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Article

Theoretical Foundations of the Web: Cognition, Communication, and Co-Operation. Towards an Understanding of Web 1.0, 2.0, 3.0

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Abstract: Currently, there is much talk of Web 2.0 and Social Software. A common understanding of these notions is not yet in existence. The question of what makes Social Software *social* has thus far also remained unacknowledged. In this paper we provide a theoretical understanding of these notions by outlining a model of the Web as a techno-social system that enhances human cognition towards communication and co-operation. According to this understanding, we identify three qualities of the Web, namely Web 1.0 as a Web of cognition, Web 2.0 as a Web of human communication, and Web 3.0 as a Web of co-operation. We use the terms Web 1.0, Web 2.0, Web 3.0 not in a technical sense, but for describing and characterizing the social dynamics and information processes that are part of the Internet.

Keywords: World Wide Web; social theory; cognition; communication; co-operation; Social Software; Web 1.0; Web 2.0; Web 3.0

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1. Introduction

Among the top 100 US Websites (in terms of estimated monthly unique visitors) we no longer only find traditional Websites that were established in the 1990s (such as yahoo.com, msn.com, ebay.com, Microsoft.com, aol.com, amazon.com), but also new Websites and platforms such as facebook.com (#3, 100M+ users), youtube.com (#5, 80M+ users), wikipedia.org (#7, 74M+ users), myspace.com (#12, 54M+ users), craigslist.org (#16, 50M+ users), blogspot.com (#14, 52M+ users), wordpress.com (#23, 31M+ users), flickr.com (#31, 21M+ users), blogger.com (#37, 19M+ users), metacafe.com (#67, 11M+ users), and monster.com (#33, 20M+ users) [47].

Such sites do not focus on information provision, but either combine several traditional Internet functions (information, data upload and sharing, email, discussion boards, multimedia, *etc*.) as in the case of social networking platforms or employ relative novel forms of information and communication such as in the case of wikis, blogging, and tagging. Terms such as "Web 2.0" and "Social Software" that should indicate that the Web has become strongly communicative, are used frequently for describing such platforms.

The notions of Social Software and Web 2.0 have thus far been vague; there is no common understanding in existence. The concepts seem to be centered on the notions of online communication, community-formation, and collaboration. In some definitions only one of these three elements is present, in others they are combined. So far it remains unclear what exactly is *novel* and what is *social* about it. What seems obvious is that Web 2.0 is not a technological novelty since the technological basis of these platforms and networks (such as Wikis, Ajax, *etc*.) have been developed years before terms such as Social Software and Web 2.0 have emerged. This view suggests that these notions refer to a *social* novelty. In this paper we want to contribute to the theoretical clarification of notions like Web 2.0 and Social Software by defining the Web as techno-social system. We try to answer the question, which understandings of Social Software and Web 2.0 exist, and how they can be typified. Furthermore, we analyze what is *social* about Social Software (section 2) by referring to traditional sociological understandings of sociality. In section 3, we discuss how the Web can be explained as a dynamic process. The research methods employed in this paper are dialectical social theory construction and systems theory, both based on the results of a literature survey.

The basic research question underlying this paper is: how should the World Wide Web be defined? For dealing with this question, we treat further questions: which social theories can be employed for defining the World Wide Web? What are the political implications of employing social theories for defining the World Wide Web? For us, these research tasks also have a normative dimension. Therefore, we are not just interested in a social theory of the Internet, but in a critical social theory of the Internet that helps to understand how computing in general and Internet and World Wide Web usage in particular can help to improve the situation of humanity and to establish a better world.

The problem is that in current academic, private, and public debates, many observers claim that the World Wide Web has become more social.. However, the notion of sociality underlying these claims, is mostly not really reflected. There is a lack of thinking about what sociality means and what sociality on the World Wide Web means in scholarly and non-scholarly discussions about changes of the Web. We therefore think that social theory is needed for helping scholars and citizens to gain a more precise understanding of sociality and sociality on the Web. The goal of our work is to contribute to this task.

David Beer and Roger Burrows [1] have argued already in 2007 that a sociology of and in Web 2.0 is needed. So far there is no theoretical clarification of these notions available. Most definitions of these terms are marketing based or rather unreflected. The paper at hand seeks to establish a sociology of Web 2.0 and Social Software by clarifying their theoretical foundations from a sociological view. One of the authors has recently argued that what is primarily needed is not a phenomenology or empirical social research of the Web, but a critical theory of the Internet and society because changing societal circumstances create situations, in which new concepts need to be clarified and social problems emerge, which need to be solved [2].

We identify three qualities of the World Wide Web, namely Web 1.0, Web 2.0, and Web 3.0. We use the terms Web 1.0, Web 2.0, Web 3.0 not in a technical sense, but for describing and characterizing the social dynamics and information processes that are part of the Internet. These notions are based on the idea of knowledge as a threefold dynamic process of cognition, communication, and co-operation [3-4]. In our terms the notion of the Web refers to the qualities of the Web as a techno-social system that enhance human cognition, communication, and co-operation. Cognition is the necessary prerequisite for communication and the precondition for the emergence of co-operation. In other words: in order to co-operate you need to communicate and in order to communicate you need to cognize. The three types of Web that we identify are based on an analytical distinction. This distinction does not imply a temporal order (such as in versions of a software, where the upper version always exists at a later point of time) or an evolutionary process. The distinction indicates that all Web 3.0 applications (co-operation) and processes also include aspects of communication and cognition and that all Web 2.0 applications (communication) also include cognition. The distinction is based on the insight of knowledge as threefold process that all communication processes require cognition, but not all cognition processes result in communication, and that all co-operation processes require communication and cognition, but not all cognition and communication processes result in co-operation.

By cognition we want to refer to the understanding that a person, on a subjective systemic knowledge,[1] connects him- or herself to another person by using certain mediating systems. When it comes to feedback, the persons enter an objective mutual relationship, *i.e.*, communication. Communicating knowledge from one system to another causes structural changes in the receiving system. From communication processes shared or jointly produced resources can emerge, *i.e.*, co-operation. These processes represent thus one important dimension, against which qualities of the World Wide Web have to be assessed.

Based on our understanding of knowledge as a dynamic process, we outline three qualities of the World Wide Web. Accordingly, we define Web 1.0 as a tool for cognition, Web 2.0 as a medium for human communication, and Web 3.0 as networked digital technology that supports human co-operation.

[1] The cognitive structural patterns that are stored in neural networks within the brains of individual human agents can be termed subjective knowledge.

