Digital Technology and the Promise of Decentralization: A Reconstruction of Popular Visions and Their Narrative Patterns

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Introduction

Since its beginning, the social adoption of the Internet has been accompanied by the promise of technology-driven decentralization. Already in its earliest embodiment, the World Wide Web was considered to foster decentralized societal structures and new forms of collective agency (Negroponte). Web 2.0 allegedly triggered the replacement of mass media and one-to-many distribution with peer-to-peer exchange and many-to-many communication—ultimately leading to a ubiquitous form of "prosumer capitalism" (Ritzer 413). With the advent of the Internet of Things, 3D printing, and cyber-physical systems, we have been witnessing again the prospect of new forms of coordination and collaboration, sufficient to counteract existing asymmetries of economic power, this time in the production of goods (Rifkin, *The Zero Marginal Cost Society*; *The Green New Deal*). Recently, such narratives have extended to discussions of blockchain technologies that, according to several social scientists (see, e.g., Vergne; Davidson et al.) were to render contractual intermediaries obsolete: "With blockchain, for the first time in human history, people and organizations can trust each other directly, without intermediaries. Trust is not achieved by a middleman; it is achieved by cryptography, collaboration, and some clever code" (Tapscott and Euchner 13). Although none of these expectations have been fulfilled empirically, the belief that digital technologies will lead to decentralization and democratization has substantially shaped public debates and social science discourse.

Drawing on empirical material (e.g., web content, text and video documents, press reports) and social science research, this article begins with a problem-centered reconstruction (Héritier; Mayntz) of the discourse of technology-driven decentralization—from the Californian do-it-yourself subculture 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 economic

systems. Subsequently, I will elucidate the shared patterns of complexity reduction of technology-centered promises of decentralization, which are a primary reason for their popularity despite repeated empirical disappointments. In light of their unambiguous formulation, these visions serve as easily recognizable landmarks in public debates and social science discourses, contributing to the channeling of public awareness and offering a basis for legitimacy in individual, collective, and corporate decision-making processes. They open up new fields of collective agency and make it possible to depict the societal status quo as both conditional and contingent and, therefore, open to criticism. Yet most visionary publications inherently give little consideration to the possibility of an expansion, conversion, or layering of existing socio-economic structures and instead focus on their radical displacement.[1]

The Whole Earth Catalog and DIY Culture

The *Whole Earth Catalog* (WEC) represents a fundamental point of origin for the vision of a decentralized do-it-yourself (DIY) culture. Regularly published from 1968 to 1971, it is considered one of the primary organs of the California counterculture movement of the late 1960s (Kirk; Roszak). The catalog defined itself as an "evaluation and access device" for technological tools. Reacting to a work culture defined by increasing division of labor and economic centralization, it propagated a return to 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 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, *Whole Earth Catalog* 2)

Stewart Brand, founder of the WEC and of its successor, the popular science magazine *CoEvolution Quarterly*, was an entrepreneurial activist with parental financial reserves in the U.S. hippie subculture. In 1985, he co-launched *The WELL* ("The Whole Earth 'Lectronic Link"), one of the first virtual communities. Contrary to many of his contemporaries (e.g., Mumford), Brand viewed technological progress, social balance, and the conservation of nature not as being fundamentally in conflict. Instead,

1 This article builds on previous research on digital transformation and the architectures of digital utopianism, including Dolata and Schrape, "Platform Companies" and *Collectivity and Power*; Schrape, "Open-Source Projects"; and Dickel and Schrape, "The Logic."

he argued in 1974, the proper application of technology held the promise of a better future in each of these areas: "Man has still within him sufficient resources to alter the direction of modern civilization, for we then need no longer regard man as the passive victim of his own irreversible technological development" (Brand, "Comment on" 23). In this respect, Brand identified information, specifically practice-oriented knowledge of production and technology, 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. […] On the other hand, information almost wants to be free because the cost of getting it out in many respects is getting lower and lower all the time" (Brand in Getty Images Archive 0:38-1:09).

Accordingly, the basic idea of the WEC was to make technological know-how accessible to as many people as possible in order to empower them to produce material goods in a decentralized and collective manner: "At a time when the New Left was calling for grassroots political (i.e., referred) power, Whole Earth eschewed politics and pushed grassroots direct power—tools and skills" (Brand, "Whole Earth Catalog" 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 sharp contrast to the world of centralized production and private enterprise, one who, aided by the power of how-to knowledge and relying on collective means of self-organization, would prepare the way for a better era of human existence to come.

