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Open access to scientific knowledge and feudalism knowledge: Is there a connection?

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Abstract

The role of universities and transnational corporations in the circulation of scientific knowledge is considered. If institutions generate, mostly scientific knowledge, trying to facilitate its free circulation, then transnational companies, contrarily, try to remove most significant and cutting-edge scientific knowledge from free circulation and its commercialization and reintroduction into an open, but now commercial, circulation in the TRIPS. However, paradoxical, the open access movement to scientific knowledge, eventually, facilitates feudalism of knowledge. We call this phenomenon the 'open access – paradox'. Based on the experiments done with Google Scholar and Google Patents, it is shown that universities generates, mostly scientific knowledge (scientific articles), and transnational companies generates, mostly technological knowledge (patents).

Keywords

Open access; Feudalism knowledge; Universities; Transnational corporations; Google Scholar; Google Patents

Introduction

In this article we will consider the open access to scientific knowledge as another major neo-liberal project in a globalizing world. However, despite the excellent objectives set forth in this project, namely, to allow free and open access to research results, and thereby dramatically accelerate the circulation of scientific knowledge, in our opinion, the true, although veiled the aim of the open access movement, is the removal of the most significant and cutting-edge scientific knowledge from free circulation and its commercialization and reintroduction into a open, but now commercial, circulation in the TRIPS (trade-related aspects of intellectual property rights). The second – later – goal could not, of course, arise in the core of the world's institutes and transnational companies and the fact that the Open Society Institution stand behind this project; with the Budapest initiative to open access to scientific knowledge speaks volumes. In this article we will try to prove our hypothesis (Moskovkin, 2010).

Open access to scientific knowledge: strengths and weakness

It is obvious that the essence of open access to scientific knowledge was inherent to science from the beginning. Scientists have always tried to share their scientific results with others, without this we would not have advances in science (Pikas, 2006; Moskovkin, 2008a). The creation of the Internet 20 years ago fundamentally accelerated this process, but after a decade influential political and academic forces decided to introduce the spontaneous process of "Internetization" of research results in a controlled channeled direction. Strong initiatives (Budapest), declarations (Berlin), statements, and mandates were put in place, recommending or even requiring the open access to research results, primarily basic ones that were carried out thanks to public funds. Powerful networks were created, consisting of open access archives and online journals with their global registers, e.g., ROAR (Registry of Open Access Repositories), OpenDOAR (Open Directory of Open Access Repositories), DOAJ (Directory of Open Access Journals); institutional and inter-institutional policies were put in place for the majority of the participants in the open access process (scientists, research institutions and universities, publishers, and funding agencies) (Moskovkin, 2008b, 2010).

Now any interesting scientific paper published in not so famous and largely inaccessible journals instantly reaches its readers after self archiving in the open access electronic archive. It is also important to note that the open access movement emerged among scholars and librarians as a response to the inflation in prices of journal subscriptions from commercial publishers, i.e. a response to pressures on private capital and the strengthening of neo-liberal positions in the world. All the participants of the open access process receive its unconditional benefits: scientists increase the visibility of their publications, and, consequently, their citations; universities and research centers increase the demand for their research results and, consequently, their ratings; journals increase their impact factors; and countries as a whole improve their overall publishing activity and citations of the their scientist's work, and, consequently, the country's rating. However, in cases where there is a weak involvement in the open access process, a lagging gap is created between a said competitor and the competitors that are well integrated into this process. This leads to a powerful exfoliation in the scientific space (Moskovkin, 2010).

Despite the fact that all active members of the international movement for open access to scientific knowledge obtain benefits from it, on a global scale long term dividends, as well as those from all other processes of globalization (the free movement of goods, services, capital, labor, and intellectual property), go to a greater extent to developed countries and multinational companies. These countries have a higher capability through strong monitoring and analytics to "digest" all that has been developed by scientists in developing countries. Scientists from developing countries make an effort to publish results of their competitive research in English but most scientists and science managers are not native English speakers. Therefore, the most ambitious countries should establish monitoring and analysis centers to process the huge flow of scientific information provided by the open access movement in order to gain maximum benefit from it. Moreover, this flow will increase dramatically, evidenced by the fact that currently only 15% of the worldwide scientific output is presented in an open online access (Brody et al., 2007).