2. Three Notions of Sociality for the Analysis of Social Software

By reviewing definitions of Web 2.0 and Social Software, we found out that these two terms are in most cases used interchangeably and that there are different understandings and concepts of what is termed social that are underlying these attempts. We will outline these notions in this chapter and work out our own understanding, which will differentiate between Social Software and Web 1.0, 2.0, 3.0, in section 3.

2.1. A Structure-Based View of Sociality

The first understanding of Social Software is based on the Durkheimian notion of the *social*: All software is social in the sense that it is a product of social processes. It is produced by humans in social relations. It objectifies knowledge that is produced in society, and it is applied and used in social systems. Applying Durkheim's notion of social facts to software means that all software applications are social. They are fixed and objectified social structures. Also if a user sits in front of a screen alone and browses information on the World Wide Web, s/he engages in sociality, because, according to Durkheim, the social facts the user is confronted with on the WWW have an existence of their own, independent of individual manifestations. Web technologies and Web contents therefore are social facts. "A social fact is every way of acting, fixed or not, capable of exerting on the individual an external constraint; or: which is general over the whole of a given society whilst having an existence of its own, independent of its individual manifestation" [5]. Based on this Durkheimian understanding of the social, Rainer Dringenberg [6] argues that the Web is a social fact because it is a structure that is cognized, internalized and about which many people interact in everyday life. Martin Rost [7] argues that computer networks are social facts, because they are types of social functions: a social reality sui generis, that has functions in and shapes society. Once created, they would fulfill certain specific functions, just like other subsystems of society. Dourish [8] argues that all digital systems – computer hardware, software, periphery, the Internet, *etc*. – are social in the sense that they objectify human intentions, goals, interests, and understandings, *i.e*., they are social facts defined by human actors and they influence the behaviour of others. He says that these artefacts are based on "commonly held social understandings" [8].

For Durkheim, social facts are "existing outside the consciousness of the individual", "penetrate us by imposing themselves upon us"; they are crystallized and objectified; they are "beliefs, tendencies and practices of the group taken collectively" [5]. If we take together the views by Dringenberg, Rost, and Dourish, then they tell us that technological artefacts such as computers or computer networks reflect certain common interpretations of the world of certain groups and by using technologies these meanings shape our thinking and action. Durkheim mentioned moral rules, aphorisms, popular sayings, articles of faith, standards of taste, laws, and the financial system as examples of social facts. He did not mention technology. Nonetheless his notion can also be applied to technologies. One can understand the approach of the Social Construction of Technology (SCOT) as being implicitly Durkheimian. Pinch and Bijker [9] argue that technologies are socially constructed, their design is a manifestation of how groups interpret the social world, which problems they see, and which solutions to these problems they consider adequate. "Meanings can get embedded in new artefacts" [10].

Langdon Winner makes an even stronger claim by arguing that artefacts have politics. "Many technical devices and systems that are important in everyday life contain possibilities for many different ways of ordering human activity. […] choices tend to become strongly fixed in material equipment […]. In that sense, technological innovations are similar to legislative acts or political foundings that establish a framework for public order that will endure over many generations" [11]. Computer hardware and software therefore can be said to incorporate collective meanings and "commonly held social understandings" [8] that influence humans in their decisions and action while using these technologies. Here we find both the aspect of collective tendencies and imposition that Durkheim saw as important for social facts. In the case of content production and computer-mediated communication, content is designed by users and communicated via networks. In this sense, it can be said that digital content reflects the collective meanings that shape the thinking and action of individuals and is therefore also an expression of social facts. The approaches by Dringenberg [6], Rost [7], and Dourish [8] are close to Durkheim [5] because they tell us that computers, networks, and content express ubiquitous facts about society that shape action and thinking of individuals.

2.2. An Action-Based View of Sociality

The second understanding of sociality that is applied in definitions of Web 2.0 and Social Software is based on Max Weber. His central categories of sociology are *social action* and *social relations*: "Action is 'social' insofar as its subjective meaning takes account of the behavior of others and is thereby oriented in its course" [12]. "The term 'social relationship' will be used to denote the behavior of a plurality of actors insofar as, in its meaningful content, the action of each takes account of that of the others and is oriented in these terms" [12]. These categories are relevant for the discussion about Social Software, because they allow a distinction between *individual* and *social activities*: "Not every kind of action, even of overt action, is 'social' in the sense of the present discussion. Overt action is not social if it is oriented solely to the behavior of inanimate objects. For example, religious behavior is not social if it is simply a matter of contemplation or of solitary prayer. [...] Not every type of contact of human beings has a social character; this is rather confined to cases where the actor's behavior is meaningfully oriented to that of others" [12]. Weber stresses that for behavior being considered as social relation, it needs to be a meaningful symbolic interaction between human actors, hence communication.

According to this understanding, Social Software and Web 2.0 are oriented on applications that allow human communication. The social character can be distinguished from activities such as writing texts with a word processor or reading online texts: "Social software's purpose is dealing with groups, or interactions between people. This is as opposed to conventional software like Microsoft Word, which although it may have collaborative features ('track changes') is not primarily social. (Those features could learn a lot from Social Software however.) The primary constraint of Social Software is in the design process: Human factors and group dynamics introduce design difficulties that aren't obvious without considering psychology and human nature" [13].

Such understandings include a wide set of digital communication technologies; they are broad, inclusive definitions, such as the one of Shirky [14]: "Social software, software that supports group communications […]. Because there are so many patterns of group interaction, Social Software is a

much larger category than things like groupware or online communities – though it includes those things, not all group communication is business-focused or communal. One of the few commonalities in this big category is that Social Software is unique to the Web in a way that software for broadcast or personal communications are not".

