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## Opening—and Closing—of Knowledge Fields: New Technologies and Reconstructing of the ‘Social Capital’ within Science

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Scientific publication is at a crossroads. The avalanche of new technical possibilities for scientific communication leads to new ways of organizing our basic knowledge in all sciences. But the desire for knowing—*Wissenschaft*—has a longer history than the value of scientific publications at any current time. Knowing transcends the forms of communication.

We seem to be constantly involved in trying to communicate—in order to be understood, or appreciated, or just for the sake of playing artificial games like ‘publish-or-perish’. The speed and accessibility of the internet gives all these activities a new and exaggerated form. It also sets new social access rules—the old rules become replaced by new ones. The issue of ‘open access’ is that of who sets up (and controls) that rule system in the scientific publication world that is radically altered by the new technologies.

Scientists as individual actors have little power in the re-organizing of the previous social system of social value construction within the scientific enterprise. It is an institutional game—the participation of the social institutions who use that value in their control over knowledge takes new forms. Any social system undergoes organizational transformation from one ‘steady state’ to another. In that transition process there may exist periods of relative disarray of the system; the previous organizational form no longer works, and the new one has not yet become established. This temporary de-differentiation of the social organization is a transitory phase.<sup>1</sup> All ‘freedom’ in any social organization is defined by constraints on its borders, and flexibilities of changing them—in short, is an example of bounded indeterminacy (Valsiner, 1984). New technologies are catalysts for re-organization of the boundary system of scientific communication, and through it, social value creation.

In terms of how technological innovations bring scientific publication into a transition state between the ‘established’ and ‘not yet created’ organizational forms we may be participant observers of a naturalistic experiment in developmental sociology of science. It may be an opportune time to study the mechanisms of transformation of these social control mechanisms; seeing their action in the process of change may allow us a glimpse into how social processes in societies transform the roles of sciences in the increasingly mass-media dominated world. Hence the phenomena described in the reviewed collection of papers goes beyond a local issue of ‘paper or internet’ kinds of publication practices. What is being revealed is a major re-organization of the scientific enterprise as a whole, under challenges provided by dramatic changes in technology.

### **A Testimony of New Opportunities**

The Special Issue of *Historische Sozialforschung*—a German journal dedicated to the application of formal methods to history—is a powerful summary of how the social sciences are irreversibly moving toward the electronic medium of publication. The increased speed and worldwide distribution of the electronically published materials in contrast to ‘traditional’ (print) medium makes open exchange of ideas and research results flexibly available. Boundaries of countries disappear at the new speeds of the internet, librarians create virtual data bases and catalogues, and the users of all of our knowledge challenge their memories by remembering all the many passwords one needs for survival in our present world, as well as challenge their intellect as to

what combination of keywords is needed for the next search of the unimaginably large virtual universe.

Heike Andermann and Andreas Degkwitz (2004) provide a thorough overview of how electronic publishing transforms the structure of bringing knowledge from the researchers to the public sphere. In the traditional publishing model that is accompanied by rapidly increasing costs of journal prices—the costs of natural science journals have skyrocketed in the 1995–2001 period by 60% to 98% (p. 12), reaching in some cases prices in the magnitude of anything between US\$ 3,501 and \$17,444 (p. 12). No surprise, then, that the ‘open access’ movement in scientific publishing finds its supporters in the basic sciences. Clearly a 10K\$+ per year subscription price for *just one* (even if major) journal is prohibitively high in the European and North American academic contexts of ever shrinking library budgets—not to speak of universities in Africa or any other continent (Graf, 2004, p. 68). The authors show how the raising of journal prices coincides with corporational consolidation of the scientific publications market; small publishers are disappearing, and conglomerate giants are dividing the market into big—and hence manipulable—parts.

The new electronic publishing allows both the scientists and their readers to create an alternative to the traditional publishing. It is in effect a ‘desktop’ publishing option—that moves immediately to the internet distribution domain. Positive examples exist in different areas of science, ranging from physics (*New Journal of Physics*) to the social sciences (*FQS: Forum Qualitative Sozialforschung*). The ‘open access’ has led to coordination of journals of the kind, and also the development of new e-publishers. The new internet journals preserve carefully the peer review system while making it possible for extensive uses of peer commentaries.

