



WP4 Edited Book Proposal (under discussion with MIT Press)

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February 2009

ResIST Deliverable #26

Prospectus: Emerging Technologies in an Unequal World

1. Brief Description:

This volume tracks five technologies as they were produced, marketed, and used in four developed and four developing countries. Did the technologies increase or decrease inequality, in business opportunity, jobs, benefits, or risks? Why and how? Did public policies make any difference in the outcomes? Could different policies lead to more equal outcomes? These are the questions at the core of our study of genetically modified maize, mobile phones, open source software, plant tissue culture, and recombinant insulin in Argentina, Canada, Costa Rica, Jamaica, Germany, Malta, Mozambique, and the United States.

Inequality within countries is increasing, in part because of dynamics between countries. Emerging technologies are a key place to examine those dynamics. They are new, science-based, and have potential broad impact. Because they are often expensive and require high levels of skill, they are particularly likely to increase inequalities. Our project developed a framework of issues for policymakers to take into account as they create the conditions for shaping and absorbing emerging technologies in their countries.

Data for the interlocking case studies were gathered by an international, interdisciplinary team, using interviews, documents, and secondary sources. We have analyzed the findings within technologies across countries and within countries across technologies, to produce a unique picture of distributional dynamics and a set of recommendations for related policies.

2. Outstanding Features:

List briefly what you consider to be the outstanding, distinctive or unique features of the work.

Important understudied topic. The connections among science, technology, and innovation (STI) policies and inequalities have received very little attention among policy scholars. Existing research is largely conceptual. This volume reports on the first large scale empirical study done in this emerging area of research. The European Commission

(through Project ResIST¹) and the U.S. National Science Foundation (as Project Resultar²) have both recognized the originality and importance of this research.

Comparative case studies. The study gains analytic power by being comparative in two dimensions, across technologies and across countries. Chapters in the book synthesize the findings in these two dimensions. The technology chapters tell descriptive, analytic stories, and the country chapters draw out the policy implications. Using case study methodology in the tradition of Yin, we are testing and modifying a theoretical model by comparing each case to it, to create greater generality. The diversity of cases is then a tool for developing a richer, more powerful understanding. We chose older examples from the traditional emerging technology areas in order to see how things worked out, in order to develop a framework for prospective use with newly-emerging technologies. In one chapter of the book, we apply the framework prospectively to a currently emerging technology, nanotechnology for solar energy.

Diverse set of technologies. Research on emerging technologies tends to study just one technology at a time, often within just one country. This project compared two technologies from the information and communication technology family, two from agricultural biotechnology, and one from health biotechnology. We also included some technologies that were developed in a proprietary mode by a few companies (GM maize and recombinant insulin) and some that were more publicly accessible (open source software and plant tissue culture), two approaches that are expected to have different distributional consequences.

Diverse set of countries. Likewise, the wide spread of countries in the study, from small to large, poor to rich, helped us see the role of national conditions in shaping distributional outcomes. The policy options used in different countries turned out to be surprisingly similar, but conditions like poverty, infrastructure, and educational levels created very different outcomes in the different national contexts.

New concepts. The existing dominant model for the process we have studied is technology diffusion – new technologies are thought to be developed in affluent contexts, taken up by high end users, and eventually diffused to mass markets as the price drops. We find that this model applies only within affluent markets and even in those settings is significantly affected by policy choices. When we view the pattern on a global basis, each technology has a distributional boundary drawn by education, skill, and infrastructure conditions. Together, these create a technological transition point, equivalent to the epidemiological transition in public health. If policymakers in developing countries want the benefits of a new technology for citizens in their countries, or if policymakers in developed countries want all their citizens to benefit, they need to focus on developing technology-specific absorptive capacities beyond the technological transition.

¹ <http://www.resist-research.net/home.aspx>.

² <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0726919>

3. Competition:

Consider the existing books in this field and discuss their strengths and weaknesses, individually and specifically. This material is written for reviewers and not for publication, so please be as frank as possible. You should describe how your book will be similar to, as well as different from, the competition in style, topical coverage and depth. If significant books are now available, you should explain why you choose to write another book in this area. Please mention all pertinent titles, even if they compete only with a part of your book.

We have searched for related titles. One set of books focuses entirely on information technology or biotechnology (usually either health or agricultural) and seldom with international examples. None of these attempts to develop a general model of technology production and absorption taking national differences into account, nor do they take into consideration the full set of distributional consequences we consider. They are often critical in approach, rather than offering constructive options for different outcomes, as our study does.

Another set of books takes a mainstream economic view focused on technological change and income inequality. Our study considers a much larger set of dynamics and inequalities and is aimed at a broader audience within the social sciences as well as in the world of policy.

Examples in the first group are:

Wyatt, S., F. Henwood, et al. (2000). Technology and In/Equality: Questioning the Information Society. London, Routledge. This is a collection of essays providing a critique of the information society. Ours is broader in technologies, and in particular much more tightly integrated into a common conceptual framework.

Drori, Gili S. Global E-litism: Digital Technology, Social Inequality, and Transnationalism. Macmillan, 2005. This is a more sociological approach, but focusing entirely on the digital divide, or the issue of access to information technologies and its consequences for broader inequalities in power. There is of course quite a lot of literature on this topic. It intersects with two of our stories, mobile phones and open source software.

Barbara Herr Harthorn, Laury Oaks. Risk, culture, and health inequality: shifting perceptions of danger and blame. Greenwood Publishing Group, 2003. Edited volume focusing on concepts of risk, with coverage of health inequities in several countries. Biotechnology and inequality are incidental.