Pascu *et al*. [15] provide a similar definition. They describe "Internet 2" or "Social Computing" as technologies that "exploit the Internet's connectivity dimension to support the networking of relevant people and content". The user is an integral part in the production process of content, tastes, emotions, goods, contacts, relevance, reputation, feedback, storage and server capacity, connectivity, and intelligence. The central feature is communication: "These applications build on the capacity of ICT to increase possibilities for interpersonal communication. Blogs, wiki, voice over IP, podcast, taste sharing and social networking services all increase the possibility of finding other people like us, and therefore enhance communication possibilities and their value." Coates [16] gives examples for the technologies that are included: "Social Software can be loosely defined as software which supports, extends, or derives added value from, human social behaviour – message-boards, musical taste-sharing, photo-sharing, instant messaging, mailing lists, social networking".

danah boyd [17] stresses that Social Software is about dynamic interaction: "The fact is that Social Software has come to reference a particular set of technologies developed in the post-Web-bust era. In other words, in practice, 'Social Software' is about a movement, not simply a category of technologies. It's about recognizing that the era of e-commerce centred business models is over; we've moved on to Web software that is all about letting people interact with people and data in a fluid way. It's about recognizing that the Web can be more than a broadcast channel; collections of user-generated content can have value. No matter what, it is indeed about the new but the new has nothing to do with technology; it has to do with attitude" [17]. boyd argues that the specific characteristic of Web 2.0 is that it allows the appropriation of global knowledge in local contexts (Web 2.0 as glocalization of communication): "Web2.0 is about glocalization, it is about making global information available to local social contexts and giving people the flexibility to find, organize, share and create information in a locally meaningful fashion that is globally accessible. […] It is about new network structures that emerge out of global and local structures" [18].

2.3. A Co-Operation-Based View of Sociality

A third understanding of the social is based on the notions of community and co-operation, as elaborated by Tönnies and Marx [19-21]. For Ferdinand Tönnies, co-operation is conceived in the form of "sociality as community". He argues that "the very existence of Gemeinschaft rests in the consciousness of belonging together and the affirmation of the condition of mutual dependence" [19], whereas Gesellschaft (society) for him is a concept in which "reference is only to the objective fact of a unity based on common traits and activities and other external phenomena" [19]. Communities would have to do with harmonious consensus of wills, folkways, belief, mores, the family, the village, kinship, inherited status, agriculture, morality, essential will, and togetherness. Communities are about the feelings of togetherness and values.

Marx discusses community aspects of society with the help of the notion of co-operation. "By social we understand the co-operation of several individuals, no matter under what conditions, in what

manner and to what end" [20]. Marx argued that co-operation is the "Essence of Society". The basic idea underlying Marx's notion of co-operation is that many human beings work together in order to produce goods that satisfy human needs and that hence also ownership of the means of production should be co-operative. In a capitalist society, humans would be alienated from their own essence due to wage labour and exploitation. Capitalism would produce structural forms of exploitation that are at the same time also preconditions for a co-operative society. The true species-being would only be possible if man "really brings out all his *species*-powers – something which in turn is only possible through the cooperative action of all of mankind" [21]. For Marx a co-operative society is the realization of the co-operative essence of humans and society.

Tönnies' and Marx's notions of the social have in common the idea that humans work together in order to produce new qualities of society, which can be material or immaterial.

The third understanding of Social Software and Web 2.0 in the Tönniesian sense is focused on technologies that allow online community building. It is related to the concept of virtual communities, which gains new relevance by the rise of social networking platforms such as MySpace, Facebook, Friendster, StudiVZ, *etc*. Alby gives such an understanding of Social Software: "The notion of Social Software is normally used for systems, by which humans communicate, collaborate or interact in any other way. […] As this seems to be too broad, another criterion for Social Software is that it must advance and support the formation and the self-management of a community; such a software should allow the community to rule itself" [22[2]]. Alby distinguishes two forms of Social Software: Social Software focusing on communication (e.g., instant messaging, chat), and Social Software, in which the content is produced or enhanced by a community (e.g., Wikipedia, Web-based discussion forums).

For Howard Rheingold and his working group, the concept of Social Software has to do with social networks that bring people together: "Social software is a set of tools that enable group-forming networks to emerge quickly. It includes numerous media, utilities, and applications that empower individual efforts, link individuals together into larger aggregates, interconnect groups, provide metadata about network dynamics, flows, and traffic, allowing social networks to form, clump, become visible, and be measured, tracked, and interconnected" [23].

For Thomas Burg [24] social networks are also the central feature of Social Software: "Social Software comprises all of the information and communication technologies that enable the digital networking of individuals and groups. [...] Social Software enables the development of ad-hoc, (non-)centralized networks between users. This kind of network is ostensibly, to borrow a phrase from emergence theory, more intelligent than the sum of the individual parts." Social software would be software that "fosters increasingly technologically supported social networking via the Internet" [25]. This would particularly include weblogs. Fischer [26] also focuses on the idea of social networking.

To form a networked group, requires shared meanings, *i.e*., a certain degree of community, and the co-operative creation of bonds. Therefore, we think that the notions by Saveri *et al*. [23], Burg [24], and Fischer [25] can be connected to Tönnies [19] and Marx [20-21].

The idea of goods as emergent qualities of human co-operation, as outlined by Marx, is important for the third understanding of Web 2.0 and Social Software: Tim O'Reilly [27-28] stresses network effects that stem from the participation of many humans and collective intelligence as important

[2] Comment: Translation by the authors.

features of Web 2.0. O'Reilly [27] mentions the following attributes as the main characteristics of Web 2.0: radical decentralization, radical trust, participation instead of publishing, users as contributors, rich user experience, the long tail, the Web as platform, control of one's own data, remixing data, collective intelligence, attitudes, better software by more users, play, undetermined user behaviour. He provides the following more formal definition: "Web 2.0 is the network as platform, spanning all connected devices; Web 2.0 applications are those that make the most of the intrinsic advantages of that platform: delivering software as a continually-updated service that gets better the more people use it, consuming and remixing data from multiple sources, including individual users, while providing their own data and services in a form that allows remixing by others, creating network effects through an 'architecture of participation', and going beyond the page metaphor of Web 1.0 to deliver rich user experiences" [28]. That co-operation produces collective knowledge on the Web also points towards a transformation in which readers become writers. Hence Dan Gillmor [29] argues that the Web has been transformed into a read/write-Web in which users can "all write, not just read, in ways never before possible. For the first time in history, at least in the developed world, anyone with a computer and Internet connection could own a press. Just about anyone could make the news."

