research (ELVIRA) Conference*, organized by De Montfort University, Aslib, London, 2-4 May 1995.

²¹ See for example, Bergstrom and McAfee Journal Cost Effectiveness at <http://www.journalprices.com/> and the Eigenfactor page: <http://www.eigenfactor.org/>

²² <http://www.mesur.org/Home.html>

²³ Peter T. Sheperd, "Final Report on the Investigation into the Feasibility of Developing and Implementing Journal Usage Factors," Sponsored by the United Kingdom Serials Group. May 2007. <http://www.uksg.org/usagefactors/final>.

- Explore the relative value, importance, and significance of traditional journal and book publication compared to newer, informal forms of scholarly communication for a sample of representative scholars. This could build on studies by the CIC and Estabrook that indicated that in the humanities there is some acceptance of digital publications and new forms, while the scholarly monograph was still the standard for promotion and tenure.²⁴

6) Adoption of Successful Innovations

Innovation – its nature, pace, drivers, and characteristics – is an underlying concept for many of the other themes explored at the meeting. The process of assimilating innovations into communication practices depends upon our ability to characterize and to understand their sources, trajectories, and potential benefits. Roger's *Diffusion of Innovations*²⁵ speaks to the processes of adoption (and rejection). Moving beyond incubation necessitates an understanding of how to deploy innovations so they can be scaled for widespread adoption.

Assessing the potential of scaling innovations requires criteria for evaluation that allows the useful recognition of "failures." It is the nature of some experiments to fail. Acknowledging and sharing results from failures may help others avoid wasting time and resources.

Illustrative Challenges

Innovation is difficult to track and may not be recognized for some time after it occurs. Even useful innovations aren't necessarily recognized and used by those who stand to benefit from them. Adoption of new communications approaches is varying widely within disciplines and even within sub-disciplines. Scholars want the fastest possible access to new approaches and technologies, but don't want to waste time on things that don't work. Publishers are often uncomfortable with taking the risks inevitably associated with innovation. Libraries attempt to deal with the full range of domain change in scholarly communication and struggle to act as change agents to accelerate the spread of useful developments.

Librarians may not be asking questions or listening to their faculty in ways that can elicit how innovation occurs and how it can be encouraged through partnerships, new services, practices, business models, and support systems. Is it possible to determine whether traditional methods and practices inhibit innovation and creative intellectual insights? What new examination of our own services can inform our ability to foster innovation?

Research Possibilities

- Analyze the nature, pace, and drivers for innovation in scholarly communication systems by drawing from the extensive literature on innovation and cultural change.
- Case studies characterizing successful innovations from various perspectives, such as valuing and reward systems, research acceleration, and new avenues of research and inquiry.
- Studies surveying, documenting, and suggesting mechanisms to encourage or reward publishing in alternative channels, the creation of large datasets, scholarly software, and other new modes of scholarly activity.

²⁴ Leigh Estabrook, "The Book as the Gold Standard for Tenure and Promotion in the Humanistic Disciplines," (2003), http://www.cic.uiuc.edu/groups/CIC/archive/Report/ScholarlyCommunicationsSummitReport_Dec03.pdf. *CIC Report: Report of the CIC Summit on Scholarly Communication in the Humanities and Social Sciences* (Champaign, IL: Committee for Institutional Cooperation, 2004), http://www.cic.uiuc.edu/groups/CIC/archive/Report/ScholarlyCommSummitReport_Feb04.pdf.

²⁵ Rogers, E.M. *Diffusion of Innovations*. New York: The Free Press, originally published in 1962, 3rd Edition 1983

7) Preservation of Critical Materials

Enormous efforts are directed toward preservation, primarily and historically to traditional materials. Recent significant initiatives, including the National Digital Information Infrastructure and Preservation Program (NDIIPP) at the Library of Congress and its grantees, are addressing digital materials. The scholarly community has ongoing concern about the relationship between the preservation of materials – whether legacy, digitized, or born-digital – and the emerging systems of scholarly communication. It is unclear whether institutions are attempting, or able, to match preservation and archival methods with increasing demands, even though long-term stewardship is crucial to future access and use by scholars.