Brand touched the nerve of the times. While the first WEC was distributed in small numbers, by the time of the so-called *Last Whole Earth Catalog* was published in 1971, it had a print run of more than one million copies and was distributed by a major publisher. Kenner described publications like the WEC as "metaphors disguised as how-to-do-it and where-to-find-it manuals. The deepest need they satisfy is the need for such metaphors" (34). In addition to its unwavering belief in the primacy of technology as a solution to social problems, the early WEC stands out for the initial development of what is now a ubiquitous business model, "essentially encouraging customers to create the product, and then selling the customers and their work to each other and keeping the profits" (Worden 212). In Brand's subsequent publications (*CoEvolution Quarterly*, 1974–1984; *Whole Earth Review*, 1984–2003), ecological issues thus moved into the background, as they gave increasing attention to technological innovation and entrepreneurial decentralization.

In Europe, where self-sufficiency had previously mostly been a matter of necessity due to the constraints of the post-war period, politically motivated DIY practices gained prominence with the rise of the environmental movements in the 1970s. In addition to the then ubiquitous nature and wildlife documentaries on TV, with their increasing warnings about environmental sins, the 1972 report on "The Limits to Growth" by the *Club of Rome* questioned the widely held belief in the benefits of progress and imparted a fundamental awareness of the significance of ecological imbalances (Engels et al. 153–64). In alternative subcultures, one response to this

awareness was a change in personal lifestyle, with the desire to free oneself from the influence of market forces, which lead to a rediscovery of collective craft and small trade.

The conceptual basis behind this shift to decentralized production and consumption patterns could be found in numerous large-scale works critical of big industry, i.e., the studies by Jungk (1973), Ullrich (1977), and Schumacher (1973). Schumacher's notion of an "economics of permanence," in particular, had a substantial impact on the international environmental movement, and anticipated some essential ideas for a decentralized post-growth society. Like Brand, Schumacher saw the key to human survival in changing the way we approach existing and emerging technologies: "[…] a technology with a human face, is in fact possible […]. It serves production by the masses instead of mass production" (117–18). Similarly, Burns foresaw an "inevitable […] decline of the market economy" (14), and Harman predicted a social transformation that, as Marien summarized, would lead to "frugal technology […] and more emphasis on social innovation" (422).

The Computer Counterculture and the Free Software Movement

However, by the early 1970s, the activist networks associated with the WEC were already taking a different direction—away from the idea of an all-encompassing anti-capitalistic lifestyle and toward the emerging computer hacking scene (Kirk; Turner). First, the few readers who aspired to really implement the WEC's proposals realized that it was impossible to decouple oneself from centralized economic structures overnight, due to the degree of technical competence this would require. 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 5). Third, through his observations on the video game *Spacewar!*, which was programmed by students from 1961 on, Brand developed an early fascination with 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, "Spacewar" 50).

Although a closer look shows that *Spacewar!* can hardly be considered a typical example of a product developed in a hacker scene detached from the commercial market, given its development on university computing equipment donated by major corporations and its later adoption by the video arcade industry (Lowood), Brand had recognized early the potential for shifting WEC concepts of decentralization and collective empowerment through access to technological knowledge to the world of intangible information networks. The free and open circulation of technological knowledge and information was, in fact, formative for many computer-

centered project groups that were established at universities in North America in the 1960s. Their work served as the breeding ground for the broader amateur computer scene in the 1970s, which has been described as "an avid, eager-beaver breed, anxious to share technological insights and applications with other chip fanatics" ("The Computer Society" 49).

As this niche gradually expanded in the 1980s into a full-fledged microcomputer industry serving the mass market, knowledge sharing became increasingly hampered by technical hurdles such as the distribution of software in binary format and changes to copyright law (Menell). In response, in 1983, MIT employee Richard Stallman announced the development of a freely usable, open-sourced operating system (GNU) as an alternative to proprietary software distributions. With Stallman's "Free Unix!" manifesto, the *Free Software Movement* was born, promoting open and self-organized software development ever since. Moreover, with the establishment of legally recognized licensing models for open-source software, the movement eventually became the basis for open-source projects such as the *Linux* kernel, which became fundamental for the industry (Schrape, "Open-Source Projects").