The reality of various sub-cultures in science—‘hermeneutic’ and ‘empiricistic’, leads Stefan Gradmann in his contribution (2004) to outline how the new publishing technologies can (and do) differentially fit the needs of both. Klaus Graf (2004) shows how ‘open access’ is a solution to the contemporary crisis in scholarly communication. The handling of ‘permission barriers’ promises to revolutionize the construction of scientific knowledge. Gerhard Schneider (2004) looks at the socioeconomic process of freeing the scientific publishing system from its dependence on the profit motives of the commercial publishers.

It is interesting to look back into the history of scientific journals altogether. Winfried Schulze (2004) brings to our attention that specifically knowledge-accumulating and distributing journals came into being in

the 17th century (*Philosophical Transactions of the Royal Society* in Britain in 1665, *Acta eruditorum* in Germany in 1682). History seems to move in dialectical helical loops. If early journals were objectified means of correspondence between few learned scholars and subsequently became collections of communicative messages between authors and wide—mostly anonymous—readership, then the new technologies of our last decade make the ‘open access’ on the internet very similar to these early times of journals. Internet allows scholars to restore their direct communication and become engaged in continuing scholarly disputes. Mey (2004) shows how, in the case of book reviewing, the new technologies allow for many innovative ways of promoting exchange of ideas through reviewer–readers–author dialogues, many of which are being implemented in FQS. The assumption is that more interactive treatment of ideas is beneficial for their growth; an ideal way of functioning by researchers. However, the different barriers—of institutional access, or of fixity of traditional print media—have previously limited the achievement of such ideal.

From the publishers’ point of view, new technology provides new opportunities, as well as problems (Klostermann, 2004). Access to constantly changing and institutionally controlled internet addresses balances the speed of electronic access. Also, one might add, the defense systems against ‘spam’, or mere overload of messages (that recipients delete without reading) might render electronic access to the recipients by the communicators, a buffered system. In other terms, if some ‘barriers of access’ are eliminated by the new media, new ones—in a different location—emerge. In this case the ease of access to the required published source is enhanced for researchers worldwide (provided, of course, that they have electricity, computers, printers, and internet access) while the ease for the electronic publishers to catch the attention of the same researchers by the ever increasing flow of advertising materials becomes reduced. The recipients take control; not by way of not paying for uninteresting sources (as in the past), but by actively ignoring major portions of the free flow of new information. The freedom of access is paralleled by the freedom *not* to access! Only the locus of control of the access is shifted, from being denied by others (through subscription prices), to that of being denied by oneself (‘I m not interested in X’). Hence, the hopes of maximization of the use of available resources through ‘open access’ (e.g. Herb, 2004) has limits on the side of the users of such resources; the capacity of human beings in processing information does not grow together with the exponential growth of such information, but remains largely the same. We can read as much—or little—as before, only there is much more material available for reading.

Thus, granting 'open access' to information through technical devices and social removal of 'access limits' leads to the re-construction of such barriers within the individual oneself. There is no alternative—in order to use one's intellectual capacities to their best, the reader needs to move from *having* access to *using* the access. Researchers are increasingly developing strategies for not paying attention to uninteresting or currently unusable sources, and may block the access to the external sources that try to persuade them that something new is of interest. Thus, the socioeconomic result of the 'open access' to scientific knowledge would give way, not to more uses of that availability, but to new forms of elimination of the functional uses of the materials. Instead of not having funds to subscribe to all relevant journals the inaccessibility comes out of one's own mental processing capacity and its limitations. Here, of course, new technologies cannot help—and need not—since the issue at stake is not the number of articles read, but new ideas generated by reading and thinking.

### **A Basic Change in the Culture of Knowledge Construction**

Our new technologies allow researchers to advance to a new way of coordinating knowledge that breaks the habitual 'linear sequence' of dependence of knowledge on certification by peers and control by publishing institutions. The traditional linear sequence of the social roles involved in publishing (Andermann & Degkwitz, 2004, p. 8) has been as follows:

Author → Publisher → Reviewer → Publisher → Agency → University  
→ Reader

This linear sequence is broken in our times; it becomes non-linear, and can (in principle) eliminate all links in this chain between the author and the reader. The author enters into direct contact with the reader, albeit through the seemingly invisible total control by the web provider, rather than through the act of operation of a printing press in some location, chosen by the publisher.

