David J. Hess:
Alternative Pathways in Science and Industry: Activism, Innovation and the Environment in an Era of Globalization
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Humanity's impact on the natural environment is mediated by technology. Accordingly, environmental movements have a long history of advocating that we use technology in more sustainable ways. It is problematic to see the technology politics of environmental movements just in terms of aiming to stop the development and use of technologies - although this has of course been an important element, for example in the case of agricultural pesticides. There is also a history of environmental movements promoting and even developing technology; the organic food movement is a case in point. But, given the limited resources available to social movements, compared with mainstream players of industry and government, how big an impact have environmental movements had on technology development and use? David J. Hess, who is Professor of Science and Technology Studies at Rensselaer Polytechnic Institute, addresses this question and places it in the context of increasing economic and political globalization and contrasting localist social experiments like eco villages and the home power movement.

The fate of social movements and their impact on technology since approximately the 1960s is covered, focussing on the situation in the United States and spanning five areas: food and agriculture, energy, waste and manufacturing, infrastructure and, finally, finance. One of the strengths of this book is indeed the very large number of social movements studied covering a wide spectrum of activism, ranging from the anti-nuclear energy and anti-highway movements to recycling movements and local currency experiments. Hess provides an impressive overview of historical cases in many areas, drawing on existing literature where possible and complementing with his own research where necessary.

The book is firmly rooted in science studies as it seeks to conceptualise the relationship between, on the one hand, environmentalist and localist social movements and, on the other, the development of new and more sustainable technologies and social practices. Hess argues for a shift of attention away from how scientific knowledge is socially shaped to the selection of what problems are chosen for academic study. He describes the current situation in terms of a tension between increasing reliance on industry money, and epistemic modernisation opening up research to the scrutiny and influence of other actors, like publics and NGOs. He claims that an important barrier to environmental movements re-shaping technology is their limited influence on research agendas, and that much of the science relevant to environmental

movements is never undertaken – it remains 'undone science'.

On the other hand, there are also examples of academic researchers taking up social movement goals, as well as the establishment of counter-expertise outside the academic mainstream. This is part of what Hess terms 'alternative pathways'. These alternative pathways include the engagement with science and technology of social movement organisations. However, the author widens the scope to include also reform movements, alternative businesses and not-for-profit organisations.

Hess argues that it is not the company influence on academic research agendas that is the problem, but the universalisation of technology production and design through regulation and policy standards, leaving less room for alternatives. Politicisation of technology innovation is said to lead to conflicts in different settings including regulation and standards, consumption and research.

A problem with the book is that it tends to conflate science with technology and innovation. The strength of the book lies in its comparative insights about how technologies are promoted and blocked by social movements, the success or failure of such activism, and the transformations of the technologies in such political dynamics. However, the empirical part of the book has relatively little to say about environmental movements' engagement with research. The scientific foundations of the innovations studied are taken for granted rather than investigated. The thesis of 'undone science' as a barrier for alternative pathway success undoubtedly has merit, but is not well backed up by the evidence presented. More could have been done with the material if the author had drawn on the experience from the technology and innovation studies areas, which shows that the link between research and technology and innovation is often neither direct nor immediate. Alternatively, the empirics could have been more strongly focussed on the role – or absence – of research in technology development, and the environmental movements' roles in this nexus.

A distinction is made between industrial opposition movements (IOMs) seeking to stop the use and development of technologies, for example the anti-GMO foods movement, and technology- and product-oriented movements (TPMs) aiming at developing and promoting alternatives, for example the green building movement. Hess shows how IOMs have in general had limited success, and rarely managed to make an industry grind to a complete halt, but more often imposed some restrictions on the technology, as has happened in the cases of pesticides or industrial pollution.

TPMs have similarly have limited success. Alternative technologies and practices have often only reached limited niches – like most renewables – or when taken up on a bigger scale, they have been transformed into something less disruptive, more compatible with established mainstream options – for example when organic standards get diluted into various 'natural' or 'health' labels. Where alternative technologies are conceived and promoted together with alternative social practices, the social practices tend to get peeled off in the process of incorporation into the mainstream. Furthermore, a common response from the mainstream is to establish a multitude of options for consumers, ranging from substantial product modifications to little more than empty greenwashing, which tends to dilute the alternative.

