Book Review

World Wide Research: Reshaping the Sciences and Humanities. William H. Dutton & Paul W. Jeffreys [eds.]. Cambridge, MA; London: MIT Press, 2010.

The aim of this edited book is to convey the benefits, challenges, opportunities, and risks that enable 21st century science and the humanities to make discoveries that advance scientific knowledge in a new computational world. Its editors and the fifty-four other contributors of this thirty-nine chapter volume set out to help us understand the complex social (institutional) and technical environment of 'e-research', several decades ago labeled 'Big Science' and now known by various names such as 'e-science', 'e-infrastructure', 'cyberinfrastructure', 'grid computing', 'grid-enabled research', 'virtual research environment', 'collaboratories', and 'research-centered computational networks'. Its editors tell us that this volume is a "wide-angle lens snapshot of the evolution of e-research about a decade after this phenomenon first emerged" (p. 344), its emergence resulting from funding decisions by government research agency policy makers in the United Kingdom and United States between the latter part of the 1980s and early 21st century. The book is to "serve as a roadmap charted at a particular point in the progress of e-research, with signposts to likely future dynamics and issues" (p. 347).

This roadmap requires a variety of perspectives, and the sociological and the technological provide the foundations for this book. Its two editors Dutton and Jeffreys represent, respectively, the social scientist and the computer scientist-cum-technologist. Dutton focuses on the non-technological landscape framed as the social shaping of sociotechnical (eco)systems, which argues that consequences and outcomes cannot be predicted in advance. Jeffreys's interests lie principally in constructing the built computational environment that provides the infrastructure for progress in science. Their colleagues, whose thinking is mostly reflected in two or three page essays, are drawn from university, government, and industry and are long-time as well as novice participants in science and technology research and science policy in their home countries, largely the United Kingdom but also Canada, China, Europe, Latin America and the United States. No matter their national origin, however, their assessment of e-research reflects a commitment to the Mertonian norms of 'open science'. This edited volume is a product of their collaborations with the University of Oxford Internet Institute and its e-research initiatives, including the e-Horizon and Oxford e-Social Science conferences in 2006 and 2008.

Dutton and Jeffreys introduce the reader to the advanced computational and network capabilities that lead to opportunities and risks to the e-research environment. Part I entitled "Foundations" sets the agenda for the volume. Chapter 1 "Reconfiguring Access in Research: Information, Expertise, and Experience" utilises the social shaping of technology perspective to describe the research environment (Dutton). Three short essays follow that describe the development of cyberinfrastructure (Bowker and colleagues), role of webometrics (Thelwall), and how the distribution of hyperlinks follows a 'power law' (Ackland). Chapter 2 "The Developing Conception of e-Research" describes the origins and growth of grid computing, explains the meaning of e-infrastructure and its social dimensions, and discusses the future of virtual collaborative organisations with a focus on the ease of use of complex technologies and services. Three short essays follow on the construction of a research platform (Hey and colleagues), the evolution in the scale and diversity of participation, content, collaboration, and infrastructure (de Roure), and how Internet technologies and the Web are altering the practices of firms and other organisations (Taylor).

Part II entitled "State of the Practice" devotes three chapters to resources, applications, and platforms in the e-research networked environment. Chapter 3 "Digital Resources and the Future of Libraries" examines the status of digital resources and institutional repositories from the perspective of social scientists (Meyer and colleagues). This chapter is followed by two essays on image repositories (Shotton) and ancient manuscripts (Bowman). Chapter 4 "Key Digital Technologies to Deal with Data" describes digital technologies to assist with the 'deluge' of data, also referred to throughout the book as 'data flood' (Wilks and den Besten). The chapter is followed by an essay on embedded networked sensing (Borgman), how digital objects are defined and managed (Fraser), and the value of the semantic web to researchers (O'Hara and colleagues). Chapter 5 "Embedding e-Research Applications: Designing for Usability" examines infrastructure and applications from the researcher's perspective (de la Flor and colleagues). Two following essays discuss system security vulnerability (Martin) and social networking applications (Thelwall).