The non-linearity of the communication chain from Author to Reader introduces a flux into the control sequence, except for the new centrality of the provider (Figure 1). The role of the reviewers is maintained—since they produce the consensus-based symbolic value of the messages—yet the other previously important gatekeepers of the linear

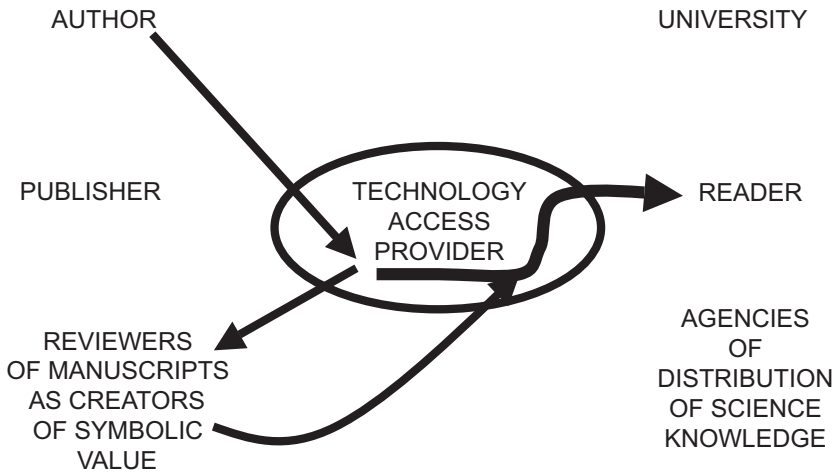


Figure 1. A non-linear model of scientific communication in the internet age

sequence model (publisher, agency, university) are functionally bypassed.

But what is likely to happen in the case of such social revolution in science: liberation from institutional canalization? As long as scientific communication has social value, the 'players' of the social-institutional 'game' of capturing scientific knowledge are likely to re-capture the 'liberated' author–reader interaction. The question 'who provides economic resources for the "open access" journals?' remains crucial here. Knowledge in our 'copyright age' is no longer a free-flowing of information, but is carefully watched, and appropriated (by patenting) by different social interest groups. The fight for 'open access' is a fight for takeover (from the publishers) of the central role in the control over the flow of the knowledge. Obvious (in Figure 1) is the new central role of the internet providers (and their subscription conditions), and makers of computer printers (assuming that most downloaded 'free access' articles end up printed on paper—locally, and at the cost of the recipients).

Furthermore, the institutions currently left to the side of the communication process such as publishers, distribution agencies, and universities, may move back into their roles by buying control over access routes. When that happens, all the original 'players' of the linear sequence will re-establish themselves in the internet world.<sup>2</sup> How that happens may not yet be fully clear in the developing system of technology-speeded scientific communication—we can see it after some time.

To summarize, new technologies lead to reorganization of power relations between various social institutions that participate in the transfer of knowledge from the authors to the readers. The technology access provider emerges as the central institution of social power that is perhaps similar to the power of the owners of printing machinery in the immediate post-Gutenberg era. Of course the 'movement of printed materials' from the printer to the reader was mediated by the social institution of the publisher.

Our present time has changed all this in a radical way. We are all becoming owners of printing presses, dependent upon our computer-linked printers (personal ones, or those of some office networks). Yet what we can print in our 'home presses' becomes fully dominated by what we can 'download' from the 'virtual world'—given that we have access to the technology access provider. The latter monopolizes the technological side of access, and is thus taking over from traditional publishers the key function of holding control over the messages in its hands. The current 'open access' debates need to be seen in the light of this transition of collective monopoly. What is 'opened' for scientists all over the world in terms of overcoming the financial barriers of access to subscription journals, is taken over by the monopolizing of technical access control to the 'open materials' by the providers of technological access. The latter of course have their own subscriber fees and access limitations to the domains under their control. 'Open access' is thus—in a wider sense—relocation of the location of the 'access boundaries' from their traditional places (publishers) to new ones (technology access providers). It is only a convenient illusion for scientists that by eliminating publishers' 'access boundaries' the access to scientific information becomes 'open'. Rather, it becomes 'closed' in ways that are socially controlled by new players in the commercialization of the newly created internet world. It is, in a sense, a process of 'closing of the openings' in unison with 'opening up closings'.