Brand was associated with the *Free Software Movement* from its very beginning. In 1983, publisher *Quantum Press/Doubleday* gave him an advance of 1.3 million U.S. dollars to create a *Whole Earth Software Catalog* "[that] would do for computing what the original had done for the counterculture" (Turner 129). The catalog came out in 1984, but was a commercial disappointment. Yet the subversive impetus of the original WEC becomes apparent in the introduction to the *Software Catalog*: "Computers and their programs are tools. They empower. They estrange. […] Their power grew with governmental and commercial institutions after the war […]. With the coming of personal computers came a shift in the power balance" (Brand, *Whole Earth Software Catalog* 2).

Brand, with Kevin Kelly (who later became the editor of the tech periodical *Wired*), also organized the first *Hackers Conference* in Sausalito (San Francisco Bay Area) in 1984, bringing together the hacker scene and the burgeoning IT industry. The event further advanced the development of a hacker ethic (Levy) as well as of new business models—and it was at this conference, too, that Brand made his famous statement—which was later frequently misquoted: "Information *almost* wants to be free" (Brand in Getty Images Archive 0:38-1:09). Kelly, along with Brand, was furthermore involved in the launch of the online community *The WELL* in 1985, which was based solely on user-generated content and, unlike social networking sites of today, funded 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" ("Sausalito Journal" A14).

Taken together, the *Whole Earth Software Catalog*, the *Hackers Conference*, and *The WELL* visibly accomplished the transformation in California "from counterculture to cyberculture" (Turner): No longer was the focus on the decentralized production of material goods, but rather on the collective appropriation of the world of digital information. For one thing, the belief in the decentralizing power of the network—resulting in a dissolution of the social roles between producers and consumers, a loss of relevance of formal organizations, and an extended scope for collectivity—became a defining influence on the subsequent discourse on cyberspace and Web 2.0. At the same time, the WEC and *The WELL*, with their early implementation of intermediary platforms for distributing and exploiting user-generated content, put to the test a concept that was to become influential for the development of the platform-based Internet economy (Dolata and Schrape, "Platform Companies").

Cyberspace, Web 2.0, and Digital Prosumerism

Beginning in the early 1970s, but widely unrelated to the Californian countercultural movement, several expectations related to technology-induced decentralization began to circulate in the German-speaking countries. Given the influence of Bertolt Brecht's radio theory and Hans-Magnus Enzensberger's "Constituents of a Theory of the Media," those were linked to the then-new media. The videocassette system was seen as the antithesis of a hierarchically constituted society (Baumgart); videotext systems heralded the end of the traditional mass media and the advent of novel options for the public to participate directly in political decisions (Haefner 286–96.). Cable television, with its richness of information and intended "open" channels allowing citizens to co-create the program, was expected to offer media recipients new opportunities of choice and expression (Modick and Fischer).

With Berners-Lee's invention of the World Wide Web as a user-friendly interface of the Internet, the American and European lines of discourse and other tech-related visions (e.g., Haraway) converged, and, from the early 1990s on, the Web quickly became known as an essentially open medium, one that would promote greater public democracy and flatten the hierarchies between producers and recipients. Negroponte, for instance, attested to the Internet—at the time termed "cyberspace" (Barlow)—the capability to advance the shift "of some intelligence, from the transmitter to the receiver" (19): "It has four very powerful qualities that will result in its ultimate triumph: decentralizing, globalizing, harmonizing, and empowering. […] The traditional centralist view of life will become a thing of the past" (239f.). In a similar sense, Steven McGeady diagnosed a "shift back towards decentralized management models and decentralized work models" (147). More moderate voices like Neil Postman, who noted that it was no longer the dissemination of information that was

the pivotal problem, but rather how to use it to generate knowledge, received little attention at this time.

After a brief period of disillusionment as a result of the implosion of the "dot-com bubble" in 2000, discussions about the reformative power of online technologies picked up again in 2002 in the social sciences: Drawing on the open-source movement's own narratives (Raymond), Yochai Benkler pointed to the increasing relevance of open-source software projects as evidence for a new, more effective production model that, being based on equitable and decentralized forms of collaboration, would eventually gain advantage over the 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 394)

A related influential concept was the paradigm of "open innovation": Drawing on the success of open-source projects, Henry Chesbrough coined the term in 2003 to characterize how previously closed and intra-organizational research and development (R&D) processes were opened up, decentralizing the dynamics of innovation and presumably improving competitiveness as well as cost-effectiveness (Bogers and West).

