Technological Forecasting & Social Change 118 (2017) 307–323

Contents lists available at ScienceDirect

Technological Forecasting & Social Change

Futures of a distributed memory. A *global brain* wave measurement (1800–2000)

Steffen Roth [a,d,*], Carlton Clark [b], Nikolay Trofimov [c], Artur Mkrtichyan [d], Markus Heidingsfelder [e], Laura Appignanesi [f], Miguel Pérez-Valls [g], Jan Berkel [h], Jari Kaivo-oja [i]

[a] *La Rochelle Business School, France*
[b] *University of Wisconsin-La Crosse, USA*
[c] *Russian Academy of Science (ISS), Russia*
[d] *Yerevan State University, Armenia*
[e] *Habib University, Pakistan*
[f] *University of Macerata, Italy*
[g] *University of Alméria, Spain*
[h] *Independent, Costa Rica*
[i] *Turku School of Economics, Finland*

ARTICLE INFO

Article history:
Received 1 September 2016
Accepted 26 February 2017
Available online 20 March 2017

Keywords:
Global brain
Google Ngram Viewer
Culturomics
Secularization
Capitalism
Functional differentiation

ABSTRACT

If the *global brain* is a suitable model of the future information society, then one future of research in this global brain will be in its past, which is its distributed memory. In this paper, we draw on Francis Heylighen, Marta Lenartowicz, and Niklas Luhmann to show that future research in this global brain will have to reclaim classical theories of social differentiation in general and theories of functional differentiation in particular to develop higher resolution images of this brain's function and sub-functions. This claim is corroborated by a brain wave measurement of a considerable section of the global brain. We used the *Google Ngram Viewer*, an online graphing tool which charts annual counts of words or sentences as found in the largest available corpus of digitalized books, to analyse word frequency time-series plots of key concepts of social differentiation in the English as well as in the Spanish, French, German, Russian, and Italian sub-corpora between 1800 and 2000. The results of this *socioencephalography* suggest that the global brain's memory recalls distinct and not yet fully conscious biases to particular sub-functions, which are furthermore *not* in line with popular trend statements and self-descriptions of modern societies. We speculate that an increasingly intelligent global brain will start to critically reflect upon these biases and learn how to anticipate or even design its own desired futures.

1. Introduction

As researchers in technological and social change, we want to track and trace significant trends in past and future societies. One such trend is secularization, the declining importance of religion, which is so important to the self-concept of modern societies that the mere thought of a trend reversal brings back memories of the Middle Age. Another widely recognized trend is the growing influence or even dominance of the economy in our societies today. There is also discussion on further and sometimes competing trends, which include the prominent idea of an information society dominated by the mass media system. Yet another stable trend is that these and similar trends have been assumed and implied rather than studied so far, which constitutes a *third order risk* (Godet, 1986) whenever we extrapolate the trend truisms into the future, thus using the right tools to meet the wrong expectations. Most of us nonetheless rely on traditional trend knowledge, while only a few have called or tried for systematic large-scale tests (Blumler and Kavanagh, 1999; Kjaer, 2010; Roth, 2014; Roth et al., 2016), and our uncritical attitude to the facticity of some of the most significant trends in modern societies is justified to the extent that their examination presents a veritable challenge even in the plain middle of the presumed information age. The on-going proliferation of information and communication technology in general and the Internet in particular has indeed given hope that the analysis of social macro trends will be more feasible or at least more convenient, but has also shown that a network of IT-supported interactions presents more than a comprehensive search tool for big data. As much as any complex tool, the Internet is observed to have taken on a life of its own, which in the case of the World Wide Web encompasses an entire globe. Pioneers go as far as to state

* Corresponding author.
E-mail address: roths@esc-larochelle.fr (S. Roth).

http://dx.doi.org/10.1016/j.techfore.2017.02.031
0040-1625/

that this "single information processing system (…) plays the role of a nervous system for the planet earth", thus referring to the Internet as *global brain* (Heylighen and Lenartowicz, 2016, p. 1).

In this article, we use a considerable proportion of the Internet to review macro trend hypotheses such as the *secularization*, *economization*, *mediatization*, or *politicization* of society. We draw on the global brain paradigm, first, as a constant reminder that the Internet is not one of our usual research tools, and, second, to further develop the paradigm by contributing a method we refer to as *global brain wave measurement*. Somewhat similar to the pending *planetary electroencephalography* suggested by Russell (1982), our procedure will measure certain aspects of the electromagnetic activity of the global brain. Yet, the comparably short history of the Internet also suggests that a traditional real-time electroencephalography (EEG) will not be adequate to monitor long-term social macro trends. It is due to the *Google Books* initiative, which has generated "the largest online body of human knowledge"[1] in the form of a word corpus of >25 million digitalized books, that we see that the global brain has a memory older than the Internet itself, and that we still can access this virtually pre-conscious memory using the Internet in an unprecedented way. We hence used the Google Ngram Viewer, an online graphing tool that charts annual word counts as found in the Google Book corpus, to run comparative analyses of word frequency time-series plots for the *English*, *Spanish*, *Russian*, *French*, *German*, and *Italian language areas*. The outcomes of this procedure positively resemble classical EEG recordings and indicate that the attention the global brain devoted to religion, economy, politics, the mass media and further social systems featured substantial changes in time and significant regional differences. The results also suggest that a number of popular trend statements and definitions of modern society are completely divorced from the global brain's memories between 1800 and 2000.