Hess also writes about localisation as a strategy for sustainability, and includes a review of what can be called localisation movements. Examples from the food and agriculture area include farmers' markets and local food labels. Finally, access movements are those that seek to include the poor and give them access to resources, for example fuel banks or cooperative housing. The book also reviews these movements and their relationship with environmental and technological matters. Many of these movements are not heavily involved in environmental or technological affairs, but there are also cases like the community garden movement, which promotes alternative and often green gardening practices with a strong localist and access-oriented thrust.

The book shows how the initiatives of localist movement – when successful – tend to get consolidated and turn their attention to distant markets. Whilst not-for-profit status can act as protection against this, there is nevertheless a tendency towards professionalization and formalisation of operations in these cases. In the case of access organisations, the route to incorporation goes via de-politicisation and re-orientation from activism to service provision and even to charity.

The core strength of the book is how it manages to analyse the grey zone between activism and the mainstream. It offers a wealth of examples of how technologies and practices are re-shaped by environmental (broadly defined) movement activism. It also contributes to our analytical toolbox in understanding the processes involved, through for example a rich understanding of the processes of incorporation and transformation of alternative technologies, and the differences between and relationships among IOMs and TPMs.

The reader is usefully left wondering if the glass if half-full or half-empty. Should we celebrate the often partial successes of these social movements or mourn their compromises? Is their impact to date enough? It is clear that the author would have liked there to be more, but he is also a reformer hoping for gains in the longer term. He argues in favour of a 'civil-society society' where not-for-profit organisations organise a large part of production in society. A sober assessment of the social movement impacts is here mixed with an activist, utopian pathos. This is reading for both activists and academics, and especially for those combining the two and who want to do hitherto undone research.

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Wesley Shrum, Joel Genuth and Ivan Chompalov:
Structures of Scientific Collaboration
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While it is increasingly recognised among social scientists that collaborative dynamics are key to contemporary knowledge production processes, it is surprising how little is known about such collaborative activities. *Structures of Scientific Collaboration* aims to remedy this situation by providing the reader with a sociological analysis of the factors that underpin this phenomenon. Drawing on an array of (mainly US) cases of collaboration across a variety of disciplines in the physical sciences, and using both qualitative and quantitative analysis, Shrum, Genuth and Chompalov (SG&C) propose that scientific collaboration is structured by the dual roles of bureaucracy and technology. Put simply, SG&C theory argues that 'technology, broadly conceived, is the basis for collaboration' (p. 23) and that collaboration types can be characterised according to how different types of data-generating technologies are combined with levels of formalisation in the modes of organising access to that data. These claims are developed through a robust methodological design that combines detailed case-studies with extensive data categorisation approaches such as cluster analysis and which sets this book apart from the mainly qualitative tradition of science and technology studies.

If suggesting a key role for technology and 'technological practices' might not seem like big news for those familiar with Science and Technology Studies literature, the same cannot be said for SG&C's two main claims in this book: a) that collaboration types do not map easily into disciplinary boundaries and b) that within collaborations bureaucracy is a guarantor of autonomy. Both these rules have an exception, particle physics, and in a variety of ways this book is an attempt to understand why other forms of large scientific collaboration are not more like particle physics, where interdependent, trustful relations are supported by the low bureaucracy and fluid organisation that Knorr-Cetina (1999) described as a 'super-organism'. This question was first confronted by the authors themselves when, having started on a research project on particle physics in 1990s, they decided to expand their sample to collaborations in other physical sciences such as oceanography and medical physics (see p. 15). Their answers to the question directly relate to key analytical strategies followed by the authors.

SG&C argue that because particle physicists do not have the option not to collaborate, the opportunity costs associated with collaboration are insignificant. In other fields, there is always the possibility of doing something else instead: opportunity costs are higher and structures and procedures

are put in place to secure outcomes from individuals' investment of time and work in the collaboration. Secondly, SG&C argue that particle physicists' range of action outside of collaborations is so restricted that there is no need to formalise their interdependence. Other fields, where collaborations are bounded affairs, temporally as well as substantively, need to devise and deploy rules and hierarchies to control and stabilise collaborators' commitment. In fact, SG&C suggest that for all the mythology about particle physics' cooperative style of collaboration, bureaucracy is a good substitute for trust. Furthermore, SG&C show that when required by the 'technological imperative', particle physics has incorporated levels of hierarchy more commonly seen in other fields. This is particularly acute when the domain upon which the formalisation of collaboration is restricted. It is in this sense that SG&C can wonder "whether freedom is greater in a collaboration whose consensual governance extends to all aspects of creating knowledge, or greater in a collaboration whose teams operate with complete autonomy over a limited sphere" (p.213).