## **Promises and Safeguards**

Of course, the contributors to the Special Issue are careful to point out that 'open access' does not equal 'free access'. And without doubt, the 'open access' benefits scholarly communication all over the world. Yet these promises are currently a part of an advertising effort that builds on the euphoria of 'liberation' of the communication from its present 'holders' (publishers). As with any up and coming utopian belief system, 'open access' has its recognized and very elaborate missionaries.

Steven Harnad is undoubtedly the most prominent of those, given his decades of promoting 'open peer commentaries' in the *Behavioral and Brain Sciences*, followed by *Psychology*. His paper (Harnad, 2004) in the Special Issue covers all sides of the new media and 'open access', preemptively answering questions that are on the minds of many skeptical readers. After reading his paper the reader is left with the very comfortable feeling that the internet has liberated the scientific world from its vanities and returned it to the honorable state of the old *academe* where knowledgeable people dispute ideas, rather than fight for power.

Harnad, while trying to persuade the reader of the absolute (and low-cost) privileges in on-line preprint distribution and post-print archiving, emphasizes that the crucial aspect of scholarly publication—the peer review—remains as central to 'open access' publication as it was before. It is the uncompensated work of reviewers (Harnad, 2004, p. 102) that creates the 'scientific impact' of the journal<sup>3</sup>—a new form of social capital. Scientific publication operates on generating a specific kind of value, 'impact income', which differs from the immediate income that authors of artistic or literary creations earn from direct sales of their work.

### **'Open Access' and 'Earning Income': The Metaphor of 'Social Capital'**

The coverage of new ways of publishing in the Special Issue is not merely a testimony to technical innovations. It demonstrates the strain of the social system of science as an institution to preserve and reconstruct its social capital. Whether scientists like it or not, what they do is partly creation of knowledge, and partly negotiation of their social roles in their wider societies. Scientific publishing is a form of creating new social capital that is used in the negotiation of the livelihood of the scientists, their institutions, and their prestige in the given society. Some of it is dangerous to them: the 'open access' of the 'wider society' (or at least its leading part, that of Inquisition) led to the public burning of Giordano Bruno and many other heretics in philosophy and science.<sup>4</sup> The survivors were the ones who could negotiate their social value in their interaction with the Inquisition, and other similar power holders in their societies (Yurevich, 2002).

The metaphor of social capital may be illustrative, even if not explanatory (Portes, 1998), of the processes in the 'open access' publishing discussions in our times. Specifically,

Social capital is the sum of the resources, actual or virtual, that accrue to an individual or a group by possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition. (Bourdieu & Wacquant, 1992, p. 119)

In science, that metaphoric extension of the notion of capital to its social realm, the acts of social certification of scientific messages (based on peer review), the symbolic weighting of different publication outlets (e.g. the 'impact factor', or added value of journal articles in contrast with books or book chapters), the role of sheer numbers of publications (in socially certified sources), and the presentation of all of this in individual scientists' or research groups' *curricula vitae*, grant applications, or institutional reports—is what is at stake.

The special form of social capital—'scientific capital' (Bourdieu, 1997, pp. 29–30)—can be viewed to exist in two forms: 'pure' and 'institutional'. These forms are mutually intertwined and inseparable. For example, a paper published in a journal operates for its author, first of all, the 'institutional' form (one more 'publication item' in one's CV or annual report), while its role for the given science may be that of 'pure' form. The latter may further feed into proliferation of the 'institutional' form (e.g. many citations that increase the 'value' of the paper, and of its author, through some 'citation index'). Yet this 'institutional success' is not automatic; high results in citation indices are also evident in the cases of politically notable, controversial, and critical treatises that trigger some public (and published) outcries. Conversely, some papers reporting basic breakthroughs in an area may go unnoticed for years in their 'institutional form' of scientific capital, and may be 'discovered' when the institutional capital construction begins to make use of these.