In 2005, the Internet again moved to the forefront of public discourse with Tim O'Reilly's widely noticed essay "What is Web 2.0?" At its core, O'Reilly's text addressed the unprecedented bundling of data in the business world: "Database management is a core competency of Web 2.0 companies […]. This fact leads to a key question: Who owns the data?" (O'Reilly 3). This aspect, however, quickly faded into the background during this phase of public discourse, as Web 2.0 quickly became a synonym for an overall spirit of optimism about the enabling possibilities of the Internet. In this context, three expectations can be distinguished that together amount to a vision of technology-induced decentralization and dismantling of established socio-economic distribution of roles (Schrape, *Digitale Transformation* 70):

- *End of the mass media*: Gillmor referred to Web 2.0 as the first "many-to-many" medium and the first step toward a general loss of relevance of the classic, "one-to-many" mass media: "Grassroots journalists are dismantling Big Media's monopoly on the news, transforming it from a lecture to a conversation" (I, IV).
- *Dissolution of producer and consumer roles*: Rheingold resumed the discussion on the expansion of collective intelligence through the Internet, and Surowiecki coined

the idea of the "wisdom of the crowds," followed by Kelly, who postulated in 2005 that by 2015 "everyone alive will (on average) write a song, author a book, make a video, craft a weblog, and code a program."

- *Democratization of societal decision-making*: The assumption that all Web users would become prosumers also led to the idea of a general democratization of decision-making throughout society due to new tech-induced options for collective agency (Castells) and "the power of organizing without organizations" (Shirky I).

In the Web 2.0 debates, again, critical voices were initially rarely heard. This is certainly true with regard to Habermas's comments in 2006, which noted the ambivalent political consequences of a fragmented public sphere ("Political Communication"; see also Habermas, "Reflections," 2022), as well as for Lanier, who warned of the unpredictable consequences of self-governing collectives.

Although it soon became apparent that sheer technological possibility would not lead to shifts in social roles and that the dynamics of the information age are shaped to a much lesser extent by individual users and user collectives than by a small number of IT corporations (Dolata and Schrape, "Platform Companies"), the affirmative theses listed became sententious points of reference in the ongoing discourse, eventually culminating in the proclamation of an entirely new age—"the age of the prosumer" (Ritzer et al. 380). This "prosumer society" (Ritzer 413) allegedly would be characterized by the newfound power of the consumer and the decentralization of media production and diffusion (Ritzer and Jurgenson; Anderson).

In this context and under the immediate influence of the "Arab Spring" (2010/2011) and Occupy Wall Street (2011), the well-received concept of "connective action" has furthermore been worked out by W. Lance Bennett and Alexandra Segerberg. They characterized online technologies as "organizing agents" that would assume the coordination tasks of traditional movement organizations and enable decentralized and distributed forms of "peer organization in the crowd" (Bennett et al. 239).

A closer look at the attention and coordination dynamics of the cases mentioned and more recent movement phenomena (e.g., Mouvement des Gilets Jaunes, Fridays for Future), however, reveals that the impression that technology can override or substitute formerly essential organizational processes is primarily the result of a temporally limited, or situational, point of view. As Anastasia Kavada has pointed out, crowd protest dynamics and organized movements have always been closely intertwined. As soon as it comes to establishing collective agency and public visibility beyond the moment, protest movements, even in the digital age, cannot do without genuinely social and complex processes of internal organization, identity formation, and collective goal-setting (Dolata and Schrape, *Collectivity and Power*).

The Notion of a Post-Capitalist Maker Economy

With the popularization of 3D printing, from the mid-2000s onwards, tech utopianism again took a "material turn"—away from the world of immaterial information and toward the distributed production of material goods. Drawing on additive manufacturing technologies already in use in industry since the 1980s and using open-sourced design data, Adrian Boyer, in 2004, initiated the project Replicating Rapid-Prototyper to develop a 3D printer assembled entirely from 3D-printer-produced parts. In his manifesto "Wealth without Money," he characterized 3D printing as the next step in socio-technological development that would decentralize economic processes and return the control of the means of production to the people. MIT employee Neil Gershenfeld's FabLabs pursued similar objectives: open workshops equipped with modern machinery offering all participants the opportunity to manufacture their own material goods. Chris Anderson, already an influential voice in Web 2.0 discourse, described 3D printing as the harbinger of a "new industrial revolution" that would lead to the emergence of a "maker economy" in which anybody could actualize their product ideas anywhere (51).