Based on O'Reilly, several authors have developed similar concepts of Web 2.0 as a platform for co-operation. For Paul Miller [30] the central principles of Web 2.0 are freeing and remixing of data so that virtual applications that draw on data and functionalities from different sources emerge, participation, work for the user, modularity, the sharing of code, content, and ideas, communication and the facilitation of community, smart applications, the long tail, and trust. Web 2.0 is a "label applied to technologies, services and social networks that build upon the Web as a computing platform rather than merely as a hyperlinked collection of largely static Web pages. In practice, services dubbed Web 2.0 reflect open standards, decentralized infrastructure, flexibility, simplicity, and, perhaps most importantly, active user-participation. Examples: blogs, wikis, craigslist.com, del.icio.us, and Flickr" [31]. The free online encyclopaedia Wikipedia [32] defines Web 2.0 as "a term describing changing trends in the use of World Wide Web technology and Web design that aims to enhance creativity, secure information sharing, collaboration and functionality of the Web". Peter Simeon Swisher [33] speaks of Multimedia Asset Management 2.0 (MAM 2.0), which he defines as the "managed Web" that allows "live collaborations between the publisher and the audience". It improves the more it is used and the more open it is: "Under MAM 2.0, open, collaborative models connect media, metadata, end users and production tools via the Web in fully networked and user-driven ways. [...] It enables greater collaboration between entire communities of users; content producers and consumers will be able to learn from each other on a scale previously unimagined" [33]. Kolbitsch and Maurer [34] argue that co-operation is central to Web 2.0 in the sense that knowledge would emerge that would be larger than the sum of all individual knowledge taken together. Tapscott and Williams [35] speak of the new Web, which they define as "a global, ubiquitous platform for computation and collaboration", that is about "communities, participation, and peering."

Based on these three understandings of Social Software and Web 2.0, we summarize the main points in the table below (see Table 1).

The three types of understandings discussed so far are not mutually exclusive, there are hybrid forms creating all combinations. One finds for example definitions of Social Software as platforms for communication and co-operation: "Social software uses the Web as a collaborative medium that

allows users to communicate, work together and share and publish their ideas and thoughts – and all this is done bottom-up and with an extremely high degree of self-organisation“ [36]. Social software would include wikis, blogs, and social bookmarking. There are also combinations of the features of public communication and community building, such as “those online-based applications and services that facilitate information management, identity management, and relationship management by providing (partial) publics of hypertextual and social networks“ [37]. For Schmidt not all software is per se Social Software. E-mail, e-governance, and e-commerce would be mainly interpersonal, whereas tools like blogs, wikis, and social networking platforms would have a *public* character. Schmidt considers only the latter as Social Software. Therefore, Social Software would be about finding, rating, and sharing information (information management), presentation of oneself to others (identity management), and creating and maintaining social relationships (relationship management).

Table 1. Different understandings of Social Software and Web 2.0 from different sociological perspectives.

	Approach	**Sociological Theory**	**Meaning of Social Software and Web 2.0**
1	Structural Theories	*Emile Durkheim:* Social facts as fixed and objectified social structures that constantly condition social behaviour.	All computers and the World Wide Web are social because they are structures that objectify human interests, understandings, goals, and intentions, have certain functions in society, and effect social behaviour.
2	Social Action Theories	*Max Weber:* Social behaviour as reciprocal symbolic interaction.	Software on the World Wide Web that enables communication over spatio-temporal distances.
3	Theories of Social Co-operation	*Ferdinand Tönnies:* Communities as social systems that are based on feelings of togetherness, mutual dependence, and values. *Karl Marx:* The social as the co-operation of many humans that results in collective goods that should be owned co-operatively.	Software on the World Wide Web that enables the social networking of humans, brings people together and mediates feelings of virtual togetherness. Software on the World Wide Web that by an architecture of participation enables the collaborative production of digital knowledge that is more than the sum of individual knowledge, *i.e.*, a form of collective intelligence.

2.4. An Integrative View of Sociality

It makes sense to develop an integrative view of these three sociality types rather than considering them separately for the following two reasons: first, the structural, the action, and the co-operation type of sociality can easily be integrated in the way the Aristotelian *genus proximum* and *differentia specifica* are linked together: Durkheim's notion of the *fait social* is the most abstract notion. As such it also applies to actions that – in the sense of Weber – are directed towards other members of society

and, beyond that, to the production of common goods within a community in the Tönniesian and Marxian sense.

Defining sociality in the mode, Weber can be seen as making the case for a more concrete and more particular type of sociality than the Durkheimian one: the latter underlies the former. And the Tönnies–Marx concept, finally, is still less general and a subcategory of the Weberian one. Thus, they form a kind of hierarchy, in which the successor is a logical modification of the predecessor: it takes place under certain constraining conditions.

Second, there is an analogous relationship between the three forms, in which information processes occur in society: cognition, communication, and co-operation processes. These processes relate to each other in a way that reflects and resembles the build-up of a complex system. One is the prerequisite for the other in the following way: in order to co-operate you need to communicate and in order to communicate you need to cognise.

Therefore, we suggest an integrative view of how sociality is manifested in Social Software. If the Web is defined as a techno-social system that comprises the social processes of cognition, communication and cooperation altogether, then the whole Web is Durkheimian, since it is a *fait social*. What in the most widespread usage is called Social Software – that is that part of the Web that realizes communicative as well as cooperative societal roles – is, in addition, social in the Weberian sense, while it is the community building and collaborative part of the Web that is social only in the most concrete sense of Tönnies and Marx. To put it in another way: that part of the Web that deals with cognition only is exclusively Durkheimian without being Weberian, let alone Tönniesian–Marxian; that part that is about communication including cognition is Weberian and Durkheimian; and only the third, co-operative, part carries all three meanings. We suggest ascribing the terms Web 1.0, Web 2.0 and Web 3.0 to these parts accordingly (see Table 2).

Table 2. Integrative and dynamic understanding of Social Software and Web 2.0.

4	An Integrative and Dynamic Approach		The Web as dynamic threefold knowledge system of human cognition, communication, and co-operation:
		Emile Durkheim: cognition as social due to conditioning external social facts	Web 1.0 as system of human cognition.
		Max Weber: communicative action	Web 2.0 as system of human communication.
		Ferdinand Tönnies, Karl Marx: community-building and collaborative production as forms of co-operation	Web 3.0 as system of human co-operation.

The Web is a techno-social network that interlinks humans by making use of global networks of computer networks. Web 1.0, 2.0, and 3.0 characterize certain qualities of the Web. Web 1.0 is that

part of the Web that supports human cognition, Web 2.0 is a system of human communication, Web 3.0 a system of human co-operation.

Most existing definitions of "Social Software" and "Web 2.0" can be grouped together as what we term "Web 2.0" and "Web 3.0". Our typology that is connected to three notions of the social (Weber, Durkheim, Marx/Tönnies) aims at showing that upon discussing social dimensions of the Web, one should reflect on the basic employed categories and take into account that a term like "sociality" is complex and has been provided with various meanings within sociology itself. We are aiming at a more nuanced, complex, and theoretically grounded notion of the Web than what is given by most existing definitions of "Web 2.0" and "Social Software".