Preservation of digital material is a technological problem, but also an economic and political problem. Long-term preservation solutions depend on scalable economic, technical and organizational infrastructures, and public policy agendas and an intellectual property regime that accommodate preservation concerns. Despite efforts at many levels for preservation of digital materials, we are still seeking clear directions and responsibilities. For example, who takes responsibility for archiving the web, including selection, rights clearances, etc.? How can this effort be organized or coordinated among multiple actors?

Systematically preserving print collections presents another enormous cooperative effort. In the transition to digital formats, how do we determine the optimal treatment of print and other legacy content? What about audio and visual materials in multiple formats? One basic determination is the optimal number of copies of any tangible material that should be preserved.

Illustrative Challenges

Though conservation and preservation science as applied to paper is fairly well developed, new digital formats are served by inadequate science and experience. At the same time awareness of the value of other kinds of legacy forms require new investments in preservation science to address, for instance, various audio-visual media as well as older digital carriers like CDs, floppy disks, and hard disks.

An urgent need is to learn more about the kinds of collaboration and economies of scale that are applicable to preserving the scholarly record in all of its formats. We need insight into how to parse the problem and produce complementary and comprehensive approaches across formats, disciplines, institutional capacities, and more. Determining the size of the problem and finding the resources is another challenge.

The question of preservation is deeply intertwined with issues of access. Will future access require us to document and preserve the research processes that produced the content, their provenance and underlying assumptions, in addition to machine readable and human readable forms of the content itself? How should the legacy scholarly record be made available digitally to scholars who need it? For an audience accustomed to digital information, how do we ensure that the full scholarly record remains available?

Research Possibilities

- Conduct meta analyses of large-scale preservation efforts to inventory the forms of collaboration in which libraries are involved, and the distribution of responsibilities, in order to characterize approaches, and analyze gaps in coverage or approach.

- Survey leaders in all sizes of academic libraries to assess a) where they believe responsibility resides for preservation of print materials and of born-digital content and b) what local actions or policies exist on preservation.
- Study the potential cost savings of reducing the acquisition, processing and shelving of print books and journals to reallocate funding to digital content creation and preservation. On a system-wide basis, suggest methods to determine how many copies of a particular book or tangible resource are needed and for what purposes.
- Propose and pilot new ways to assess enduring value and to preserve scholarly software, data sets, web sites, blogs, wikis, and other components of the scholarly record beyond traditional publications.

8) Public Policy and Legal Matters

Public policies and the legal environment have great power to inhibit or enable scholarship and its communication whether indirectly or intentionally. As works of research and scholarship move to formats where they can be shared, reused, reformatted, segmented, and repurposed in a variety of ways impossible with print works, a host of policy questions arise. Many of the themes discussed previously, such as preservation and organizational models, present public policy issues.

Copyright policy has many points of intersection with changing systems of scholarly communication. As new modes develop, questions of how to manage ownership emerge. As new kinds of joint authorship arise, how is authorship and the ability to control the use and dissemination of works managed? Who actually owns the copyright to works such as postings in blogs, etc.? Other kinds of compound and hybrid works raise similar issues.

Copyright policy also affects the uses that can be made of works of research and scholarship, whether these are publications or less formal communication mechanisms. Rights to make particular uses of works may be poorly defined when copyright ownership is ambiguous. Attempts to map old definitions into new situations may significantly inhibit the opportunities that new communication modes offer to speed and enhance research and scholarship. Fair use exemptions in copyright law permit a wide range of uses of works without permission of copyright holders and underpin many uses of works for teaching, and a host of traditional practices such as quotation, citation, criticism, and parody. Our current environment may be undermining the intent of fair use provisions as works of research and scholarship shift from print to digital formats, for instance, when payments are made for permissions when it is unnecessary to do so or if authors refrain from making use of works when they are unable to ascertain who, if anyone, exercises copyright control over them (e.g. orphan works).