The basic idea from 1960s Californian counterculture that "grassroots direct power" (both in an economic and political sense) could be achieved by making tools and knowledge available to everybody had thus undergone a comprehensive update: New technologies were now expected to tackle the DIY scene's inherent problems, as many of the tools and resources needed could now be manufactured by amateurs themselves. In this manner, central dilemmas of open-source and maker movements (e.g., exploitation by corporations) would be resolved through a decoupling from traditional capitalist market structures. Modern means of communication would help to ensure that self-sufficiency was no longer accompanied by social deprivation (Anderson; Gershenfeld).

Taken together, contributors to the discourse suggested, 3D printers, online technologies, and the Internet of Things opened up opportunities for social transformation that previously could not be realized:

> The Makers Movement […] has been driven by four principles: the open-source sharing of new inventions, the promotion of a collaborative learning culture, a belief in community self-sufficiency, and a commitment to sustainable production practices. […] 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 in the twenty-first century. (Rifkin, *The Zero Marginal Cost Society* 99)

In other words, visions of technology-driven decentralization no longer solely pertained to commons-based peer production or an adhocracy among equals

in cyberspace, but— under the umbrella term of the "collaborative commons" (Rifkin)—now projected that the decentralized production of material goods would help overcome real-world socio-economic imbalances (Papadimitropoulos; Kostakis et al.; Stalder).

Propositions for a socially and ecologically balanced post-capitalist economy also draw on such narratives. They offer the prospect of an upturn for the individual and self-organized collectives and a loss of relevance for classic economic authorities due to "the rise of non-market production, of unownable information, of peer networks and unmanaged enterprises" (Mason 244). Thanks to new forms of technologically mediated collective coordination, communities such as FabLabs or Makerspaces can now exchange knowledge at all stages of production and development regardless of time or location. Such communities, it is suggested, will thus 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 existence (Pansera and Fressoli; Hankammer and Kleer).

Much like their forerunners, "resilient communities, the degrowth movement and peer production" are described as complementary components of a comprehensive paradigm shift—"away from an economic system based on the irrational exploitation […], towards one characterized by a radically different definition of the content of human well-being" (Kostakis et al. 133). In a similar sense some evangelists consider Blockchain technology, the principle of decentralized accounting based on cryptographically secured chains of distributed data ledgers managed by peer-to-peer networks, to be the stepping stone to an emerging period of post-capitalism in which intermediary organizations allegedly become increasingly obsolete (Vergne; Waters; Tapscott and Tapscott; Cohen): "The ultimate purpose of blockchain is to abolish, or at least reduce the power of monopolies, and according to its proponents this will eventually happen using decentralized structures allowing creators to interact directly with users […]" (Makridakis and Christodoulou 8).

From the countercultural message of the Whole Earth Catalog to the computer hacking scene and the debates about the Web and Web 2.0, to the discourses on a presumed maker economy and post-capitalism, new technologies have been and continue to be characterized as the stimulus for fundamental processes of societal transformation. By enabling comprehensive processes of decentralization and novel forms of collective agency, they are seen to open up the possibility of surmounting current societal conditions. Yet, technological innovation alone is incapable of pushing society into a particular direction; it is necessarily embedded in multi-layered social appropriation processes, as the history of the Gutenberg printing press clearly showed us already centuries ago: The modern letterpress was only able to achieve its transformative power in an interplay with major societal developments, including the European Reformation and the Industrial Revolution (Stöber).

Narrative Patterns of the Promises of Technology-Driven Decentralization

The promises of technology-driven decentralization outlined above are characterized by three basic assumptions: (1) Technological innovations or the repurposing of already existing technologies are expected to enable the replacement of centrally coordinated communication and transaction procedures with collaborative processes in peer-to-peer networks. (2) As a result, intermediary organizations, established market structures, and classic forms of hierarchical decision-making are expected to decline in significance. (3) Taken together, these dynamics are expected to lead to reduced socio-economic power asymmetries, the disintermediation of social roles, and a democratization of society.