It should be noted that even now in an era of unprecedented internet development, when intellectual property can be sent to anywhere in the world with simple keystroke, knowledge, which is inseparable from its carrier, has played and will play a huge role, especially in the training of the next generation of scientists and skilled specialists. Therefore, developed countries will never abandon the search and recruitment of "brains" around the world, primarily within the least developed and post-socialist countries, where they are often not in demand and therefore cheap (Moskovkin, 2010).

Feudalism knowledge

In the context of this analysis, it is important to note that the production, distribution, and use of global scientific knowledge is controlled and regulated by institutions and corporations of developed countries (Dugger, 1989; Waller, 1987). For example, the Nobel Prize award in economics is under the control of "Wall Street" and the Bank of Sweden. The corporatization and privatization of knowledge is becoming a reality of the corporatized economy, in which there is a presence of corporate power instead of market competition (Dugger, 1989).

Any research that is done outside the so called "mainstream" is considered as marginal; its results are ignored and not referred to, and it is almost impossible to attract attention to them. The research results that promise benefits upon commercialization in the future are removed from the open scientific revolution. This is called "Knowledge encapsulation" (Kovriga, 2002; Waller, 1987), which also include research results that are conducted outside mainstream. Belonging to the mainstream means publication in journals that are included in the *Web of Science* and *Scopus*.

In each area of research it is important to understand which institutions control them, forming research fronts and cluster publications, which correspond to the "mainstream" agenda. Otherwise it is impossible to build a strategy for accessing them. By institutions we mean research centers and universities, scientific journals, editorial boards and other entities, as well as capital investors that stand behind them (foundations, corporations). For example, many biomedical research forefronts create multinational pharmaceutical, biotechnological, and genetic engineering companies that contribute to the hypertrophic growth of research, which are not all related to their social significance.

The same issues apply to the areas connected to nanotechnology and information and communication technologies, whose development is fueled by interests of big companies.

If the results of fundamental and applied research, that are published in scientific journals which freely circulate in the community, facilitate the open access movement, then in the realm of commercialized knowledge, "information" or "knowledge feudalism" dominate (Drahos & Braithwaite, 2002; Raj, 2009). In this regard, Indian researcher Abhishek Raj points out to the following:

1. A school in a village is unable to impart computer education as it cannot afford to license expensive Windows operating systems (Copyright)
2. Millions of people die out of hunger, while technology (patents) to enhance agricultural productivity is zealously protected;
3. Large companies have devised technology to make saline/muddy palatable but still poor people struggle to get pure drinking water;
4. In Africa people die of AIDS while low cost generic drug companies are being prevented from manufacturing life saving drugs patented by large multinationals;
5. Effective means of production are available, but small and medium-scale enterprises are deprived of using such patented processes and business methods (Raj, 2009).

According to Abhishek Raj, if everything in the world becomes patented, only the rich will enjoy its benefits. The question is where do you draw the line? (Raj, 2009).

The connection: open access and feudalism knowledge

The above analysis allows us to understand the relationship between open access to scientific knowledge and knowledge feudalism. This relationship is depicted in Figure 1 (layout). Thus, freely circulating socially significant knowledge, after its removal from the scientific circulation and commercialization, is reintroduced once again into open, but now commercial, circulation in the TRIPS, which strengthens the position of knowledge feudalism.