3. Towards a Theory of the Web

We define the World Wide Web (as the most prominent part of the Internet) as a techno-social system, a system where humans interact based on technological networks. The notion of the *techno-social system* refers to the fact that the Web cannot be defined without connection to the human social realm. On the one hand, the Web as part of the Internet belongs to the technological infrastructure of society, which is itself a materialized outcome of social action. On the other hand, the Web is a social system of mediated cognition, communication, and cooperation, which is based on this infrastructure as means of its realization. In both cases human agents interact, they act as producers and users. The Web is the result of these interactions. The human agents are the driving force behind the construction and reconstruction of this overall system in all of its facets. This logic of a techno-social production and reproduction can be described as a dialectical relationship between human social agency and its intended and also its unintended consequences. Emerging from the local level of social interaction, the consequences of this action constitute a global level of social structure; the latter, in turn, influences further processes of action as it enables and constrains them at the same time [38]. We speak of techno-social systems and not of socio-technological systems because in the English language the first term in a composite term further characterizes the second term, which is considered as the main characteristic. Therefore, the term socio-technological system stresses primarily technological aspects, whereas we think that all relations of humans are primarily social and societal. Technological systems are primarily social systems, technology is a medium that enables and constrains social action. The term techno-social systems expresses this circumstance better than the term socio-technical system, which can invoke techno-deterministic meanings. With the Social Construction of Technology (SCOT) approach we share the critique of technological determinism and that technology is socially constituted. However, the SCOT approach frequently underestimates the complexity of technology that can result in unpredictable outcomes and effects of technology and technology usage. We therefore favour the approach of the mutual shaping of technology and society, in which technology and society shape each other in complex ways and have a relative autonomy. We see dialectical sociological theories, such as Giddens' structuration theory, suited for helping to ground the mutual shaping approach.

Thus, we do not speak of technologies as something detached from humans, but of systems in which technologies and humans are mutually connected and produce each other.

Our model of the Web is not a development model, *i.e.*, it does not operate within time and does not

identify succeeding stages. It provides an analytical separation that allows to distinguish different techno-social Web systems. We find emergent properties in the model, *i.e.*, Web types that have new qualities based on qualities of other types, but at the same time go beyond these types. This model is thus not to be understood as a means of prediction. It is not a scheme of linear progression from one state to another. It attempts at giving an account of the necessary condition for a next step, which, in the past, occurred as a contingency and, in the future, might or might not be taken. How is it that Web 2.0 can be interpreted as successor of something called retrospectively Web 1.0 and what are the possibilities for a Web 3.0 to develop prospectively? This is the question that we want to address. And the methodology we use to give an answer is to investigate to what extent Web 1.0 can be considered a necessary condition for Web 2.0 as well as in what respect Web 2.0 may turn out a necessary condition for Web 3.0. We do so by comparing Web 2.0 with Web 1.0 to find out about identical features and qualities and about differences between Web 1.0. We are further looking for qualitative differences within Web 2.0 that might anticipate Web 3.0. Today, the Web is mainly a Web of cognition and communication. We find certain technologies of co-operation such as wikis, but they still constitute a minority of the Web. Therefore, we can say that a fully co-operative Web does not yet exist and it is unclear if it will ever come into existence or not.

In order to be able to make empirical observations, one needs theoretical concepts that can be applied. We are utilizing a concept of information based on different subprocesses of information that take place in social life and are technically supported by ICTs. These are cognitive, communicative, and co-operative processes.

- Cognitive processes (including emotional ones) are individual, or ,in case of any supra-individual social agency named a subject, intra-subjective processes of generating information. Human-Computer Interaction as discipline deals with how cognition is being supported and influenced by using ICTs.
- Communicative processes are interactive, that is, among individuals or other social subjects. Due to the coupling of cognitive subjects, communicative processes can be understood as information generation processes. Computer-mediated communication deals with these processes supported by ICTs
- Cooperative processes are integrative, concern the supra-individual level and let information emerge from synergetic effects of communicating subjects. Originally, Computer-Supported Cooperative Work researched this topic from the perspective of the involvement of ICTs. Nowadays, this approach takes advantage from research in collective intelligence, wisdom of the crowds and so on.

From these definitions follows that cognition is the necessary condition for communication and communication the necessary condition for cooperation. In addition, we assume that if one level serves the function of a necessary condition for the next higher level, then the lower level might be influenced, shaped, adjusted according to this function by the higher level. Communication emerges from cognition, co-operation emerges from communication: This means that a subset of cognition processes forms communication processes and that a subset of communication processes are co-operation processes. Communication processes are cognition processes with specific, additional qualities. Co-operation processes are communication processes with specific, additional qualities.

Therefore, we can categorize Web phenomena according to the dimensions of information generation. The advantages of distinguishing three forms of information processes on the World Wide Web are that this allows classifying Web-based technologies, that it allows connecting Internet studies and sociological theory, that it helps answering the question what is social about the World Wide Web and World Wide Web usage, that it clarifies what the term information on the World Wide Web means so that the notion of the World Wide Web as information system becomes clearer and information science and Internet research can be connected.

Furthermore, since deliberating on Web 3.0 includes technology assessment and design of technology ("Technikgestaltung"), taking a neutral, value-free stance in identifying the necessary conditions for the possible future of the Net is not appropriate. We have to take that into consideration, which is not only possible, but also desirable. This concept makes our approach a critical one. It includes not only an account of the potential that is given with the actual, but also an evaluation of the potential, which sorts out the desired. Thus, our philosophy embraces an ascendance from the potential given now to the actual to be established in the future as well as an ascendance from the less good now to the better then which altogether yields the Not-Yet in critical theorist Ernst Bloch's sense [39]. That is, we criticize the present against the blueprint of a better future. And we do this, after Bloch, by identifying phenomena hic et nunc and hidden in the present that nevertheless are able to anticipate and foreshadow a possible better future. This possible better future is cast as vision of a Global Sustainable Information Society. By that we define a society that, on a planetary scale, is set on a path of sustainable development by the help of ICTs. That is, we suggest that the overall value be sustainability that denotes a society's ability to perpetuate its own development. Complying with sustainability implies complying with social values like justice, equality, freedom, and solidarity as well as with sustainability in the ecological and technological sense. These values to be implemented need, above all, the collaboration of different partitions of humankind, a planetary discourse aimed at co-operation, and intelligent actors ready for the planetary discourse.

Thus, we can evaluate Web phenomena according to their contribution to processes of how people can work together, share resources, co-produce, co-act, and engage in activities that benefit all, which addresses the cooperative dimension, according to the planetary discourse, which addresses the communicative dimension, and according to the intelligence of actors, which addresses the cognitive dimension.