The whole system of social capital generation crumbles under the impact of new technologies. Advances in technology coincide in time with the sociological tendency of appropriation of the academic world by the 'market dominance' of the corporate globalizing world (Kurasawa, 2002, p. 327). Sciences are not just merely an 'epistemic market' (Bourdieu, 1988; Rosa, 1994) but become a commodities market where working conditions of scientists, research teams, and even research institutes become exchanged on the basis of some currency equivalent. As with the value of all currencies it is an illusory process depending on the irrational 'trust' in one or another economic success parameter, such as number of publications, total values of obtained research grants, use of fashionable equipment (e.g. fMRI) for purposes of answering trivial-but-publishable questions.

Yet behind 'scientific capital' is its backing in real finances. The question of who pays for the 'open access' is answered clearly in the

letter to NIH by one of the internet publishers, under the general banner of campaigning for freedom of research information:

Since we publish research articles with open access and have done so for the last five years, we have come to conclude that there is a viable and feasible business model that ensures immediate open access, *based on article processing charges payable by or on behalf of the author*, as an integral part of the research process, instead of the traditional subscription charges to users and institutional libraries, which restrict access. (Velterop to Zerhouni, September 23, 2004, added emphasis)

Thus, 'freedom' is a keyword for new business interests—about to reach profitability. Putting the burden of publication costs (per page) on the authors (and their research grants or institutions) has been a practice in print-based journals (at least in natural sciences) already for some time. It is not surprising that it becomes the core of the business model of new internet publishers. Yet here is the rub—while the 'open access' initiative has been focusing on the accessibility of already published journals to audiences who cannot afford subscribing to them, how can one expect that representatives of some of these audiences, as authors, will be able to afford the per page costs required to publish his or her paper in a new internet journal? If the answer is no—the new developments in the scientific publishing world lead to a state of neo-colonialism at the source—what is being published comes from that part of the world that can afford to pay the publication costs, but is indeed free to all of the world, without any 'access boundaries'. Thus—opening up access may be equal to its closing—at the other end. Technology allows for many new forms of scientific communication, aside of many new forms of commercial profits from the collective acts of symbolic capital creation in the social institution of science.

### Notes

1. The whole history of the internet shows the move of business interests to take over a new technological device that was originally meant for free and open scholarly communication. Control of access to the internet (by providers) creates a new opportunity for centralized and absolute control over the 'world of accessibility' of individual users. Commercialization of the internet indicates its power as recognized by profit-oriented social institutions.
2. As an example of the role expected from publishers in the internet era: 'The only essential service still provided by journal publishers . . . is peer review itself' (Harnad, 2004, p. 81).
3. Harnad (2004, p. 102) subscribes to the formal estimation of the value added to journals: '. . . journal quality and prestige (and impact) depend on rejection rates. Trying to inflate revenue by lowering acceptance thresholds

simply lowers quality, thereby favoring the competition, with higher standards.' There can hardly be a more inadequate way of valuing the impact of a journal to the development of ideas in the given field. This criterion replaces intellectual future-oriented value of the ideas published in a given journal by measurement of outcomes of the submissions, and of the citations. *Culture & Psychology*, with its around 90% rejection rate and 36th place in ISI Journals Citation Report of 2003, should be proud of its high value due to the rejection rate. In fact, I consider it to be a weakness of the intellectual productivity of the field.

4. Possibly, that era could be characterized by another version of the 'publish and perish' game. If, in our time the 'not publish' orientation would lead to a metaphoric 'perish' outcome in the academic world, then in the middle ages the act of publishing (or publicizing) one's ideas led to the danger of literal perishing of the author.
5. The 'discovery' of the heritage of Jean Piaget in the 1960s, Lev Vygotsky in the 1970s, and Mikhail Bakhtin in the 1980s in the North-American social sciences is an example of how the 'institutional form' of the 'scientific capital' began to make use of basic ideas ('pure' form of 'scientific capital') that were of course known in America around the time of their first publications, but not turned into a means of public discourse of the social scientists.

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