Federal policies are also being considered or enacted that intend to increase access to the results of scholarship and research, including a "public access" mandate under consideration for the NIH (and other federal funders via the 2006 Federal Research Public Access Act) in the U.S., or in place for the research councils in the U.K. and elsewhere. Rhetorically, both proponents and opponents support advancing knowledge through efficient and well-structured scholarly communication systems. But there are significant differences of opinion and resulting tensions from policy and legal intervention. Meanwhile, libraries are challenged to participate in crafting and debating new policies, informed by an only modest amount of modeling and evidence of their impact.

Policy environments also enable or constrain innovation differentially, so that private universities, public universities and commercial enterprises have advantages and disadvantages relative to each other. This differential may be mined creatively, such as in the Google Books Library Project, but may dampen innovation and collaboration at other times.

Illustrative Challenges

With regard to copyright, we need to understand better the ways in which universities could maximize fair use to repurpose materials for distance education, K-12 teaching, public service and outreach, other research uses, accessibility for special populations, teaching and learning outside of formal educational venues, and the like.

Protecting fair use, especially as collections shift from print to digital formats, and for which there are fewer guidelines and guiding case law, is an enormous challenge. Rights boundaries and ownership affect the informal and new forms of communication such as blogs, gray literature, and commentary. The need is increasing for informed investments in copyright expertise, risk assessment, and reduction plans. Will, for example, proposed orphan work legislation requiring “reasonable effort” to identify and try to contact the rights-holder for these works help libraries or require additional workload and resources?

Libraries may not have the requisite experience and expertise in assembling copyright services to assist authors to incorporate others’ material in their own creative work and to help authors manage their own copyrights. They need to understand the legal boundaries and the potential for influencing local policy in order to leverage copyright as a tool to enhance the dissemination and impact of scholarship.

With regard to public policy, universities and their libraries need to gauge their commitments to scholarly communication policy interventions and to make investment decisions about their advocacy efforts. This is necessary, for example, to differentiate the goal of “open access” from the policy compromises that may appropriately first enable “enhanced” or “sustainable” access.

As for the differential effects of policy, government funded research and academic institutions employ human subject constraints to protect participants in experiments, clinical trials, and other research activities. While the oversight of Institutional Review Boards (IRBs) is mandated by law, each institution is responsible for setting up their own policies and procedures. As a result, the IRBs operate locally and autonomously, so that conducting research across multiple institutions is difficult if not impossible. Consequently, commercial entities, such as search engines and Internet service providers, have much richer data about use of the Internet and other facets of the cyberinfrastructure than do universities.

As noted in the previous theme, public policy developments will play a key role in addressing preservation challenges. In the short term many rights questions complicate or even inhibit preservation efforts, and the development of long term preservation solutions are dependent on the evolution of the public policy agenda.

Research Possibilities

- Determine new investments in copyright expertise and service that have been made by libraries and their institutions. Use information from a sample of institutions and extend projections for those who have not yet invested. Characterize the potential for deeper collaborations in copyright expertise and services.
- Quantify increased expenditures by libraries for individual permissions and expanded licenses to allow needed uses of content that may actually be covered by fair use. For instance case-by-case analyses of whether fair use would address specific needs, or cost-benefit analyses of the cumulative labor costs required to make these determinations compared to expanded licenses.

- Encourage local study of the cost and impact of complying with new policies, such as funders' "public access" mandates, and aggregate that information. Explore the potential for collaborations that provide community-wide compliance services.
- Mine the literature and records on university-industry partnerships, identifying cases where differential strengths or policy environments led to an innovation in library or scholarly publishing service.

Conclusion and Invitation

When reviewed collectively, these issues highlight the wide range of challenges and opportunities that invite an active response from the community. The themes presented here begin to frame a far reaching research agenda, but are open to discussion, expansion, review and action. Specific research possibilities can be refined, extended, or combined, and, ideally, prioritized and pursued through individual or collective effort.

Acknowledging the limitations of this singular brainstorming effort and the way it is reported here, we strongly encourage community efforts that:

- 1) Refine or expand the need for research, important issues and possible projects;
- 2) Identify additional articles and reports that collectively form a knowledge base from which the research agenda emerges more clearly;
- 3) Suggest ways to conduct the research;
- 4) Volunteer to participate or collaborate in a specific research initiative;
- 5) Propose additional avenues of distribution for this report;
- 6) Leverage this report in additional discussions of a research agenda to inform strategic planning and action for the evolution of scholarly communication.

