



# The Promise of Technological Decentralization. A Brief Reconstruction

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## Abstract

Internet and Digitalization have long been associated with the promise of a technology-enabled decentralization of social conditions. Although such expectations have regularly fallen short, this underlying generic vision has proven to be astonishingly stable. This article traces the origin of the notion of decentralizing socio-economic forms of coordination through technological means—from the do-it-yourself scene of the 1960s, the early computer counterculture, and debates on cyberspace and Web 2.0 to present day ideas of decentralized and distributed forms of production and economic systems.

**Keywords** Decentralization · Communication · Coordination · Digitization

From the very beginning, the World Wide Web was meant to foster decentralized and thus more democratic social and economic structures (Negroponte 1995); Web 2.0 was to trigger a replacement of traditional mass media by user-centric exchange processes; with the advent of the Internet of Things, 3D printing, and cyber-physical systems, the promise of new forms of collaboration in the production of material goods sufficient to counteract existing asymmetries of economic power (Rifkin 2014) again has carried on for a number of years now.

Although none of these expectations has yet to empirically redeem itself, their underlying premise for the future has proven to be astonishingly stable. The belief that digital technologies will someday lead to a decentralization of essential communication and societal transaction processes, along with hopes for equality, transparency, and democratization, has significantly shaped the various discourses in their respective areas; most recently, this includes discussions of blockchain technologies for distributed accounting in computer networks that may someday make classic financial intermediaries obsolete (Tapscott and Tapscott 2016).

Drawing on empirical material and available literature, this article traces the origin of the notion of decentralizing socio-economic forms of coordination through technological means—from the early do-it-yourself (DIY) scene of the 1960s, the computer counterculture of the 1970s and 1980s, and debates on cyberspace and Web 2.0 in the 1990s and 2000s to present day ideas of decentralized and distributed economic systems. Furthermore, the text discusses the changing material and immaterial orientations in the discourse on technological decentralization as well as the basic patterns of arguments behind these promises.

## The Whole Earth Catalogue

The *Whole Earth Catalog* represents a fundamental point of origin for the notion of a decentralized do-it-yourself (DIY) culture. Regularly published from 1968 to 1971, it is considered one of the central organs of the California counterculture of the late 1960s (Roszak 1986). The catalog defined itself as an “evaluation and access device” for technological tools and propagated, as a counter-reaction to the increasing economic centralization, a return to the practices of individual, distributed production:

So far, remotely done power and glory—as via government, big business, formal education, church—has succeeded to the point where gross defects obscure actual gains. In response to this dilemma and to these gains a realm of intimate, personal power is developing—power of the individual to conduct his own education, find his

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own inspiration, shape his own environment, and share his adventure with whoever is interested. Tools that aid this process are sought and promoted by the WHOLE EARTH CATALOG. (Brand 1968: 2)

Stewart Brand, founder of the *Whole Earth Catalog* (WEC), was an entrepreneurial activist in the Californian hippie subculture and had previously organized music festivals; in 1985, he went on to launch The WELL (“The Whole Earth ‘Lectronic Link”), one of the first virtual communities accessible via dial-up modem. Contrary to many of his contemporaries (e.g., Mumford 1967), Brand (1974) viewed technological progress, social balance, and the conservation of nature as not being fundamentally in conflict with one another; the proper application of the appropriate technology, he argued, held the promise of a better future in each of these areas. In this context, Brand identified *information*—specifically practice-oriented knowledge of production, which had often not been freely accessible in the past—as a key resource: “On the one hand information [...] wants to be expensive, because it’s so valuable. The right information in the right place just changes your life. On the other hand, information almost wants to be free [...]” (Brand in Getty Images 1984: 0:38) Accordingly, the basic idea of the WEC was to make technical know-how accessible to as many people as possible in order to empower them to a decentralized production of material goods and to overcome capitalist structures: “At a time when the New Left was calling for grass-roots political (i.e., referred) power, Whole Earth eschewed politics and pushed grass-roots direct power—tools and skills.” (Brand 1998: 3).