2. Global brain waves: from electrophysiological to electrosociological brain wave measurement

In our research, we used a small Internet tool to observe a big Internet database. Or put briefly, we used the Internet to monitor the Internet. This situation is different from the case of a traditional electrophysiological brain wave measurement, where the research in brains is thought to be performed from a standpoint external to the examined brains. By contrast, our research was literally *in* the global brain throughout the entire process. Our only logical starting point hence was a thorough exploration of our own research environment.

One of the most up-to-date, compact, and still comprehensive accounts of this research environment has recently been published in *Technological Forecasting and Social Change*. In their editorial to the special issue devoted to the global brain, Heylighen and Lenartowicz (2016) introduce the concept as a realistic model of the information society. They define the global brain "as the self-organizing, adaptive network formed by all people on this planet together with the information and communication technologies that connect them into a coherent system". Their idea is clearly that ICT-mediated interactions have increased interpersonal dependences up to the point where we can observe the emergence of a single superorganism, "i.e. an organism (global society) consisting of organisms (individual people)", with the Internet playing the role of the nervous system for this planetary superorganism. Next to the rapidly intensifying interdependences, the authors also stress the constantly increasing information storage and processing capacities that go along with the present Internet revolution. The authors conclude that we shall soon live to see a qualitative leap in or to the evolution of an adaptive, globally *distributed intelligence* that has a life of its own.

Among the many compelling contributions to the corresponding special issue we found co-guest editor Marta Lenartowicz' (2016) single-authored article particularly instructive as it deviates from a number of classical assumptions in the global brain literature and even in her above co-authored introduction. In "Creatures of the semiosphere. A problematic third party in the 'humans plus technology' cognitive architecture of the future global superintelligence" she argues that neither human beings nor IT-supported networks of human beings, but rather social systems can be conceived as "the most advanced intelligence currently operating on Earth" (Lenartowicz, 2016). As she draws on the work of Niklas Luhmann (1995, 2012, 2013), she defines social systems as autopoietic systems of communication, the first emergence of which she traces back to the origins of spoken language tens of thousands of years ago. This approach is remarkable in two ways: first, she proposes to change the traditional human-technology focus prevailing in the global brain literature[2] for a technology-communication focus, which, to our mind, is more suitable for the observation of complex information and communication technology systems. This proposed observational shift from networks of humans to networks of communications[3] allows access to a so far under-researched macro region of the global brain. Second, her short and appropriate recourse to the history of communication and communication media suggests that distributed intelligence might be older than the global consciousness about it (Heylighen, 2011).

If we trace these two ideas back to their systems' theoretical origins, then we find indeed that the idea of a social global brain consisting of a network of communication and technology is as plausible as is the classical idea of a bio-technological global brain made of human organisms and technology. This is true particularly because a basic form of intelligence, memory, is inherent to all forms (Luhmann, 1997, p. 364), including all forms of communication (Luhmann and Rasch, 2002, p. 160). Communication as threefold selection of information, utterance, and understanding operates in time, which implies the management of the difference between past and future, the token of which is memory (Luhmann, 2012, p. 350); and systems of communication imply memory in order to link one communication to another. Memory is hence not an isolated subfunction of a social system, but rather involved in all of its operations, and Luhmann emphasizes that "these operations are communications, and thus not neurobiological changes in the state of the [biological] brain nor what enters the awareness of a single consciousness" (id, p. 349). The more complex the social system, the more complex its memory. We consequently can image highly complex forms of collective, distributed, or simply social memory that are made of communication and nothing but communication. The main function of all these forms of memory would be the same as with all forms of memory: *forgetting*. This only prima facie counter-intuitive take on the memory function is stringent insofar as the memorization of no matter what presents a necessarily selective operation which recalls only very little information, thus filtering out numerous alternatives.

Memory works as a filter located at the interface of the past and the future, and is therefore necessarily always in the present. As a filter, the

> function of memory relates to distinctions; or, more exactly, to indications of something as opposed to something else. The memory operates with what has been successfully indicated and tends to forget the other side of the distinction. Although it can also mark distinctions as forms, for instance, the distinction between good and

[1] Only the bold beauty of this fittingly anthropomorphical metaphor made us quote the *Wikipedia* article on "Google Books" as accessed on July 28, 2016.

[2] Theories that focus on human-technology linkages, or "humans-plus-technology," and theorize the global brain as a network connecting human beings are useful but still anthropocentric. Two important texts on network society are Harrison White's *Identity and Control: A Structural Theory of Social Action* (1992) and Manuel Castells' *The Rise of Networked Society* (1996). More recently, in *Networks of Outrage and Hope: Social Movements in the Internet Age*, Castells (2012) takes up the subject of networked social movements with reference to the Arab Spring and other movements. We are more interested in autonomous social systems than in networks of human beings.

[3] For an extensive case made for a similar turn in organization studies including instructive visualizations see also Lenartowicz (2016, p. 178) and Luhmann (2012).