Post your comments directly for public view at <http://www.acrl.ala.org/scresearchagenda>, or if you prefer your comments to be kept confidential, send them to ACRL Scholarly Communication Committee co-chairs John Ober at John.Ober@ucop.edu and Joyce Ogburn at joyce.ogburn@utah.edu.

Appendix A: Attendee List

The following individuals participated in the discussions and helped formulate the report's central themes. Statements in the report do not necessarily reflect the views or priorities of participant's home institutions.

Karla Hahn
Director
Office of Scholarly Communications
Association of Research Libraries

Charles Henry
President
Council on Library and Information Resources

Heather Joseph
Executive Director
Scholarly Publishing and Academic Resources
Coalition

Suzanne M. Lodato
Associate Program Officer
Scholarly Communications
The Andrew W. Mellon Foundation

Clifford A. Lynch
Executive Director
Coalition for Networked Information

Kara J. Malenfant
Scholarly Communications & Government
Relations Specialist
Association of College & Research Libraries

John Ober
ACRL Scholarly Communications Cmte Co-chair
Director
Office of Scholarly Communication
University of California

Joyce L. Ogburn
ACRL Scholarly Communications Cmte Co-chair
University Librarian
Director, J. Willard Marriott Library
University of Utah

Meredith M. Quinn
Strategic Services Project Manager
Ithaka

October Ivins
Ivins eContent Solutions
Meeting Consultant and Facilitator

Judy Luther
Informed Strategies
Meeting Consultant and Facilitator

Appendix B: ACRL Scholarly Communications Committee Roster 2007-2008

John Ober, Co-Chair
Director
Office of Scholarly Communication
University of California

Joyce L. Ogburn, Co-Chair
University Librarian
Director, J. Willard Marriott Library
University of Utah

Brent Allison, Member
Director, Social Sciences & Professional
Programs
University of Minnesota Libraries

Barbara Jo DeFelice, Member
Director, Digital Resources Program
Dartmouth College

Emily Anne Dill, Member
Assistant Librarian
Indiana University - Purdue University Columbus

Georgie Lynn Donovan, Member
Assistant Professor, Collection Development
Appalachian State University

Kimberly Douglas, Member
University Librarian
California Institute of Technology

Richard C. Fyffe, Member
Rosenthal Librarian of the College
Grinnell College

Douglas K. Lehman, Member
Director, Thomas Library
Wittenberg University

Lee C. Van Orsdel, Member
Dean of University Libraries
Grand Valley State University

William C. Welburn, Member
Associate Dean of the Graduate College
University of Illinois

Karen A. Williams, Member
Associate University Librarian for Academic
Programs
University of Minnesota Library

Kara J. Malenfant, Staff Liaison
Scholarly Communications & Government
Relations Specialist
Association of College & Research Libraries

Bibliography

The following items were cited in the body of the report and are listed here as a reference aid.

A Multi-Dimensional Framework for Academic Support: A Final Report. The libraries of the University of Minnesota. (2006). http://www.lib.umn.edu/about/mellon/UMN_Multi-dimensional_Framework_Final_Report.pdf

Bernan, F. and H. Brady. *Final Report on the NSF SBE-CISE Workshop on Cyberinfrastructure and the Social Sciences*. (2005). <http://vis.sdsc.edu/sbe/reports/SBE-CISE-FINAL.pdf>

Bradley, Jean-Claude. *Open Notebook Science Using Blogs and Wikis*. (June 2007). <http://precedings.nature.com/documents/39/version/1>

CIC Report: Report of the CIC Summit on Scholarly Communication in the Humanities and Social Sciences. Champaign, IL: Committee for Institutional Cooperation. (2004). http://www.cic.uiuc.edu/groups/CIC/archive/Report/ScholarlyCommSummitReport_Feb04.pdf

Cyberinfrastructure Vision for 21st Century Discovery. National Science Foundation Cyberinfrastructure Council. (March 2007). <http://www.nsf.gov/pubs/2007/nsf0728/index.jsp>