Part III entitled "Social Shaping of Infrastructures and Practices" addresses various aspects of the implications of information and communication technologies for an e-social science research infrastructure. Chapter 6 "Enabling or Mediating the Social Sciences: The Opportunities and Risks of Bottom-up Innovation" defines 'e-social science', provides a brief description of the diffusion and sustainability of e-social science tools and applications; and discusses the implications of an e-research infrastructure with scenarios of optimism and pessimism and risk and opportunity. Implications include the routines and norms of social science research and its quality, creativity and excellence, and data collection of the subjects of research via virtual/distancing observation (Dutton and Meyer). The first essay briefly summarises the need to overcome technical and non-technical problems and barriers to conducting multidisciplinary social science research, such as the 'data deluge', multiple interfaces, and the need to return periodically to the data (Proctor). The second essay describes the status of Chinese e-social science (Zhu and Li). Chapter 7 "Institutional Infrastructures for Global Research Networks in the Public Sector" discusses the potential of the e-research infrastructure to connect scientists, tools and services to support all stages of the research process. It is here – 191 pages into the book – that the reader is provided with a history of the vision and conceptualisation of e-Science/cyberinfrastructure initiatives that took place in the United States, the realities and sources of challenges of the different institutional structures that influence the implementation of intra-institutional e-research, and a 'possible way-forward' for creating an institutional infrastructure for international collaboration to address the various problems identified as barriers to successful e-research (David and Spence). Two essays very briefly describe the lessons learned from an e-science collaborative project in medical imaging conducted in the United Kingdom (Piper and Vaver) and intellectual property issues of digital works authorship (Pila). Chapter 8 "The Politics of Privacy, Confidentiality, and Ethics: Opening Research Methods" offers a standard textbook description of the array of ethical issues that confront the conduct of quantitative and qualitative, virtual and non-virtual, and institutional and intra-institutional social science research (Dutton and Piper). Three short essays describe the ethical and moral dimensions of e-research (Parker), the legality of sharing genomic research (Kaye), and protecting confidentiality (minimizing the risk of disclosure) in global inter-institutional science (Lane).

Part IV entitled "Implications for Research" and its four chapters and four essays conclude the volume and are intended to "highlight significant areas where e-research can challenge and change many long-established policies and practices in the sciences and humanities" (p. 253). Chapter 9 "The Changing Disciplinary Landscapes of Research" considers the potential of an e-research infrastructure to alter the way that various disciplines define their central research problems and conduct their research, in terms of skill sets, tools, and existing institutional, disciplinary and specialisation boundaries (Fry and

Schroeder). The essay on agenda-setting of e-research restates the implications of e-research for research agendas, funding and resources, skill sets, and boundaries (Wouters). Chapter 10 "Reshaping Research Collaboration: The Case of Virtual Research Environments" (VRE) discusses the context and significance of virtual research environments, provides terms and definitions and a typology of collaboration, and summarises VRE research practices based on empirical research conducted by the authors (Carusi and Jirotka). This is followed by a short essay that summarises four key issue areas for future work on VREs: usability, adaptability, interoperability, and sharability (Dovey). Chapter 11 "Will e-Science Be Open Science?" discusses the importance of global collaboration to e-science, the norms of open science and its relationship to the practice of research, and evidence from and implications of research by the authors about 'e-science as open science' based on findings from a survey of e-research projects (David and colleagues). Two essays follow on the politics of open access (Cardozo and colleagues) and a description of the neurocommons as an example of an open access approach (Wilbanks and Abelson). Chapter 12 "Shaping Research in Developing Areas" concludes this section with a discussion about how the "new globalizing technologies" of information and communication technologies are in the process of influencing knowledge production, with one paragraph descriptions of developments in India, Kenya, Ghana, Philippines and Chile, followed by a summary of the results of the empirical research conducted by the authors (Ynalvez and colleagues).

The "Coda: The Ends and Means of World Wide Research" by the editors Dutton and Jeffreys restates discussions of earlier chapters and poses what the editors define as the two central questions about e-research: (i) whether new technologies and practices will lead to improvements in the quality of information and (ii) whether e-research will create an environment for researchers to be more creative and productive such that better quality information (new knowledge) leads to improvements in the quality of social life. They suggest that e-research is in its early stage of maturity and that the next "challenge" will be to "demonstrate improvements in research outcomes", that is, "research-centered network innovations foster true advances across research disciplines" (p. 346), including interdisciplinary collaborations, technologies, and services. Thus far, e-research is a promise; its reality remains for the future.

I had very much looked forward to reviewing this book. Dutton and Jeffreys and a number of the other contributors are well known to those of us who have been toiling in the science and technology fields and have been involved in e-science, some for several decades, and who are knowledgeable about the issues discussed here. There is, unfortunately, nothing new in this book. It does not meet its stated goal of stock-taking or persuade the reader that the millions and millions of pounds and dollars poured into e-research have led to much more than a large bill for taxpayers and a cornucopia of new toys for computer scientists. The title "world wide research" suggests contents that are not dominated by the extensive reporting of e-science activities in the United Kingdom found in this edited volume.

This book does not convince me that research practices have been transformed; it echoes a narrative about 'potential' that has historically been stated whenever new technology is introduced. It is unclear how this edited volume contributes new ideas, information, or knowledge to our understandings of how science progresses. There is little or no convincing evidence, only many assertions and prescriptions about how science is being transformed. The deluge of data ('data flood') and the high-speed networks referred to by many contributors do not yield transformation. Moreover, as I recall, the very same issues were discussed in the 1950s during the organisation of international oceanography research, during the 1960s by computer scientists, and during the 1980s through the early 1990s when my colleague Martin David and I created a 'collaboratory for the social sciences' with funding from the National Science Foundation.