Given these presuppositions, we can categorize and evaluate Web phenomena. We do not do empirical research on our own here, but draw upon generalizations of other works. In particular, we discuss Benkler [40], Sunstein [41], Lovink [42], Gurstein [43], and Bruns [44].

When addressing eutopian and dystopian views regarding the development of the Net, that is, the view of virtual communities to revitalize human communal existence and the view of physical communities being supplanted rather than being supplemented, Yochai Benkler [40] uses the distinction between strong ties and weak ties, introduced by Mark Granovetter, to summarize empirical studies on how ICTs strengthen or fragment social relations as follows: strong ties, which relate to family and local communities, were not weakened, but rather strengthened by the use of ICTs, and new weak ties were created in addition (see chapter 10). These new weak ties have established what is known by the terms "communities of practice" and "communities of interest"; they are instrumental for the individual, but not in the way that they are to become the dominant mode of connecting to other

people. However, Benkler seems to see an exception from this rule: the emergence of Social Software and peer-production like with F/OSS or Wikipedia make the group more important than the individual; they go beyond a community of mere interest in that they "allow the relationship to thicken over time" [40]. Overall, Benkler's assessment is rather optimistic.

Cass R. Sunstein [41], who deliberates over how many minds can produce knowledge and avoid failures, also arrives at a rather positive evaluation of F/OSS and Wikipedia. The following factors have led to the success of F/OSS: "Many people are willing and able to contribute, sometimes with the prospect of economic reward, sometimes without any such prospect. It is often easy to see whether proposed changes are good ones. For open source projects, filters are put in place to protect against errors. The problems associated with deliberation can be reduced because we are often dealing with eureka-type problems, where deliberation works well. Open source projects typically combine deliberation with access to widely dispersed information and creativity" [41]. And Wikipedia "provides an exceptional opportunity to aggregate the information held by many minds. Wikipedia itself offers a series of deliberative forums in which disagreements can be explored" [41]. Contrary to F/OSS and Wikipedia, the blogosphere "offers a stunningly diverse range of claims, perspectives, rants, insights, lies, facts, falsehood, sense, and nonsense" [41]. Sunstein lists some positive examples, but they seem to be outweighed by negative ones because the blogosphere "runs into the usual pitfalls that undermine deliberation, sometimes in heightened forms" [41].

Geert Lovink [42], who sets out to theorize Internet culture, is critical of the blogosphere to an even greater extent. According to the data he finds, blogs are used primarily as instruments for managing one's self, for marketing one's self, for making P.R. for one's self. Therefore, he doubts that blogs belong to groupware or Social Software. They are rather the follow-up generation of the homepage. He quotes from a blog that writers do not care about whether or not a community forms as a result of their writing. Blogging, he says, is competing for a maximum of attention. And, we can add, this is true not only for the blogosphere. Here the similarity to the sphere of so-called Social Software platforms like Facebook is striking: what counts is being linked. Lovink criticizes the superficiality of content. In many cases existing information is only reproduced, he bemoans, and no new content is created. At the same time he admits that blogging, annotating, and building links could be a start for defeating the indifference. Together with Ned Rossiter he opts for "organized networks" that are useful in strategic contexts that transcend tactical ones. "Networked multitudes create temporary and voluntary forms of collaboration that transcend but do not necessary disrupt the Age of Disengagement" [45]. In organized networks Lovink seems to realize the ideal of free co-operation, in which the result outperforms the sum of individual performances.

Michael Gurstein [43] distinguishes between *networks* and *communities*. While networks are "structured around the relationships of autonomous and self-directed individual actors (or nodes) where the basic structuring is of individuals (nodes) interacting with other individuals (nodes) with linkages between nodes being based on individual choice", communities "assume collectivity or communality within a shared framework which may include common values, norms, rules of behaviour, goals and so on" [43]. He refers to Barry Wellman's notion of "networked individualism", the meaning of which he puts on a level with the meaning of the "Facebook society". He interprets Wellman's networks as externally driven ones that combine fragmented individuals and contrasts it with "self-initiated (self-organized) and participatory networks, which inter-link individuals not on the

basis of fragments of identity, but on the basis of self-initiated and self-realized identities. These networks function as 'communities' (whether based on physical or virtual connections) through which action may be undertaken, projects realized, reality confronted and modified" [43]. "These communities provide a basis or a foundation element for the construction of an alternative reality" [43]. Community Informatics then is the way to "provide the means for communities to be enabled and empowered and to effect action in the world" [43].

Last not least, Axel Bruns [44] who came to call the combined producers and users of collaborative content creation "produsers" makes use of the notion of communities as opposed to traditional ways of production. In the introduction to his book, he says that such modes of content-creation "are more closely aligned with the emergent organizational principles in social communities than with the predetermined, supposedly optimized rigid structures of governance in the corporate sphere. User-led content creation in this new model harnesses the collected, collective intelligence of all participants, and manages – though in some cases better than in others – to direct their contributions to where they are best able to make a positive impact" [44]. By the notion of collective intelligence, Bruns relates to philosopher of cyberspace Pierre Levy's ideas.

Now, applying our model to the theoretical findings presented above, we put forth the following judgment: Web 2.0 is something ambiguous, it oscillates between a positive and a negative manifestation, and, because of that, it is likely to be transitory.

On the one hand, the usage of terms like "Social Software", "social media", "social networking" aimed at characterizing Web 2.0, seems to typify an euphemistic ideology because the meaning of "social" blurs the distinction between the interaction of actors and the relationships that emerge from these interactions and exert a kind of dominance over these interactions, in turn. That people interact on the Web does not tell us anything about the quality of these interactions and the underlying power structures. Therefore, discussions of normative and desirable aspects of the Web are needed that avoid affirmation. Web 2.0 shares with Web 1.0 that it is nowadays instrumental for competition in the capitalist economy that shapes Internet usage and results in the fact that actors who hold economic or political power are more visible on the Internet. Thus, it lays emphasis on individuals or individual organizations being cognized and recognized by other individuals or individual organizations. What makes Web 2.0 distinct from Web 1.0 is an increase in interaction facilitated by new technological applications. However, interaction is functional for gaining attention, thus communication serves cognition instead of the other way round, let alone communication serving cooperation. Bearing in mind that "communities" are entities belonging to the supra-individual level, so-called "communities of practice" or "communities of interest", in which individual actors gather to pursue some practice – without need to share some interest – or to pursue some personal interest, are instrumental to the individual actors only and do not qualify for the label of "community". They represent weak ties that need not thicken among individual actors that are networked. Social networks reside on the interactive level, but not on the integrative level. Barry Wellman's networked individualism seems to be the predominant characteristic of Web 2.0. Web 2.0 is predominantly a Web of competition, not a Web of co-operation (Web 3.0) that benefits all humans [2].