Environmental Scan: Pattern Recognition. OCLC Membership Reports. (2003). <http://www.oclc.org/reports/escan/default.htm>

Estabrook, Leigh. *The Book as the Gold Standard for Tenure and Promotion in the Humanistic Disciplines*. (2003). http://www.cic.uiuc.edu/groups/CIC/archive/Report/ScholarlyCommunicationsSummitReport_Dec03.pdf

Faculty Attitudes and Behaviors Regarding Scholarly Communication: Survey Findings from the University Of California. University of California, Office of Scholarly Communication. (July 2007). <http://osc.universityofcalifornia.edu/responses/activities.html>

Foster, Nancy Fried and Susan Gibbons. "Understanding Faculty to Improve Content Recruitment for Institutional Repositories." *D-Lib Magazine*. (Jan. 2005). <http://www.dlib.org/dlib/january05/foster/01foster.html>

Goldenberg-Hart, Diane. *Libraries and Changing Research Practices: A Report of the ARL/CNI Forum on E-Research and Cyberinfrastructure*. CNI, ARL Bimonthly Report 237. (Dec. 2004). <http://www.arl.org/bm~doc/cyberinfra.pdf>

Harley, Diane., et al. *The Influence of Academic Values on Scholarly Publication and Communication Practices*. Center for Studies in Higher Education. (Sept. 2006). <http://cshe.berkeley.edu/publications/publications.php?id=232>

Houghton, John, Steele, Colin, Sheehan, and Peter. *Research communication costs in Australia: Emerging Opportunities and Benefits*, Centre for Strategic Economic Studies, Victoria University, Melbourne (Sept. 2006). <http://dspace.anu.edu.au/handle/1885/44485>

Ithaka (Schonfeld, Roger C. and Guthrie, Kevin M.) "The Changing Information Services Needs of Faculty." *Educause Review* 42, no. 4. (2007). <http://www.educause.edu/apps/er/erm07/erm0746.asp>

King, C. Judson, et al. *Scholarly Communication: Academic Values and Sustainable Models*. Center for Studies in Higher Education, University of California, Berkeley. (July 27, 2006).
http://cshe.berkeley.edu/publications/docs/scholarlycomm_report.pdf

King, C. Judson; Harley, Diane; Earl-Novell, Sarah et al. *Scholarly Communication: Academic Values and Sustainable Models*. Center for Studies in Higher Education, University of California, Berkeley, Paper CSHE 16.06 (2006). <http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1080&context=cshe>

Modern Language Association *Report on Evaluating Scholarship for Tenure and Promotion*. (Dec. 2006).
http://www.mla.org/tenure_promotion

Our Cultural Commonwealth: The Final Report of the American Council of Learned Societies Commission on Cyberinfrastructure for the Humanities and Social Sciences. (2006).
<http://www.acls.org/cyberinfrastructure/OurCulturalCommonwealth.pdf>

Revolutionizing Science and Engineering through Cyberinfrastructure. Report of the National Science Foundation Blue Ribbon Panel on Cyberinfrastructure. (2003).
http://www.communitytechnology.org/nsf_ci_report/

Rogers, E.M. *Diffusion of Innovations*. New York: The Free Press, originally published in 1962, 3rd Edition 1983.

Shepherd, Peter T, *Final Report on the Investigation into the Feasibility of Developing and Implementing Journal Usage Factors*, Sponsored by the United Kingdom Serials Group. (May 2007).
<http://www.uksg.org/usagefactors/final>

Veltrop, J. "Keeping the minutes of science", in *Proceedings of Electronic Libraries and Visual Information Research (ELVIRA) Conference*, Aslib, London, May 2-4, Aslib, organized by De Montfort University. (Eds), Milton Keynes. (1995).

Zalta, Edward. "The Stanford Encyclopedia of Philosophy: A University/Library Partnership in Support of Scholarly Communication and Open Access." *C&RL News* Vol. 67, No. 8.(Sept. 2006).
<http://www.acrl.org/ala/acrl/acrlpubs/crlnews/backissues2006/september06/stanfordencyclopedia.cfm>