Thus already in the early years of the modern DIY movement, the screwdriver-in-hand amateur was cast as a social figure standing in contrast to the world of centralized production and private enterprise, one who, aided by the power of how-to knowledge and relying on distributed means of self-organization, would prepare the way for a better and more just era of human existence to come. Brand clearly touched the nerve of the times—while the first WEC initially was distributed in small numbers, by the time of the so-called *Last Whole Earth Catalog*, published in 1971, the catalog had a print run of more than one million copies and was being distributed by a major publisher. Kenner (1971: 34) described the WEC and related publications at this time as “metaphors disguised as how-to-do-it and where-to-find-it manuals [...] propelling [themselves] across bookstore counters, by the hundred thousand, what only two years ago was the information exchange of a nearly invisible subgroup.”

In addition to its unwavering belief in the primacy of technology as a solution to social problems, the early WEC stands out, aside from its single-handed leadership, for its

development of a business model that is today omnipresent: “essentially encouraging customers [with their contributions] to create the product, and then selling the customers and their work to each other and keeping the profits” (Worden 2012: 212). In Brand’s subsequent publications (*CoEvolution Quarterly*, 1974–1984; *Whole Earth Review*, 1984–2003), ecological issues ergo moved further into the background as increasing attention was given to technological innovations and options for entrepreneurial decentralization.

In Europe, politically motivated DIY practices gained prominence with the rise of the environmental movements of the 1970s. In addition to the then omnipresent nature and wildlife TV documentaries with their evermore explicit warnings about environmental sins, the 1972 report “The Limits to Growth,” by the Club of Rome, questioned the widely held blind belief in the benefits of progress and imparted a fundamental awareness for ecological imbalances (Engels et al. 2005: 153ff). One response to the ensuing unease, in the alternative milieu subsequent to the demise of the student-centric political movements of the late 60s, was a change in choice of lifestyle, with the desire to free oneself from the influence of market forces leading to a rediscovery of local artisanry and small trade.

The conceptual basis behind the shift to decentralized production and consumption patterns could be found in numerous large-scale works critical of big industry, i.e., Jungk (1973), Ullrich (1977), and Schumacher (1973). Schumacher, in particular, with his notion of an “economics of permanence,” anticipated some essential ideas for a decentralized post-growth society and, like Brand, saw the key to human survival in changing the way we approach technologies: “[...] a technology with a human face, is in fact possible [...]. It serves production by the masses instead of mass production.” (Schumacher 1973: 117 f.) Similarly, Burns (1977: 14) foresaw an “inevitable [...] decline of the market economy.” Bell (1967: 400), on the other hand, early on characterized such propositions of a DIY economy as nothing more than a “secular religion.”

## The Computer Counterculture

Admittedly, by the early 1970s, the activist networks associated with the WEC were already turning in another direction—away from the idea of an all-encompassing anti-capitalistic lifestyle and toward the emerging computer hacking scene as a subcultural complement to the material world: First of all, the small portion of its readership seeking to really implement the WEC’s proposals quickly realized that decoupling from centralized economic structures required a degree of individual technical competence that could not be achieved over night. Second, Brand and the activists around him recognized that a subsistence lifestyle went hand in hand

with “mind-numbing labor and loneliness” (Baldwin and Brand 1978: 5). Third, through his observations on the video game *Spacewar*, Brand had developed an early fascination for the computer counterculture:

The hackers made *Spacewar*, not the planners. When computers become available to everybody, the hackers take over. We are all Computer Bums, all more empowered as individuals and as co-operators. (Brand 1972: 50)

Although a closer inspection suggests that *Spacewar*, given its development from 1961 onwards on university computing equipment donated by major corporations and its later adoption by the video arcade industry (Lowood 2009), can hardly be considered a successful example of a product developed in a hacker scene fully detached from the commercial market, by 1972 Brand already had recognized the potential for shifting WEC concepts of socio-economic decentralization and individual empowerment through access to technical knowledge to the world of intangible information networks.