On the other hand, examples of "communities of action", true communities that exist in today's reality, can be found in cyberspace. An example is Wikipedia, where humans co-operate in order to produce a world repository of knowledge. Another one is F/OSS, where software is produced for the

world by means of co-operation. Also online communication and co-operation frequently results in offline action, as for example the phenomenon of cyberprotest shows. Probably the best example in this respect is that the movement for alternative globalization co-ordinates most of its protest actions with the help of the Internet and documents actions on the alternative online news platform Indymedia. There is a minor faction of blogs devoted to co-operation by helping to bring about a new way of thinking as an underpinning for political action in a global society. Examples are anti-war blogs. From a sociological, techno-social-systems point of view, these undertakings in peer production show that there are possibilities for transcending networked individualism and for realizing "networked communities" or "community networks", as Gurstein [43] puts it. But these possibilities are islands of an alternative reality that point to the level of co-operation, albeit under the prevalence of the communicative and cognitive restraints of networked individualism and an overall competitive society that is based on egotism, accumulation, and heteronomy. These islands might become spearheads of a transition to a Web 3.0 that enables and empowers communities such that a reorganization of today's societies into a Global Sustainable Information Society can be envisaged. They might turn out as anticipations of a future development only after this development happened to come true. So far they manifest what is possible today and desirable for tomorrow too. The future is open due to the complexity and indeterminacy of human behaviour. Therefore, potentials are first of all unrealized, they can remain potentials forever if humans do not consciously act in fundamentally transformative ways. The negative potentials of the Web that predominate today are likely to be outcomes of the Web because we live in a predominantly competitive society. Alternative developments are much more unlikely because they require societal transformations and do not automatically emanate from a Web that is shaped by the existing society. The emergence of a co-operative Web is not a technological issue, but one that requires the transformation of society.

Thus, we want to conclude: in principle, the World Wide Web, as the Internet at all, by virtue of its technical qualities, has the potential for transforming societies into networked communities so that it can advance from the cognitive and communicative levels of information generation towards the co-operative level, on which the collective intelligence of humanity might facilitate the collective action needed for the survival of mankind. Whether or not this will come true and Web 3.0 will look alike, is up to the forces that shape technology nowadays and will be determined by the outcome of social struggles that shape techno-social systems.

4. Conclusion

In this paper, we have outlined three qualities of the World Wide Web, namely Web 1.0 as a tool for thought, Web 2.0 as a medium for human communication and Web 3.0 technologies as networked digital technologies that support human co-operation.

This means that we distinguish between a cognitive Web, a communicative Web, and a co-operative Web. The discussion in part 2 of this paper has shown that when people speak of Social Software or Web 2.0, what they normally mean is that the World Wide Web is today dominated by communication and co-operation (including community-formation). In order to distinguish between these two aspects, we have suggested the distinction between Web 2.0 and Web 3.0. Hypertext is a Web 1.0 technology, blogs and Web-based discussion boards are Web 2.0 technologies, wikis are Web

3.0 technologies. Web 1.0 is based on an understanding of the social as Durkheimian social facts, Web 2.0 adds the Weberian idea of communication, Web 3.0 the Marxian idea of collective co-operative production and Tönnies' idea of communities. We have argued that the Marxian and Tönniesian dimension of co-operation is mainly a mere potential of the contemporary Web. Web 3.0 expands the understanding of the social from Durkheim and Weber to Tönnies and Marx, it is a system of online collaboration that enables the formation of virtual communities, co-operative knowledge, and co-operative labour.

What we argue for is that the turn towards Web 3.0-technologies that foster co-operation should not only remain a technological turn, as for example the Semantic Web or wikis, but needs to be accompanied by a transformation towards a fully co-operative society [2]. What is desirable is that the World Wide Web networks individuals, organizations, institutions, and societies at a global level and thus provides the glue by which cohesion of the emerging world society can be supported. The Internet and the World Wide Web provide the material underpinning of the consciousness that is inherent to the social system that may emerge. Eventually, its role may be that of a catalyst of global consciousness in a global society. But at the same time, it catalyzes already existing social antagonisms. The Internet does not automatically bring about co-operative social systems and a co-operative society. In order to reach a "co-operative society based on common ownership of the means of production" [46] in which "the springs of co-operative wealth flow more abundantly" [46], humans need to actively create co-operative systems that transcend domination. In this context, the Internet can help to create such change, but at the same time today it also helps to deepen domination. The Web will become truly co-operative only if humans establish a truly co-operative society in the Tönniesian and Marxian understanding, in which society and technology mutually shape each other in a sustainable way.

References

1. Beer, D.; Burrows, R. Sociology and, of and in Web 2.0: Some initial considerations. *Sociol. Res. Online* **2007**, *12*, http://www.socresonline.org.uk/12/5/17.html (accessed 18 February 2010).
2. Fuchs, C. *Internet and society: social theory in the information age*. Routledge: New York, NY, USA, 2008.
3. Hofkirchner, W. *Projekt Eine Welt. Oder Kognition Kommunikation Kooperation. Versuch über die Selbstorganisation der Informationsgesellschaft*. LIT: Münster, Germany, 2002.
4. Fuchs, C.; Hofkirchner, W. Self-organization, knowledge, and responsibility. *Kybernetes* **2005**, *1-2*, 241-260.
5. Durkheim, E. *Rules of sociological method*; Free Press: New York, NY, USA, 1982.
6. Dringenberg, R. Auf dem Weg zur Internetgesellschaft - Markierungen und Perspektiven einer Soziologie des Internet. In *Internet – vorgeführt und diskutiert;* Dringenberg, R., Ed.; EFH RWL Bochum: Bochum, Germany, 2002; pp. 96-144.
7. Rost, M. Anmerkungen zu einer Soziologie des Internet. In *Soziologie des Internet. Handeln im elektronischen Web-Werk;* Gräf, L., Krajewski, M., Eds.; Campus: Frankfurt am Main, Germany, 1997; pp. 14-38.
8. Dourish, P. *Where the Action Is*. MIT Press: Boston, MA, USA, 2001.