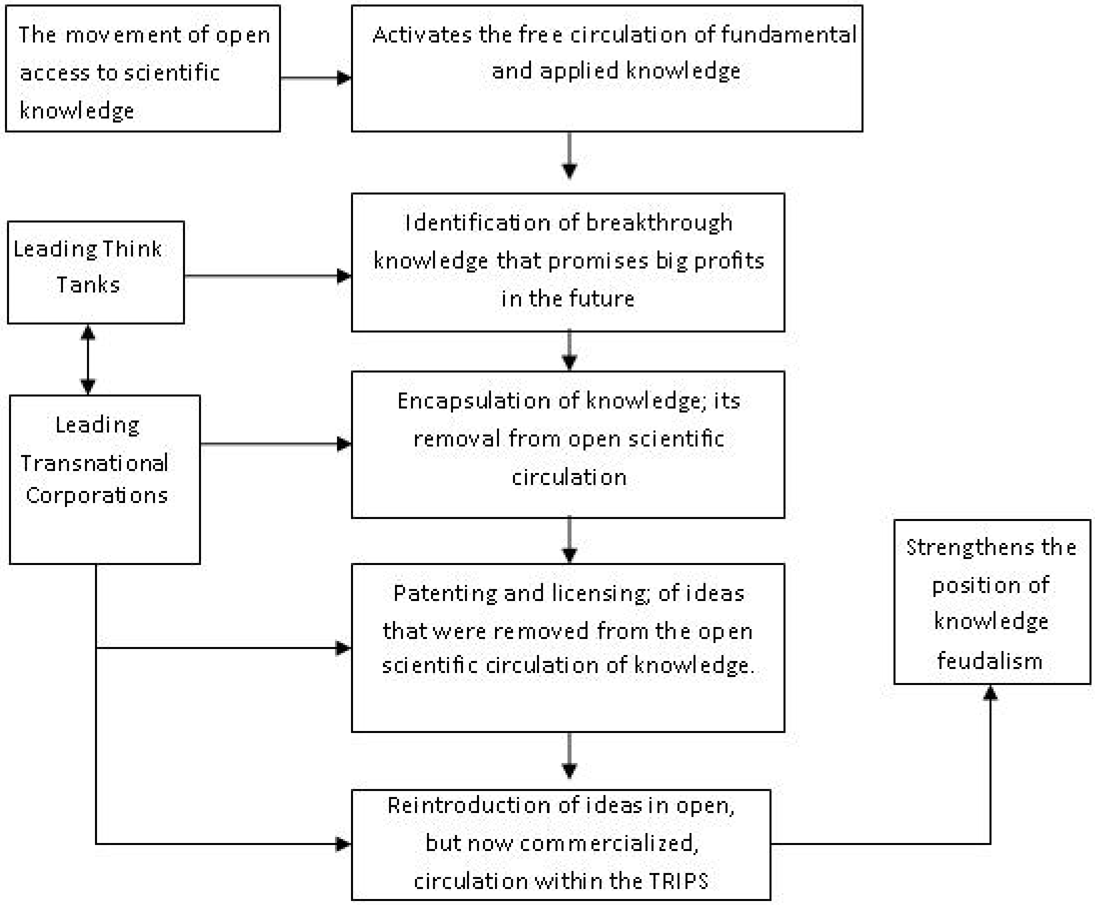

Figure 1. The connection between open access to scientific knowledge and knowledge feudalism (Moskovkin, 2010)

Global world has been placed in a situation where there is a constant race to invent more and more new products and processes to supersede existing patents with old ones, which increases the cost of end products. Unfortunately, this is treated as beneficial and innovative path to development. Thanks to this type of policy, many Americans can no longer afford to obtain their own medicine and are forced to go to Mexico in search for cheaper generic drugs. Australian scientists Peter Drahos and John Braithwaite, in their now classically acclaimed book "Information Feudalism", stated that the total cost of Brand name drugs in the U.S. tripled from 1990 to 2000, with 40.3 to 121.8 billion dollars (Drahos & Braithwaite, 2002).

Conclusions of our proposed layout (as shown below) consist of the following: Socially significant knowledge obtained through public funding at the expense of tax payers should remain even after it has been commercialized as a public good.

A huge role in this process should be played by autonomous university communities, who should not give businesses the majority right control over their inventions and henceforth monitor commercialization and distribution of their inventions. This can only be made possible under conditions where strong university networks are developed, since individually, universities in a globalizing world cannot generate finite competitive knowledge for the new technological wave. The university community should be no less powerful than commercial ones and transnational corporations; they should foresee promising and cutting edge technology that emerge from their own basic and applied research and build their own centers for scientific and technological forecasting. Again, this is possible only if strong university networks exist.