The free and open circulation of technical information was in fact formative for many computer project groups being established at universities in North America from the 1960s onward, whose work served as the breeding ground for the broader amateur computer scene arising in the 1970s. As this niche gradually expanded in the 1980s into a full-fledged IT industry serving the mass market, the sharing of product knowledge became increasingly hampered by technical hurdles such as the distribution of software in binary format and changes to copyright law. In response, Richard Stallman (1983) announced the development of a freely usable, open-source operating system as an alternative to proprietary distributions. With Stallman’s “Free Unix!” manifesto, the Free Software Movement was born, since then promoting open, self-organized and decentralized software development. With its establishment of stable licensing models for open-source software, the movement became the basis for today industry-fundamental open-source projects as the Linux kernel (Schrape 2018).

Stewart Brand was associated with the Free Software Movement from its very beginning; in 1983 he was given an advance of \$1.3 million to create a *Whole Earth Software Catalog* “[that] would do for computing what the original had done for the counterculture” (Turner 2006: 129). The catalog was a commercial disappointment; the subversive impetus behind the original WEC, however, could clearly be felt: “Computers and their programs are tools. They empower. They estrange. Their power was first generated and employed by institutions [...]. With the coming of personal computers came a shift in the power balance.” (Brand 1984: 2)

Brand, together with Kevin Kelly, in 1984 organized the first hackers conference, bringing together the protagonists of

the hacker scene as well as the burgeoning IT industry—and it was at this conference, too, that Brand’s later often misquoted statement first arose: “Information *almost* wants to be free” (see above). Kelly, along with Brand, was furthermore involved in the establishment of the online community The WELL in 1985, which unlike most social-networking sites of today was funded solely by membership fees, with no advertising:

By contrast to ponderous commercial systems [...], the WELL offers little beyond what its users bring to the system. [...] Despite its state-of-the-art veneer, WELL habitués argue that the medium is as much a step backward to the 19th-century literary salon as a step into the future. (The New York Times 1989: A14)

With the *Whole Earth Software Catalog*, the Hackers Conference and The WELL, the transformation in California “from counterculture to cyberculture” (Turner 2006) was thus visibly accomplished: No longer was the focus on the decentralized production of material goods, but rather on the appropriation of the nonmaterial world of digital information. For a start, the belief in the decentralizing power of the network—resulting not least in a dissolution of the established distribution of roles between producers and consumers—was a defining influence on the subsequent discourse on cyberspace and Web 2.0. Secondly, the WEC and The WELL, with their implementation of intermediary platforms for user-generated content, put to the test a basic concept that was influential for the development of the later Internet economy.

## The Web (2.0) and Digital Prosumerism

Beginning in the early 1970s, but widely unrelated to the Californian counterculture, a number of hopes for decentralization began to circulate, particularly in the German-speaking countries, where, given the influence of Bertolt Brecht’s (1967 [1932]) radio theory and Hans-Magnus Enzensberger’s “Constituents of a Theory of the Media” (1970), they were linked to the new media: The home videocassette recorder was seen as the antithesis of a “hierarchically constituted [...] society” (Baumgart 1970: 212); videotex systems (in West Germany: BTX, in France: Minitel, in the UK: Prestel) were seen as the harbinger of the end of the classic mass media (Haefner 1984: 290); cable television was set to offer once passive media recipients new opportunities of choice and forms of expression.

With the development of the World Wide Web by Tim Berners-Lee from 1989 on, the two lines of discourse converged: the Internet quickly becoming known as an essentially “free and open” medium, one that would “[eliminate] the separation of roles between communicator and recipient”

(Höflich 1996: 13). Negroponte (1995: 239 f.) attested to the Web's capability to advance the shift of intelligence from sender to receiver: "It has four very powerful qualities that will result in its ultimate triumph: decentralizing, globalizing, harmonizing, and empowering." In a similar sense, McGeady (1996: 147) diagnosed a "shift back towards decentralized management models and decentralized work models." More restrained voices, such as Postman (1999), who noted that it is no longer the dissemination of information that is the current problem, but rather how to use it to generate knowledge and insight, were paid little attention.