Anchoring both these answers appears to be a particular conception of the scientist as a rational calculative subject and an ideal of science as a free, rational activity. SG&C different positions in relation to these reveal an important analytical tension about the meaning of rationality in science that goes beyond this particular book. While viewing scientists as calculative subjects and their decision to collaborate as a 'choice' might be an illuminating strategy to understand their data, SG&C do not provide the reader with much evidence that scientists actually operate such calculations when entering collaborations. This reader in particular was left wondering if the initial level of bureaucratisation within projects could be equally linked to the levels of uncertainty about what it means to collaborate at the outset and across fields. That is to say that given the historical, contingent nature of these collaborations, scientists might not know what they are in for. Bureaucracy could be, in this alternative view, a compensatory institutional response to uncertainty about differing options, a possibility that would have enriched the model of collaboration formation presented in the book (pp.25-66).

In relation to the ideal of science as free exercise of rational enquiry, SG&C's book is, as the quote given above (p. 213) demonstrates, an attempt to complicate matters. From their perspective, bureaucracy is, in certain technological conditions, the right safeguard for scientific freedom. This collective, concerted effort to balance the objectives of 'projects' and the 'needs' of individuals sits, however, uncomfortably with the aggregative view of collaborations underpinned by the notion of opportunity costs and 'rational choice'. That SG&C do not attempt to solve this tension is less indicative of a weakness in the book than of a shared, deep view among sociologists of science that science 'works with' and beyond the individualistic preferences of scientists.

While the book speaks to such an important issue in the field of Science and Technology Studies, this does not make it, however, an easy read. In fact, if the book has one failing is that, at times, the authors do not use the text, graphs or tables to clarify the complexity or the models proposed. This will make it difficult for anyone not specifically interested in large, technologically-based scientific collaborations in late modern

societies to read to book from cover to cover. Nevertheless, the book and its models of collaboration formation, progress and success should become a key reference for those readers. Amongst those, there will be someone who might be interested in answering the question SG&C., due to data they had available, could not answer: why do some collaborations fail?

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Neil Pollock and Robin Williams:
Software and Organisations: The biography of the enterprise-wide system or how SAP conquered the world
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This book is perhaps the first to address long-term processes in the development, procurement, implementation and post-implementation support of organisational technologies such as Enterprise Resource Planning (ERP) systems or Commercial Off-The-Shelf (COTS) corporate information systems. In doing so, the authors convincingly propose a new analytical template, the Biography of Artefacts (BoA) framework, and align themselves with the so-called 'third wave' in Science and Technology Studies following Harry Collins and Robert Evans. The BoA framework constitutes the epitome of analytical advancements in the study of IT in organisations, over a period of more than 20 years by Edinburgh-based scholars.

The authors express their dissatisfaction with existing literature by arguing that the recent dominance of localist studies of Information Systems (IS) implementation resulted in overlooking broader factors and influences which have a significant effect on the long-term evolution of software packages. Their alternative framework extends the analytical scope both spatially and temporally to include more distant terrains of relations among actors and different stages in the biography of ERP systems. The BoA template allows authors to produce an evolutionary account of the development, procurement, implementation and maintenance of ERP systems at three different levels: a) the level of particular enterprise systems (the specific); b) a broader level of a class of artefacts (the generic); and c) the level of coupling of a technical field with a societal practice (the institutional). The BoA framework is theoretically based on the Social Shaping of Technology approach and its recent variants (social learning approach, theory of performativity) and is informed by insights from various disciplinary areas (cultural studies, sociology, organisation studies, social studies of IS, computer science). Guided by the temporal and spatial dimensions of the BoA framework, the authors propose a research design of 'variable geometry' by focusing on multiple implementation sites and on different stages in the biography of ERP systems.

The first three chapters of the book, excluding the introduction, are setting the scene. Chapter 1 discusses the empirical context and the development of the packaged software sector; Chapter 2 is a critique of existing disciplinary literatures; and Chapter 3 outlines the BoA framework. Chapters 4 to 8 present the empirical studies. Chapters 4 and 5 discuss the biographies of a particular innovation. In the following two chapters the focus is shifted towards procurement activities and the constitution of

the technical field through cases of how adopting organisations choose technologies and of the increasing role of intermediary organisations (i.e. Gartner group) in constituting the technical field. In the final empirical chapter, the authors discuss support work illustrating how maintenance of ERP systems has become an extended global activity with significant implications.