A breathtaking number of active verbs to describe the future of e-research populates this edited text; and these verbs are often separated by 'or' and 'on the one hand, but on the other hand' to reflect the caution that accompanies prognostication and the difficulty if not impossibility of predicting the future, the gap if not chasm between the promise and the reality, and because outcomes are not a foregone conclusion. The new world of science: leads to, transforms, alters, constrains, impedes, enables (these are only a few of these verbs). For certain, however, the claim is made that e-research is conducted in a globalized world of highly connected, "digitally incentivised" (p. 72) and "empowered" (p. 73) scholars who conduct more productive, effective, and efficient scientific activity that is data-, information- and tool (computationally)-intensive, geographically distributed, interactive, cooperative and collaborative, and networked through large scale complex ubiquitous information, computational, and communication technologies.

The book would have benefited from better editing of its contents and organisation. Contents of many chapters and essays are redundant and replete with the same discourse and commentary, particularly those on the social shaping of technology. Many of the essays repeat what is written in a preceding chapter; and the same ideas can be found in subsequent chapters and essays. Redundancy is also found throughout the book in the references to works by the same scholars (e.g., Borgman's 2007 *Scholarship in the Digital Age*). Many essays in the first two sections of the book do not appear to be intellectually linked to their preceding chapter (see, for example, an essay on webmetrics that follows the chapter on social shaping). One would have expected a discussion of the history of the origins of science policy for world-wide cyberinfrastructure and e-science in the first chapter(s) of the book; yet we only learn about this history as it pertains to the United States and global science policy more than half-way through the book. And for the most part, a typical social science ahistorical description dominates the book. There is minimal information on work in the humanities. Definitions of relevant terms are relegated to a chapter more than half-way through the book (e.g., a definition of 'e-social science' appears on p. 167; a definition of 'e-research' appears half-way through the book). The two or three page essays that summarise research projects offer little value in the way of empirical evidence or insights into the projects that are described. The section on how social science research is carried out and various aspects of ethics, confidentiality, and intellectual property reads like a primer that we give our beginning students in research methods.

Overall, my sense is that the social shaping of technology perspective has outlived its usefulness as a way of thinking about the relationship between the social and the technical. We have countless case studies of ICT diffusion and adoption that demonstrate that technologies are not only socially shaped but in practice also highly intertwined with social relations and resources. The dominant 'unintended consequences account'— whereby outcomes are uncertain and (more than likely) uncontrollable, is the mantra of social informatics. We are now well aware that outcomes of the use of any particular ICT are not foretold by its properties; affordances and constraints built into technology may limit or enable a range of actions. (I do not deny that general tendencies guide outcomes of ICT use, such as the overall reinforcement of the distribution of power and resources.) Nonetheless, as many essays in this edited volume seem to suggest, our visions remain over-determined; our hopes and dreams are bound up in technology, and its authors appear to "award these new technologies for their transformative ability" (p. 3) and for contributing to our productivity, as Sturken and Thomas wrote in the introduction of the edited volume *Technological Visions*. Let me play the devil's advocate and be somewhat provocative: I want to suggest that we have reached a point—save for some perhaps intrepid souls—where few of us seem to be generating new ideas or conceptions of how to inform ourselves about new technologies. I want to suggest that each new study whose theoretical framework is founded on the philosophies of

technological determinism and constructivism and concepts of co-evolution, co-constitution, and mutual and social shaping does not seem to add—let me be bold and say any longer—theoretically or empirically to understandings or our knowledge base. Yes, the core concepts remain critically important, but I also think we need to move beyond the point where books devote an entire issue to gauging the effects of ICTs. And I think that an overabundance of single-case analyses has begun to limit our ability to develop a coherent knowledge base.

Please understand that my assessment reflects disappointment because my hopes were high given my esteem for the editors and authors. The book could easily have been half its length. Although there are a large number of chapters, the description of e-research is superficial largely due to the book's organisation. The book does not serve as a "sign-post". There are, nonetheless, valuable aspects that will serve the interested reader. Thelwall's essay is a nice introduction to webometrics. The Jeffreys and David and Spence chapters about the development of an e-infrastructure are helpful for understanding the development of science policy. Schroeder, whose contributions are several, offers, as always, valuable insights; the chapters for which he is co-author are worth reviewing. The many tables succinctly summarise issues and are good entrees to e-research and e-science. The book is most useful for its rich set of references to e-projects and e-science policy by authors who have thought deeply about the complex institutional and technical issues. And for someone who is much more familiar with e-science and cyberinfrastructure policy and research projects in the United States, references to these activities and a description of e-research projects in the United Kingdom and the few that have taken place in other parts of the world is a welcome reminder that we conduct science in a global, interconnected world.

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