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Section 3: Expert Opinion

FORCE11 gains momentum creating the future of research communications and e-scholarship



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Scientists, scholars, publishers, and librarians in many locations and disciplines are developing methods and tools to improve the process of creation, reviewing and/or editing of scholarly content, working on technologies and techniques to interpret, visualize, or connect (scientific) knowledge more effectively. They are formulating concepts, tools, standards, and techniques for sharing multimodal research data. These developments are currently taking place in disparate and disconnected domains, including Computational Linguistics, Bioinformatics, Information Science, the semantic web and data technologies in general, Social Sciences, and computer-human interface studies. It is apparent to publishers and scholars alike that the future holds radical and disruptive changes in both the nature and form of the transmission of scholarly reports. What has largely been missing, however, is a forum where these diverse groups can discuss how they are working to effect these changes, and develop a common platform to communicate, collaborate and co-develop new architectures, models, and modes of working; in short – to invent the future as a distributed collective.

FORCE11 is an international group representing scholars from various disciplines, librarians, archivists, publishers, and research funders, developing an understanding of the problems and potential surrounding scholarly communication by means of information technology. The activities of this group grew out of a series of workshops held in 2011, Beyond the PDF (held in January 2011 in San Diego) and the Dagstuhl Workshop for the Future of Research Communications, the outcomes of which were reflected in the research agenda presented in the FORCE11 Manifesto (1).

The FORCE11 Manifesto lays out the vision and motivation for FORCE11 along with a potential agenda for focusing activities of FORCE11. In this article, we will first summarize the key proposals from this paper and then discuss our current and future activities.

Key Proposals from the manifesto:

Define new publishable objects:

To date, online versions of 'scholarly outputs' have tended to replicate print forms, rather than exploit the additional functionalities afforded by the digital terrain. We believe that digital publishing of enhanced papers will enable more effective scholarly communication.

Our vision entails creating a new, enriched form of scholarly publication that enables the creation and management of relationships between knowledge, claims and data. In this vision, the journal article or research paper is rapidly being replaced as the standard unit of currency by which knowledge is exchanged: it becomes but one among many forms. In the most generic sense, the new form of knowledge exchange centers on the research object - a container for a number of related digital objects - for example a paper with associated datasets, workflows, software packages, etc., that are all the products of a research investigation and that together encapsulate some new understanding. Publishing of research objects is not necessarily publishing as we know it today, achieved by the same mechanisms as used for traditional scholarly articles. It consists of providing free and open access to the component parts of the research object, which may or may not have been individually reviewed by others either pre- or post-publication.

There is a temporal aspect to research and the scholarly lifecycle that also needs to be recorded, either within research objects or between research objects, and that should also be capable of being reproduced. This means the creation of a knowledge infrastructure that allows the sharing of computationally executable components, such as workflows, computer code and statistical calculations, as scientifically valid content components; and an infrastructure that allows these components to be made accessible, reviewed, referenced and attributed.

Collate innovative publishing tools:

Developing the tools to support these new modes, if undertaken from scratch, would be an immense undertaking. Thus, where possible, existing tools should be adapted and integrated within a newly opened and increasingly integrated infrastructure. This change is likely to occur gradually through a series of incremental steps, most of which will not be driven by the technology. Rather, the technology should respond to the recognized requirements of scientists for improved dissemination, reproducibility, recognition, etc. Efforts at archiving, retrieving and citing digital research objects in standardized ways should be closely linked with open data and open-source software publication approaches, and should converge on common standards and practices. Citations to datasets and other digital research objects within publications should be treated on a par with the current treatment of bibliographic citations. Citations to these in the text should be made with a standard reference mark (in-text reference pointer) and the full reference should be given in the reference list of the publication, using a resolvable globally unique identifier (URL, DOI, HDL). Additionally, a formal semantic representation of the metadata into semantic data standards such as OWL and RDF, describing these research objects, their provenance, their relationships to and citations of one another etc., would be very useful and is now achievable.

Treat data as a first-class object:

We have to develop best practices for depositing research datasets in repositories that enable linking to relevant documents, and that have high compliance levels driven by appropriate incentives, resources and policies. In addition, for scientific domains, the new forms of publication must facilitate reproducibility of results, which means, at least for in silico research, the ability to preserve and re-perform executable workflows or services. This will require the ability to re-construct the context in which these objects were executed, which may well contain or reference other executable objects as well as data objects that may evolve through time. In this way, the content of communications about research will follow the same evolutionary path that we have seen for general web content: a move from the static to the increasingly dynamic.

Collectively develop new business models:

Current business models for scholarly publication face significant disruption due to many factors: the growth in open access, the advent of alternative publication platforms that exploit new technologies for inexpensive communication and information exchange over the internet, a widening view of what constitutes a publishable research object (e.g. data, workflows), and the challenges of curating, linking and preserving the wider world of digital research objects. Furthermore, it is anticipated that the overall funds dedicated to scholarly communication may well become more restricted in future, at least on a per researcher basis. Both the major customers (research libraries) and brokers (currently, publishers) have an interest in being an active party in shaping the transition to new, sustainable business models, to ensure that the transition is a smooth one.