After a period of disillusionment as a result of the implosion of the dotcom bubble in 2000, discussions about the reformative power of online technologies picked up again in 2002 in the economic and social sciences: Drawing on the open-source movement's own narratives (e.g., Raymond 1999), Benkler (2002) pointed to the increased relevance of open-source software development projects as evidence of the emergence of a new, technologically more effective production model that, being based on decentralized forms of collaboration, would eventually gain advantage over classic forms of socio-economic coordination:

Commons-based peer production is [...] emerging in the digitally networked environment. Facilitated by the technical infrastructure of the Internet, the hallmark of this socio-technical system is collaboration among large groups of individuals [...] without relying on either market pricing or managerial hierarchies [...]. (Benkler and Nissenbaum 2006: 394)

In 2005, the Internet once more moved to the forefront in the public discourse with Tim O'Reilly's widely noticed essay "What is Web 2.0." At its core, O'Reilly's article actually addressed the unprecedented relevance of data in the business world and questions about who would control it: "Database management is a core competency of Web 2.0 companies [...]. This fact leads to a key question: Who owns the data?" This aspect of informatization, however, quickly faded into the background during this phase of discussion, as Web 2.0 quickly became a new synonym for an overall spirit of optimism about the enabling possibilities of the Internet. Three expectations can be distinguished here that together amount to a technology-induced decentralization and dismantling of established social role distributions:

- *End of the mass media:* Gillmor (2006) referred to Web 2.0 as the first "many-to-many" medium and first step in the loss of relevance for "one-to-many" mass media: "Grassroots journalists are dismantling Big Media's monopoly on the news, transforming it from a lecture to a conversation."
- *Dissolution of producer and consumer roles:* In 2004 James Surowiecki coined the idea of the "wisdom of the crowds," followed by Kelly (2005: 6), who postulated that by 2015 "everyone alive will [...] write a song, author a book, make a video, craft a weblog, and code a program."
- *Democratization of social decision-making processes:* The assumption that those online would all become prosumers also led to the idea of a general democratization of social decision-making (Castells 2009; Shirky 2008).

In the Web 2.0 debates, as well, critical voices were for a long time rarely to be heard—this is certainly true of the comments of Habermas (2006), who noted the ambivalent political consequences of a fragmented public sphere.

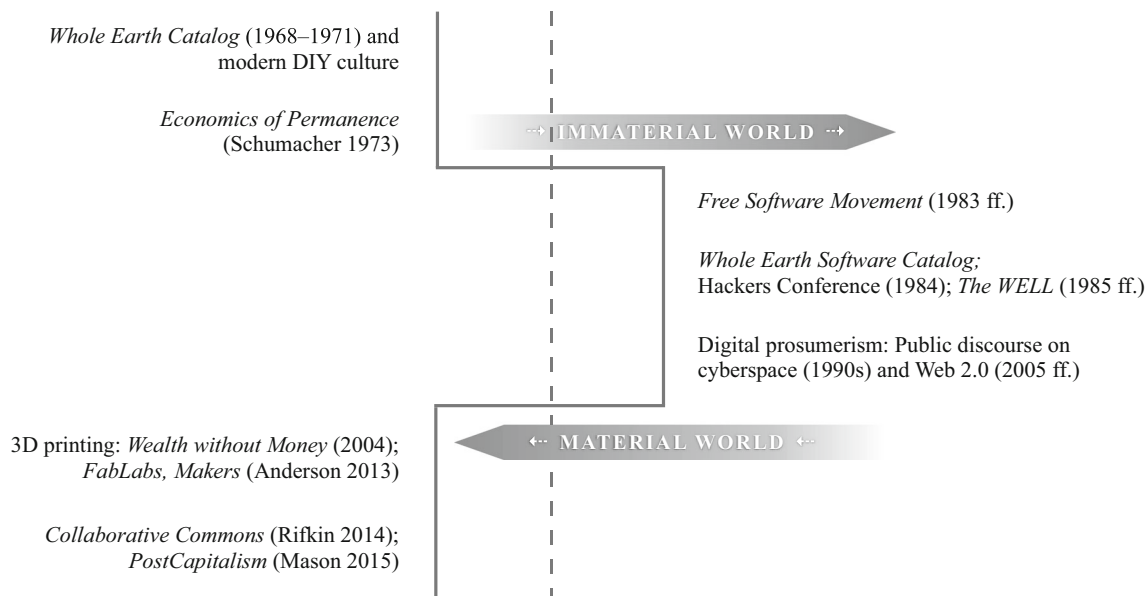
Although it soon became apparent that the sheer technological possibility would not immediately lead to shifts in social roles, the listed affirmative theses became sententious points of reference in the ongoing discourse, culminating in the proclamation of "the age of the prosumer" (Ritzer et al. 2012: 380) that would be characterized, on the one hand, by the newfound power of the consumer and niche products in economic realms. On the other hand, it would involve the decentralization not only of the processes of media production and dissemination, but also of socio-political organizing processes (Bennett and Segerberg 2012).