However, although the Internet, at a purely technical level, is still based on the principle of distributed control and decentralization, empirical developments point in a direction opposite to these expectations:

- The DIY counterculture that arose with the WEC did by no means lead to an erosion of centralized production. Instead, by exploring intermediary structures for the aggregation of user-generated content, it contributed to the genesis of a core business model of the platform-based Internet economy (Worden).
- The present-day relationships between open-source communities, hardware and software companies, and the commercial IT sector in general are not characterized by competition but complementarity, as open-source development projects nowadays serve as essential incubators for industry-fundamental infrastructures and standards (Schrape, "Open-Source Projects").
- Although the Web (2.0) has made communication more flexible and contributed to the emergence of new hybrid forms of private and public spheres as well as new forms of collectivity and collective agency, this has not eroded the significance of big media providers, nor has it led to a general dissolution of producer-consumer roles. Instead, the present Internet economy is characterized by an almost worldwide hegemony of a few technology companies and a historically unique bundling of private sector power over infrastructures and data (Dolata and Schrape, "Platform Companies").

Against these findings, it seems implausible that further technological innovations or new technology-mediated forms of co-production, co-consumption, and collectivity will lead to an end of mass production or an immediate loss of relevance for intermediary organizations. Nonetheless, corresponding expectations continue to circulate in public and social science discourse, especially in the early days of any new technology. One reason for the popularity of technology-driven promises of decentralization despite repeated empirical disappointments—other than their compati-

bility with utopian ideals (Sargent)—can be found in their patterns of factual, social, and temporal complexity reduction (*Tab. 1*).

Table 1: Simplification patterns of technology-based decentralization promises

Factual Dimension	Social Dimension	Temporal Dimension
Decontextualization Decoupling from socio-economic contexts; bridging social problems through technology	*Overgeneralization* Transference of technological practices from specific user milieus to the population at large	*Detachment* Dissociation from past empirical disappointments; marginalization of professionalization dynamics

Source: Dickel and Schrape (54).

In the *factual dimension* of meaning, technological innovations are framed as solutions to overcome or bypass long-term solidified social problems. The discourse here tends to detach application-specific technologies from their original frame of reference, as the processes of technology adaption become decoupled from their socio-economic contexts and characterized as universal alternatives. In the Web 2.0 discourse and debates on a presumably emerging post-capitalistic economy, context-dependent application areas of new technologies such as 3D printing or social media have been depicted as a catalyst for generating comprehensive decentralized substitution structures for fully-fledged organizational contexts and functional systems of society (e.g., economy, law, politics).

From a *social viewpoint*, the early adopters of new technologies are formatted as agents of socio-technical change. Their individual and collective practices are projected onto the future population as a whole without considering their milieu-specific sociocultural backgrounds. The activists in the early DIY movement, for example, were forced to realize early on that the ideal of a distributed subsistence economy was not an option for most people. Likewise, the preferences of the young, educated, and tech-savvy early adopters of Web 2.0 were not easily transferred to later users (seminal: Rogers); the users of open workshops such as *FabLabs* or *Makerspaces* are as well conspicuous for their specific motivations and socio-economic backgrounds (Hepp and Schmitz; Schrape; Lange and Bürkner).

From a *temporal perspective*, current visions of decentralization are readily dissociated from previous developmental stages, failed expectations, and foreseeable professionalization dynamics. Contemporary discussions of a post-capitalist economy often fail to consider empirical caveats regarding former expectations about the

reformative power of the Internet. These discussions reflect the very same ignorance found in the Web 2.0 discourse that ignored the failed visions of the 1970s. The gradual appropriation of niche developments by established economic actors in earlier periods is likewise overlooked in current debates or regarded as the consequence of afore insufficiently defined technological infrastructures.

Communicative Functions of Visions of Technology-Centered Decentralization

Based on such patterns of simplification and arising out of diverse individual and collective interests, far-reaching promises of technologically-enabled decentralization are regularly reformulated—often by professional "visioneers" (McCray; Sand)—not least as they are easily integrated into a variety of ongoing political, cultural as well as economic discourses and fulfill elementary communicative functions in the areas addressed (Zhan; Schrape, *Digitale Transformation*; Tutton; Beckert; Konrad).