In a collaboration involving scholars, publishers, libraries, funding agencies, and academic institutions, we need to develop models that can enable this exciting future to develop, while offering sustainable forms of existence for the constituent parties, although perhaps not in their present states. To be financially viable, new communication modes will need to demonstrate tangible value to both producers and consumers. To be sustainable, the cost recovery streams will need to be aligned to perceived value. The changes we envisage pave the way for a revolution in the manner in which research is carried out and communicated, leading to significant improvements in scholarly productivity and quality, and enhanced transparency. In collaboratively reinventing science publishing, we hope to increase the public trust in and access to the value and outputs of science, and draw new participants into our endeavors; quite possibly the greatest challenge we face within Science as well as the Arts and Humanities.

Explore new metrics of impact:

To obtain the benefits that networked knowledge promises, we have to put in place reward systems that encourage scholars and researchers to participate and contribute. We need to acknowledge the fact that notions such as journal impact factor are mere surrogates for measuring the true impact of scholarship, and are increasingly irrelevant in a world of disaggregated knowledge units of vastly varying granularity (2). We need to derive new mechanisms that allow us more accurately to measure true contributions to the ongoing enterprise of augmenting the world's store of knowledge. Measuring impact is complex because it depends on context, on purpose, and on audience. It can have different effects for different individuals. Similarly, a communication can have different degrees and even polarities of effect. For example, a research paper might be simplified and published by newspapers to make headline news with great societal impact, but be roundly criticized or even ignored by academic colleagues. To address these issues, better mechanisms of measurement need to be put in place, that allow for different types of impact and influence. A multi-dimensional measurement instrument would be useful. It needs to be customizable for specific situations and individuals and it must be easy to use both for the individual academic and for the reviewer or decision-maker.

Current Work and Next Steps

This agenda is ambitious, but progress - at least on some fronts - has been rapid. In the spring of 2012, a one-year grant was awarded by the Alfred P. Sloan Foundation to the FORCE11 group, led by Phil Bourne of UCSD, to achieve three goals:

- Development of a web platform to allow virtual communication and tool building for accelerating change in science publishing and increasing the community that participates in this process;
- Stimulate collaboration on the creation of a series of exemplars to further explore the key points proposed in the FORCE11 Manifesto;
- Organize another workshop to bring together an ever-growing community of tool builders, scientists, publishers, librarians, funders, and other interested parties to discuss these matters.

Six months into this process, we are actively driving this agenda (lead by Executive Director Maryann Martone) and are pushing this agenda on all three fronts:

- What started as a simple website has now evolved into a distributed, Drupal-based collection of modules, containing blogs, access to a wide catalog of tools, websites and other resources, a calendar and set of links, and several other virtual community components.
- The next workshop, 'Beyond the PDF 2', is scheduled for March 18-20, 2013, in Amsterdam, The Netherlands (see <http://force11.org/beyondthepdf2> for more details). The goal is to make this a 'future-centric workshop' that allows active virtual participation through webinars, online demos, and real-time social media interactions.

- We are developing concepts for exemplars to showcase the wide variety that is currently ongoing inside and around FORCE11 themes.

From the time the Manifesto was produced to now, new tools have been developed and existing ones matured. Exciting new developments appear daily and we hope that many of these will be in evidence in the next Beyond the PDF conference. But we admit that replacing a system that is so intertwined with the evaluation and advancement of academia will not be easy or swift.

We wish to invite anyone interested to join us in this endeavor by signing up as members on <http://force11.org>, attending the workshop in Holland, either virtually or in person, or by starting a discussion and looking for partners to define new projects that address the issues we have identified or other related matters pertaining to the future of research communications and e-Scholarship. If we get this right, the potential is immense. We greatly look forward to hearing your comments and ideas, and welcome you to join us, by signing up as a member at <http://force11.org>, or contacting us directly.

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About the authors

Anita de Waard has a background in experimental physics, which she studied in Leiden and Moscow. She joined Elsevier as a physics publisher in 1988 and has been working as Disruptive Technology Director within the Labs division of Elsevier since 1997. Her work focuses on establishing active research collaborations with key academic institutes in Europe and the US and as such, she has co-organised the 'Beyond the PDF' and 'Force11' workshops and instigated Elsevier's Grand Challenge and the Executable Papers challenge. Her research interests include implementing standards and cross-disciplinary frameworks for sharing annotations and content. Next to that, she conducts research in collaboration with the University of Utrecht, pertaining to a discourse analysis on key rhetorical components in scientific text.

Maryann Martone received her BA from Wellesley College in biological psychology and her Ph. D. in neuroscience in 1990 from the University of California, San Diego, where she is currently a Professor in the Department of Neuroscience. She is the-principal investigator of the Neuroinformatics Framework project, a national project to establish a uniform resource description framework for neuroscience. Her recent work has focused on building ontologies for neuroscience for data integration. She just completed her tenure as the US scientific representative to the International Neuroinformatics Coordinating Facility (INCF), where she still heads to program on ontologies. Dr. Martone recently joined FORCE11, an organization dedicated to advancing scholarly communication and e-scholarship, as Executive Director. She serves as Co-Editor in Chief of Brain and Behavior, a new open access journal for brain-related research.

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