Google Scholar and Google Patents - Experiments

The possibility to use Google Scholar to evaluate publication activities and citations was first noted by Noruzi (2005), who noted that the Google Scholar provides a free alternative and complements to other Citation Index. Moskovkin (2009) proposed to use Google Scholar for estimating the publication activities of the world's leading universities. But Google Patents was not yet used to estimate patent activities of universities and other organizations. In order to show that scientific knowledge is generated, mainly, in universities and technological knowledge in Transnational Corporations (TC), we will take the largest universities in the world in various categories of the Taiwan rankings for 2010, and the largest TC in the different subject categories of Forbes for 2010. In addition to the Forbes categories, we will also include the two largest automobile companies. In calculating the university's publication activity, using Google Scholar, we have established a correspondence with its categories to the categories of the Taiwan ratings (Table 1), so that we can calculate the number of publications for each university in each subject category. In Table 1 Google Patents - feedbacks from the queried universities are shown.

Table 1. Google Scholar and Google Patents feedbacks for the world's leading universities in 2010, by subject category in the Taiwan rankings for 2010. (Timeframe of Experiment - 12 - 14 March 2011)

Subject Categories		Universities		Google Scholar feedbacks		Google Patent feedbacks
Taiwan ratings	**Google Scholar**	**Name**	**Location**	**Total**	**Subject category**	
Engineering	Engineering, Computer Science, Mathematics	Massachusetts Institute of technology	Cambridge Ma (US)	15300	5610	184
		University of California – Berkeley	Oakland CA (US)	15400	4230	370
		Tsinghua University	Beijing (CN)	15600	13800	121
		National University of Singapore	Singapore (SG)	9470	2430	5
Computer Sciences	Engineering, Computer Science, Mathematics	Massachusetts Institute of Technology	Cambridge Ma (US)	15300	5610	184
		Stanford University	Palo Alto, CA (US)	16700	7200	167
		University of California - Berkeley	Oakland CA (US)	15400	4230	370
		Harvard University	Cambridge, MA (US)	17900	3750	4
Material Science	Chemistry, Material Science	Massachusetts Institute of Technology	Cambridge MA (US)	15300	1820	184
		Tohoku University	Sendai-Shi (JP)	7960	1920	30

		National University of Singapore	Singapore (SG)	9470	1300	5
		University of California - Berkeley	Oakland CA (US)	15400	1460	370
Life Sciences	Biology, Life Sciences, Environmental Science; Medicine, Pharmacology, Veterinary Science	Harvard University	Cambridge, MA (US)	17900	6600	4
		Johns Hopkins University	Baltimore MD (US)	16200	9110	72
		University of California - San Francisco	San Francisco, CA (US)	10400	7330	0
		University of California - San Diego	San Diego CA (US)	11770	4850	0

Google Scholar and Google Patents - feedbacks from the queried TCs are shown in Tables 2 and 3. Google Scholar - feedbacks were determined by using advanced searches upon writing the full name of a university or TC with the exact phrase, with constraints on time (2010), and areas of knowledge.

Table 2. Google Scholar feedbacks for the world's leading companies in 2010, by sectors in the Forbes ratings for 2010. (Timeframe of Experiment - 23rd March 2011)

Sectors	Companies		Google Scholar - Feedbacks		
	Name	Location	Total	Chemistry[1], Engineering[2], Physics[3]	Biology[4], Medicine[5]
Technology hardware & Equipment	Hewlett Packard Co.	Houston, TX (US)	423	157	152
	Apple Corporation	Cupertino, CA (US)	51	15	7
Semiconductors	Samsung Electronics	Suwon - Si, (KR)	1420	1150	29
	Intel Corporation	Santa Clara, CA (US)	2190	1790	38
Software & Services	IBM Corporation	Armonk, NY (US)	981	618	47
	Microsoft Corporation	Redmond, WA (US)	3850	1360	1490
Telecommunication Services	AT&T Labs - Research	Florham Park, NJ (US)	423	388	6
	Telefonica Research	Madrid (Sp)	71	65	0
Drugs & Biotechnology	Pfizer Inc.	New York NY, (US)	3809	288	2801
	Johnson & Johnson	Montreal ,CA (US)	5460	373	3370
	Sanofi-Aventis	Frankfurt (DE)	6270	323	5110
	Novartis	Basel (CH)	1660	66	1440