The different case studies can be read as stand-alone cases raising different concerns and shedding light to different aspects of the topic. Empirical findings, then, cover a broad area of issues in the biography of ERP systems. This makes it difficult to talk about a specific set of findings, apart from what can be understood as a set of epistemological/analytical/methodological suggestions constituting the BoA framework.

Although it draws on a variety of disciplinary areas and can be read by a diverse audience, including practitioners, this book is mainly a contribution to the field of STS and the Social Study of Information Systems. The authors advocate an epistemological shift in the field of social studies of IT in organisations to better match the shift taking place in the societal practices of developing, procuring, implementing and maintaining ERP systems. This connection of empirical and epistemological shifts is of more value to the broader interdisciplinary field of study as it offers an opportunity for self-reflection. More particularly, the authors identify a shift in the development and implementation of organisational technologies from 'we make' to 'we buy'. This has caused a growing importance of procurement activities and inter-organisational relations. However, when analysts focus on snap-shot studies of local implementations, their analytical scope is not adequate to capture such broader factors. The authors' overall message therefore clearly points to the fact that the world is changing and therefore we need to change the way we look at it by re-determining fields of research.

Although authors' critique of ethnographic studies of local implementation within particular organisations is quite convincing, their opposition to actor-network theory (ANT), is not consistent. The authors criticize mainly early versions of the ANT and not in a consistent manner. They present their critique through various dispersed comments throughout the book and while they are rejecting some founding principles of early ANT (i.e. empiricism), they are happy to take on others (i.e. on human socio-technical action). Additionally, although the discussion on institutions and institutional practices is central to their analysis, there is not an adequate reference or a critique to Institutional and Neo-Institutional theory (DiMaggio & Powell, 1983). One would expect, at least when they talk about 'generification' or the identification of a 'class of artefacts', that the authors would articulate their position in relation to Neo-Institutionalism.

Nonetheless, the BoA framework should not be understood as a theory but rather as a template for integrating various theoretical approaches and insights. It is an effective narrative mechanism that integrates and presents in an evolutionary way research results and issues, previously fragmented. This framework does not reject any theoretical perspectives rather it opposes to analytical, methodological and research design-related presumptions based on which empirical investigation on the topic has been conducted so far. Their

contribution lies in the temporal and spatial extension of the analytical scope through the employment of relevant analytical concepts (agora, arena, biography) and on a critical reflection on research design choices and theories on behalf of the analyst. Analysts are, thus, seen as important actors whose choices affect the outcomes of research.

Their openness to various theories and their reference to various disciplinary areas and concepts give the impression of a 'loose' or 'blended' theory which might confuse the reader. This projects the authors' inclusive and integrative analytical attitude but it also exposes them to the possibility of a broader criticism. Regarding research design, the authors encourage scholars to mobilize their 'viewpoints' (see Kaniadakis, 2006 on different viewpoints of actors and analysts) and strategically think and critically reflect on their choices within the alternative, integrative narrative structure offered by the BoA framework.

An important strength in their analysis is that they emphasise similarities between locales, cases and artefacts, drawing connecting lines between different technologies of the past (MRP, MRPII, ERP). They see such labels as different understandings of similar artefacts and establish the existence of what they call 'classes of artefacts'. By emphasising the similarities rather than the differences between artefacts and organisations, they manage to escape analytical blinders and restrictions by narrowly focused differences of local settings (both social and technological) and address the importance of the broader social fabric surrounding such phenomena. The establishment of classes of artefacts seems to be based particularly on the dominance of big actors, like SAP, who have the power and the resources to constantly re-define what a 'class of artefacts' means. The authors suggest an extension of this framework by studying other types of technologies. It is hard to imagine, however, how the BoA approach could be applied in the study of new emerging technologies with no previous history.

As a final remark, in the biographies that the authors refer to (of artefacts, of organisations, of the technical field) one could add the biographies and research careers of the authors themselves as well as of the research programmes in Science, Technology and Innovation Studies at Edinburgh. In this sense, the shift in practice and the shift in the analytical approach the authors suggest is something very personal and also express maturation of the research identities of the authors themselves as well as the approach they represent.

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