9. Pinch, T.J.; Bijker, W.E. The social construction of facts and artifacts: or how the sociology of science and the sociology of technology might benefit each other. In *The social construction of technological systems;* Bijker, W.E, Hughes, T.P., Pinch, T.J., Eds.; MIT Press: Cambridge, MA, USA, 1987; pp. 17-50.
10. Kline, R.; Pinch, T. The social construction of technology. In *The social shaping of technology;* MacKenzie, D., Wajcman, J., Eds.; Open University Press: Maidenhead, UK, 1999; pp. 112-114.
11. Winner, L. Do artefacts have politics? In *The social shaping of technology*; MacKenzie, D., Wajcman, J., Eds.; Open University Press: Maidenhead, UK, 1999; pp. 28-40.
12. Weber, M. *Economy and society: an outline of interpretive sociology*. Bedminster Press: New York, NY, USA, 1968.
13. Webb, M. (2004). *On social software consultancy*. http://interconnected.org/home/2004/04/28/on_social_software (accessed 18 February 2010).
14. Shirky, C. (2003). Social Software and the Politics of Groups. http://shirky.com/writings/group_politics.html (accessed 9 July 2007).
15. Pascu, C.; Osimo, D.; Ulbrich, M.; Turlea, G.; Burgelman, J.-C. The potential disruptive impact of Internet 2 based technologies. *First Monday,* **2007***, 3*, http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/viewArticle/1630 (accessed 18 February 2010).
16. Coates, T. (2005). An addendum to a definition of social software. http://www.plasticbag.org/archives/2005/01/an_addendum_to_a_definition_of_social_software (accessed 18 February 2010).
17. boyd, d. The significance of social software. In *BlogTalks reloaded*; Burg, T.N., Ed.; Books on Demand: Norderstedt, Germany, 2007, pp. 15-30.
18. boyd, d. (2005). Why Web 2.0 matters: Preparing for glocalization. http://www.zephoria.org/thoughts/archives/2005/09/05/why_web20_matte.html (accessed 18 February 2010).
19. Tönnies, F. *Community & society*; Transaction Books: New Brunswick, NJ, USA, 1988.
20. Marx, K.; Engels, F. Die deutsche Ideologie. In *Marx-Engels Werke (MEW);* Dietz: Berlin, Germany, 1846; Vol. 3, pp. 5-530.
21. Marx, K. Ökonomisch-Philosophische Manuskripte von 1844. In *Marx-Engels Werke (MEW);* Dietz: Berlin, Germany, 1844; Ergänzungsband, pp. 465-588.
22. Alby, T. *Web 2.0. Konzepte, Anwendungen, Technologien*; Hanser: München, Germany, 2007.
23. Saveri, A.; Rheingold, H.; Vian, K. *Technologies of Cooperation*; Institute for the Future: Palo Alto, CA, USA, 2005.
24. Burg, T.N. Social software – an emancipation. On the manifold ways of making ideas and individuals present and visible. In *BlogTalks 2.0*; Burg, T.N., Ed.; Books on Demand: Norderstedt, Germany, 2004. pp. 7-14.
25. Burg, T.N. MonsterMedia. Monstrosity in the face of weblogs. In *BlogTalks 2.0*; Burg, T.N., Ed.; Books on Demand: Norderstedt, Germany, 2003; pp. 83-100
26. Fischer, T.E. *Unternehmenskommunikation und Neue Medien;* Deutscher Universitäts-Verlag: Wiesbaden, Germany, 2006.
27. O'Reilly, T. (2005a). What Is web 2.0?

http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html?page=1 (accessed 18 February 2010).
28. O'Reilly, T. (2005b). Web 2.0: compact definition. http://radar.oreilly.com/archives/2005/10/web_20_compact_definition.html (accessed 18 February 2010).
29. Gillmor, D. *We the media. Grassroots journalism by the people, for the people*; O'Reilly: Beijing, China, 2006.
30. Miller, P. Web 2.0: Building the New Library. *Ariadne* **2005**, *45*. http://www.ariadne.ac.uk/issue45/miller/ (accessed 18 February 2010).
31. Stefanac, S. *Dispatches from blogistan. A travel guide for the modern blogger*; New Riders: Berkeley, CA, USA, 2007.
32. Wikipedia. (2008). Web 2.0. http://en.wikipedia.org/wiki/Web_2 (accessed 26 October 2008).
33. Swisher, P.S. The managed web: a look at the impact of Web 2.0 on media asset management for the enterprise. *J. Digit. Asset Manag.* **2007**, *1*, 32-42.
34. Kolbitsch, J.; Maurer, H. The transformation of the Web: How emerging communities shape the information we consume. *J. Univers. Comp. Sci.* **2006**, *2*, 187-213.
35. Tapscott, D.; Williams, A.D. *Wikinomics: How Mass Collaboration Changes Everything*; Penguin: London, UK, 2006.
36. Rollett, H.; Lux, M.; Strohmaier, M.; Dösinger, G.; Tochtermann, K. The Web 2.0 way of learning with technologies. *Int. J. Learning Technol.* **2007**, *1*, 87-107.
37. Schmidt, J. Social software: Facilitating information-, identity- and relationship management. In *BlogTalks reloaded*; Burg, T.N., Ed.; Books on Demand: Norderstedt, Germany, 2007; pp. 31-49.
38. Giddens, A. *The constitution of society: Outline of the theory of structuration*. Polity Press: Cambridge, UK, 1984.
39. Bloch, E. *Das Prinzip Hoffnung*; Suhrkamp: Frankfurt am Main, Germany, 1959.
40. Benkler, Y. *The wealth of networks*; Yale University Press: New Haven, CT, USA, 2006.
41. Sunstein, C.R. *Infotopia*; Oxford University Press: New York, NY, USA, 2006.
42. Lovink, G. *Zero comments*. Routledge: New York, NY, USA, 2007.
43. Gurstein, M. *What is community informatics?* Polimetrica: Monza, Italy, 2008.
44. Bruns, A. *Blogs, Wikipedia, Second Life, and beyond: from production to produsage*. Peter Lang: New York, NY, USA, 2008.
45. Lovink, G.; Rossiter, N. Dawn of organised networks. *Fibreculture J.* **2005**, 5. http://journal.fibreculture.org/issue5/lovink_rossiter.html (accessed 18 February 2010)
46. Marx, K. Kritik des Gothaer Programms. In *Marx-Engels Werke (MEW)*; Dietz: Berlin, Germany, 1875; Vol. 19, pp. 13-32.
47. Quantcast US Site Rankings. http://www.quantcast.com/top-sites-1 (accessed 12 November 2009).