## The Notion of a Post-Capitalistic Maker Economy

With the popularization of 3D printing technology, from the mid-2000s onwards, the promises and visions of technological decentralization again took a material turn—away from the world of intangible information and toward the distributed production of material goods (Fig. 1). Drawing on additive manufacturing technologies in use industrially since the 1980s, Adrian Boyer initiated the project *Replicating Rapid-Prototyper* with the aim of producing a 3D printer assembled entirely from 3D-printer-produced parts using freely available design data. In his manifesto "Wealth without Money" (Boyer 2004), he characterized 3D printing as the next step in technological development, one that would return control over the means of production to the people.

A similar impetus lays behind MIT employee Neil Gershenfeld's so-called *FabLabs* (2005)—open workshops equipped with modern machinery offering all comers the opportunity to develop and manufacture their own material goods. Technology visionary Anderson (2013) thus described 3D printing as the harbinger of a "new industrial revolution" that would lead to the emergence of a decentralized "Maker Economy".

The basic idea set forth in the counterculture of the 1960s that grass-roots direct power could be achieved by making available technical knowledge, thereby enabling the



**Fig. 1** Material and immaterial orientations in the discourse on decentralization. Source: own considerations

decentralized production of material goods, has thus undergone a comprehensive update since the mid-2000s: New technologies are now expected to tackle the inherent problems in the DIY scene, as many of the needed tools and resources could now be manufactured by amateurs themselves; in this manner, central dilemmas of many open-source projects (e.g., exploitation) should be resolved through a decoupling of capitalist market structures; modern means of communication should help to ensure that self-sufficiency no longer need be accompanied by social deprivation. Taken altogether, so the narrative, 3D printers and online technologies could now tap into all of the opportunities for social transformation that previously could not be realized (Powell 2012):

If we were to put all the disparate pieces of the 3D printing culture together, what we begin to see is a powerful new narrative arising that could change the way civilization is organized [...]. The DIY culture is growing around the world, empowered by the idea of using bits to arrange atoms. (Rifkin 2014: 99)

Drawing on such narratives are propositions positing a socially and ecologically balanced post-capitalism, offering the prospect of a loss of relevance for classic economic structures due to “the rise of non-market production, of unownable information, of peer networks and unmanaged enterprises” (Mason 2015: 244). Thanks to new forms of technologically mediated communication, distributed production communities such as FabLabs, it is suggested, will pave the way for a sustainable economic order, as decentralized production not only reduces the need for the transport of goods, but also promotes a more environmentally friendly form of human existence (Kostakis

et al. 2015). In that sense, Blockchain technology is likewise considered by some authors to be the stepping stone to an emerging period of post-capitalism, as intermediary organizations allegedly become increasingly obsolete (Tapscott and Tapscott 2016): “[...] blockchain [...] pose significant opportunities for radically new forms of post-capitalist organizing [...].” (Cohen 2016: 743).