Examples in the second group are:

Saint-Paul, Gilles. Innovation and Inequality: How Does Technical Progress Affect Workers? Princeton University Press, 2008. This is a mainstream economic treatment of income inequality as it relates to the labor market when a new technology is introduced. This book fits well into the large economic literature on the impact of new technology on employment that goes back to David Ricardo. It is relevant to our story in that we consider the impact of emerging technologies on employment, but we take a much broader view, which also encompasses business opportunities, benefits, and costs.

Greenwood, Jeremy. The Third Industrial Revolution: Technology, Productivity, and Income Inequality. American Enterprise Institute, 1997. This book focuses only on income inequalities over long periods of time and in terms of what might be called general purpose technologies.

There is a new emerging literature that focuses on global value chains and inequality. One example of this literature is:

Raphael Kaplinsky. Globalization, Poverty and Inequality: Between a Rock and a Hard Place. Polity, 2005. This book presents a critical view of globalization and global value chains. Unlike our book, it is predominantly abstract and does not contain concrete examples of technology and inequality.

4. Apparatus:

1. *Will the book include examples, cases, questions, problems, glossaries, bibliography, references, appendices, etc.?*

The book is based on examples and cases, but these are not treated as separate from the main text.

2. *Do you plan to provide supplementary material (solutions, answers, workbook, laboratory manual or other material) to accompany the book?*

No.

5. Audience:

For whom is the book intended (the lay public, professionals, students, etc.)?

The book is intended for scholars in STI policy studies and the economics of innovation; for agency and legislative staff working on STI policy issues; and for graduate students or upper level undergraduates.

In what discipline or disciplines?

The primary disciplinary audiences are STI policy studies, economics of innovation, and STS (science and technology studies). However, it could be used in social responsibility courses or training modules in engineering or science curricula at graduate or upper undergraduate levels.

The book is cross-disciplinary in two senses. It crosses various social and physical sciences in that the focus of the book is on technology and inequality in the broadest sense of the term. But it also crosses between what might be called the social studies approach to science and technology and the more policy, management and economic studies approach. The editors of the book also come from different disciplines.

1. *Is it primarily descriptive or quantitative, elementary or rigorous, etc.?*

The material is primarily qualitative description and analysis.

2. *Prerequisites, if any (mathematical level, any applicable)?*

None. We will explain the concepts and models we use in the introduction, in order to make the results accessible to people from a wide range of backgrounds.

6. Market Considerations:

What kind of person will buy the book, and why? What new information will the book give them to justify its cost? What is your estimate of the total market for the book?

Scholars and graduate students are the target audience for this book. Since it is the first full-length empirical study, it will define the terms of the discourse in this area.

If you are aware of professional organizations or mailing lists which would be useful in promoting the book, please mention them.

Globelics, PRIME, DIME, Cozzens's Scitechpol list (about 1400 emails), Society for Social Studies of Science, AAAS Section X, AAAS S&T Policy Forum list, Schumpeter Society, DRUID, S&T-related section of American Economic, Political Science, Sociological, and Anthropological Associations, S&T section of the Association for Public Policy and Management.

7. Status of the Book:

1. *What portion of the material is now complete?*

The introduction and four of five technology chapters are in second drafts. Seven of eight country essays are in draft form and one in partial draft. Conclusion, mobile phones, and nano chapters are in outline.

2. *When do you expect to have your manuscript completed?*

Summer, 2009

3. *What is the planned length of the book (double-spaced typed pages)?*

Approximately 100,000 words

4. *How many and what figures (drawings, half-tones, charts, etc.) do you plan to include?*

There are currently a number of tables in the draft, but not many figures, charts, or pictures. A few more of these would probably be helpful, so we might estimate 10-15 in the final version.

8. Reviewers:

We may use reviewers of our own choice, but we will also try to include some whose opinion you feel will be valuable. Can you suggest any? If the book has several distinct markets, try to recommend at least one reviewer for each.

Naturally, we do not reveal the names of our reviewers without their permission. If you desire, we will submit the material to the reviewers anonymously.

Rinie van Est, Rathenau Institute, The Netherlands [policy analyst]

Judith Sutz, Universidad de la Republica, Uruguay [academic innovation researcher]

Draft Table of Contents

[Final chapter titles will reflect the main story of each chapter.]

Introduction (Susan Cozzens and Mark Knell)

Technologies [The first five synthesize and analyze across countries.]

- Genetically Modified Maize (Sonia Gatchair with Isabel Bortagaray, Lisa Pace)
- Mobile Phones (Dhanaraj Thakur with Bernd Beckert, Isabel Bortagaray, Roland Brouwer and Lúdia Brito, and Tanya Sammut-Bonnici)
- Open Source Software (Dhanaraj Thakur with Bernd Beckert Isabel Bortagaray, Roland Brouwer, Mário Falcão and Lúdia Brito, Tanya Sammut-Bonnici)
- Plant Tissue Culture (Isabel Bortagaray with Lidia Brito, Roland Brouwer, Susan Cozzens, Mario Falcao, Sonia Gatchair)
- Recombinant Insulin (Sonia Gatchair with Isabel Bortagaray, Lidia Brito, Roland Brouwer, Sibylle Gaisser, Jim Ryan, Richard Zammit)
- Solar Nanotechnology (Walter Valdivia and Susan Cozzens) [This chapter applies the framework prospectively to an emerging technology in its early stages.]

Countries [synthesis and analysis across technologies, with policy implications]

- Argentina: Isabel Bortagaray
- Canada: Dhanaraj Thakur
- Costa Rica: Isabel Bortagaray
- Jamaica: Sonia Gatchair with Dhanaraj Thakur
- Germany: Bernd Beckert
- Malta: Noel Zarb-Adami
- Mozambique: Lidia Brito and Roland Brouwer
- United States: Susan Cozzens with Sonia Gatchair, Dhanaraj Thakur

Conclusions (Susan Cozzens and Mark Knell)