	Pharmaceuticals				
	Novartis Pharma AG	Basel, Switzerland	794	118	633
Conglomerates	General Electric	Schenectady, NY (US)	8400	2040	3110
	Siemens AG	Zurich (CH) Munich (DE)	1680	801	555
Car Industry	Toyota Motor Corporation	Toyota (JP)	346	180	13
	General Motors	Detroit , MI (US)	5220	1250	90

Notes:

1. Chemistry, Material Science
2. Engineering, Computer Science, Mathematics
3. Physics, Astronomy, and Planetary Science
4. Biology, Life Sciences, Environmental Science
5. Medicine, Pharmacology, Veterinary science

Table 3. Google Patent feedbacks for the world's leading companies in 2010, by sectors in the Forbes ratings for 2010. (Timeframe of Experiment - 16th March, 2011)

Sectors	Companies		Google Patent feedbacks	Notes
	Name	Location		
Technology Hardware & Equipment	Hewlett Packard	Houston, TX (US)	1496	Calculated on a quarterly basis
	Apple	Cupertino, CA (US)	616	Calculated on a semi-annual basis
Semiconductors	Samsung Electronics	Suwon - Si, (KR)	4829	Calculated on a monthly basis
	Intel	Santa Clara, CA (US)	1645	Calculated on a quarterly basis
Software & Services	IBM	Armonk, NY (US)	4	
	Microsoft	Redmond, WA (US)	3188	Calculated on a monthly basis
Telecommunications Services	AT&T	New York, NY (US)	934	Calculated on a quarterly basis
	Telefonica	Madrid (Sp)	0	
Drugs & Biotechnology	Pfizer	New York NY, (US)	76	
	Johnson & Johnson	Montreal ,CA (US)	130	
	Sanofi - Aventis	Frankfurt (DE)	122	
	Novartis	Basel (CH)	259	
Conglomerates	General Electric	Schenectady, NY (US)	1230	Calculated on a quarterly basis
	Siemens	Zurich (CH)	1713	Calculated on a

		Munich (DE)		quarterly basis
Car Industry	Toyota	Toyota (JP)	1092	Calculated on a quarterly basis
	General Motors	Detroit , MI (US)	42	

We tested the names of the universities and TCs with the help of Google's advanced patent search, by writing the name of the university or TC in the "assignee" line, with restrictions on time (Jan. 2010 - Dec. 2010) for issued patents. It was necessary to calculate the number of patents on a quarterly or monthly basis, because Google Patent searches are limited to 500-600 relevant feedbacks.

It should be noted that when the exact name of a university is given, Google Scholar gives us feedbacks on scientific publications (sometimes "citations") of the given university; for TCs it does not. The name of a TC might appear in various publications that are not related to articles published by company specialists. Often we see records of TCs sponsoring article publications. Hence, when comparing Tables 2 and 3, we can arrive at a conclusion that TCs patenting activity is more than their actual publication activity. From Table 1, we can see that the publication activity of the world's leading universities is 2-3 orders greater than their patenting activity. In general, the patenting activity of leading TCs is 2-3 orders greater than the patenting activity of the world's leading universities, and the university's publication activity is 1-2 orders greater than the patenting activity of the leading TCs.

All the above mentioned, quantitatively confirms our hypothesis that scientific knowledge is generated, mainly, in universities and in technological knowledge in Transnational Corporations.

Conclusions

We can safely say that the open access movement greatly facilitates knowledge monitoring, analysis and control for global institutions and transnational corporations that stand behind it, and allows them to quickly indentify perspective sprouts of scientific knowledge, and use it to their advantage. Paradoxically, the open access movement emerged as an opposition to the neo-liberal aspirations of commercial publishers, but it has fallen under the control of the neo-liberal forces, and has become a tool to rake in even bigger profits. We call this phenomenon the 'open access – paradox'.

Now countries, universities, research centers and institutes, research teams and individual scientist are faced with a tough choice; to remain on the periphery of global scientific knowledge or try to enter the "mainstream" using the unique possibilities of open access (Moskovkin, 2010).

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