In this respect, from the countercultural message of the *Whole Earth Catalog*, to the early computer hacking scene and the debates about the World Wide Web and Web 2.0, but also in the current discourse on a post-capitalist Maker Economy, new technologies have been and continue to be characterized as the stimulus for fundamental processes of transformation. By enabling comprehensive processes of decentralization, they are seen to open up the possibility to surmount current socio-economic conditions. That technological innovation alone, however, is not capable of pushing society in a particular direction, but gradually unfolds in accordance with multi-layered dynamics of socio-economic appropriation, is something that already the history of the Gutenberg letterpress clearly shows us.

## Basic Patterns of Technology-driven Promises of Decentralization

The outlined expectations of a technologically derived decentralization of socio-economic conditions are characterized by three fundamental assumptions:

- New technological solutions or the repurposing of existing technology will enable the replacement of hitherto

centrally coordinated social communication and transaction procedures by distributed processes in peer-to-peer networks.

- As a result, intermediary organizations, established market structures, and classic forms of hierarchical coordination and decision-making will decline in influence and significance.
- Together, these dynamics will lead to a significant reduction of economic resource and power asymmetries, a disintermediation of social roles, and finally to a general democratization of the society as a whole.

However, although the Internet, at a purely technical level, is still based on the principle of decentralization, the empirical developments to date point in a direction that is opposed to these expectations: The DIY counterculture that arose with the *Whole Earth Catalog* did not lead to an erosion of centralized forms of production; instead, by exploring intermediary aggregation platforms for user-generated content, it contributed to the genesis of a basal business model for the Internet economy. Today, open source projects no longer compete with the commercial software industry; instead they serve as incubators for industry-wide infrastructures. Although the Web (2.0) makes communication more flexible and has contributed to the emergence of new hybrid forms of private and public spheres, this has not eroded the central significance of big media providers, nor has it led to a general dissolution of producer-consumer role distinctions. Instead, the current Internet economy is characterized by a historically unprecedented bundling of private sector power over infrastructures (Dolata and Schrape 2018).

One reason for the popularity of visions of technological decentralization in spite of repeated empirical disappointments be found in their patterns of complexity reduction (cf. Dickel and Schrape 2017):

- In the *factual dimension*, technological infrastructures are conventionalized as a means of overcoming solidified social problems as well as the respective processes of appropriation are decoupled from their socio-economic contexts. In the Web 2.0 discourse as well as in discussions of a digital post-capitalism, context-dependent application possibilities of new technology sets have been depicted as a catalyst for the genesis of decentralized substitution structures for fully-fledged functional contexts (e.g. the mass media or industrial economics).
- From a *social viewpoint*, the practices of early adopters of new technologies are often projected onto the future population as a whole without any consideration being given to their milieu-specific sociocultural backgrounds. The preferences of the young, educated, and tech-savvy users of the early World Wide Web and the Web 2.0 were not easily transferred to later users; the users of open

workshops such as FabLabs are conspicuous for their specific motivations (Lange and Bürkner 2018).

- From a *temporal perspective*, current theses of decentralization are readily dissociated from previous developmental stages. In the missing consideration of empirical qualifications or caveats regarding former expectations for the reformative power of the Internet in today's discussions of a post-capitalist Maker Economy, we see a reflection of the same ignorance of the failed visions of decentralized production from the 1970s found in the Web 2.0 discourse.

On the basis of such patterns of simplification and arising out of diverse economic and political interests, new and far-reaching promises of technologically-enabled decentralization are regularly reformulated—not least as they are easily integrated in a variety of ongoing societal discourses and fulfill elementary communicative functions in the areas being addressed (Dickel and Schrape 2017): With their explicitness, promises of technological decentralization not only contribute to the alignment and channeling of communication processes and the coordination of collective and corporate activities, but also facilitate distinction from other social groups in early-adopter milieus and offer a plausible basis for validation and legitimization in organizational and personal decision-making processes. And furthermore, utopian visions of technology-driven decentralization make it possible to depict the societal status quo as contingent as well as changeable and therefore open to criticism.

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