Table 2: Communicative functions of technology-centered decentralization visions

Channeling	Alignment due to the necessity of either consent or disagreement; semantic coordination of collective and corporate activities
Motivation	Motivation of volunteers in civil society, of freelancers and employees in economic contexts, or of early adopters in innovation processes
Distinction	Supporting the construction of collective identities, simplifying differentiation from other social domains or groups in early user milieus
Legitimization	Plausible basis for validation and legitimization in entrepreneurial or organizational, political, and personal decision-making processes
Attention	Public awareness of potential new socio-technological development paths; marketing of commercial products and content; individual self-marketing
Criticism	Critical assessment of given social conditions through the construction of utopian alternatives alongside new technological possibilities

With their unambiguousness and thus insistence on either agreement or rejection, such propositions of technological decentralization considerably contribute to the alignment and channeling of socio-political communication processes, the semantic coordination of collective or corporate activities, and the motivation of employees, freelancers, consumers, volunteers, or activists. Moreover, they facilitate the construction of collective identity and goal-setting in social movements, tech-related communities, and further interest groups and allow a distinction from other social domains in early-adopter milieus (*Tab. 2*).

In light of a fundamentally unpredictable future (Schneider et al.), the expectations and visions outlined above also offer a plausible basis for validation and legitimization in organizational, collective and personal decision-making processes as they substantially contribute to the coping with contingencies and uncertainties (Dickel and Schrape 54): Business enterprises may see in these utopias (or dystopias) a confirmation of their previous course or derive from them a need for realignment. Early adopters may align their preferences with them and consider themselves as "innovative." Academia may declare a need for further research. Established politicians or social movement activists may call for reorientation. Mass media and publicist channels on the Social Web may mount a series of follow-up reports after the emergence of a (recurring) radical vision of the future.

Furthermore, as can be seen in the history of the discourse since the 1960s and, more recently, in the example of blockchain technologies, radical visions and expectations of technology-driven decentralization serve to create public awareness of potential socio-technological development paths that private-sector organizations or science and politics at some point will have to confront. They open up new fields of experimentation and collective agency, both in the political and economic sense, and promote the emergence of accordingly oriented communities or movements. Finally, utopian expectations and visions of the future associated with new technological lines of development make it possible to depict the societal status quo as both conditional and contingent and, therefore, changeable and open to criticism. Thus, the recourse to technology-based promises of decentralization can serve as an instrument for reducing situational complexity in a plethora of communication contexts.

Conclusion

Notions and visions of technology-driven decentralization and democratization continue to circulate with increasing ubiquity—from the Californian counterculture of the 1960s, the computer hacking scenes of the 1970s and 1980s, and the debates on the disruptive potential of the World Wide Web and Web 2.0 in the 1990s and 2000s to more recent visions of a post-capitalist economy. The specific

expectations range from the user-centered creation and distribution of digital information to the decentralized production of material goods. Yet, they all share the prospect of overcoming existing social power configurations, the belief that new technological solutions will enable the transfer of hitherto centrally coordinated socio-economic activities to distributed peer-to-peer networks, and the conviction that technologies foster self-organized collectives and new, more potent forms of collective agency.

The unambiguous formulation of these visions allows them to serve as easily recognizable landmarks in public debates and social science discourses, contributing to the channeling of public awareness and offering a basis for legitimacy in individual, collective, and corporate decision-making processes. Yet most visionary publications inherently give little consideration to the possibility of an expansion, conversion, or layering of existing socio-economic structures and instead focus on their radical displacement.

However, even though new technologies from the 1960s onward have led to considerably greater flexibility in communication, collective coordination, and collaborative production of content or goods, this has by no means caused a radical erosion of fundamental socio-political resource and power asymmetries, nor a general replacement of established forms of socio-economic organization. Open-source projects, for example, have contributed significantly to the reorganization of software production. Today, though, they are, above all, an integral part of the development activities of large IT companies. On the one hand, Web 2.0 has significantly expanded the scope for collective formations and enables new forms of collective agency, but, on the other hand, it has also led to the emergence of highly profitable multi-sided market structures and centrally controlled platform ecosystems for almost all activities society has to offer.

Promises of decentralization, or even democratization, of socio-economic structures primarily through technology thus remain a well-honed delusion, one that, in the worst case, obscures contradictory empirical developments such as oligopolistic configurations or dynamics of re-centralization in the Internet economy. At their best, technological infrastructures can serve to enhance existing trends in social, political, or economic areas, which already show a tendency toward decentralization. However, these potentials will not be realized automatically within the horizon of technological innovation, or within a short period of time, but become part of long-term and gradual socio-technical reconfiguration dynamics, as they are in all cases embedded in complex and multi-layered processes of social appropriation and deliberative negotiation.

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