Society, Technology and the Future in Tech Development

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Abstract

Much attention has been brought to the techno-futures of "Californian Ideology" (Barbrook/Cameron 2001) and the popular discourse of Silicon Valley. This paper explores techno-futures as collective orientations (Bohnsack 2010) of tech developers outside of tech world's epicentre. Two group discussions among tech workers are used to identify their understanding of society, of technology's role in it, and visions of the future. This analysis relates to two sociological approaches: the sociology of future imaginaries and utopias and the sociology of critique. These perspectives shed light on future imaginaries as interpretations of society and technology's role in shaping it as well as normative judgements on capitalism and technology. The findings suggest that variations of the well-researched Silicon Valley technology discourse can be detected in the discussions. In contrast to a Solutionist Polis legitimising the Silicon Valley model of disruptive innovation (Nachtwey/Seidl 2017), the respondents demand democratic and social control of technological development. Yet, this is only associated with the sphere of the application of technologies, while the production of technologies is imagined as independent from the social and political sphere. The orientations thus indicate a technologized vision of the future, in which society has a reactive role vis-à-vis technological changes.

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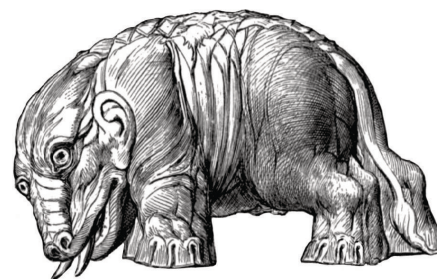
Introduction

Many famous tech developers of the last decades engaged in predicting or imagining a future shaped by disruptive technological innovations (e.g. Kelly 1994; Kurzweil 2010). These "visioneers" imagined a complete "mastery of the material world through technology" (MyCray 2012, 9). New technologies such as AI and robotics, biotechnology, nanotechnology or digital technologies like Blockchain are believed to create a more rational and democratic world of abundance for all through a resourceless production and to even make us live longer (Kelly 1994; Kurzweil 2010). Analyses of this "Californian Ideology" (Barbrook/Cameron 2001) or "Cyberculture" (Turner 2008) have revealed the cultural and political connections of this optimistic technological discourse to libertarian economic views. Sociological analysis of technological utopias reconstruct how these visions of the future may over-emphasize technological transformations while leaving societal questions untouched (Dickel/Schrape 2015, 442f.). Yet, less attention has been given so far to collective orientations on the micro-level of social interaction. Actors beyond Silicon Valley's most famous personalities and firms are participating in shaping techno-futures on a local and daily basis. Their ideals are most likely to depart from the 'Californian Ideology' (Thompson 2019, 22). This paper explores imaginaries of the future, ideals and understandings of society and technology as collective orientations of groups of technology developers. These orientations are defined by the Documentary Method as "tacit knowledge, which is implied in the practice of action" (Bohnsack 2010, 103). They are based on a common knowledge of experience (ibid., 103f.), in this case daily work experiences in the field of technological development. They constitute a collective understanding of our (technological) society and might orient actions that can shape this society. Despite the small and exploratory sample, this study offers first indications for exploring the collective perception of society and technology's role in it as well as possible variations within the subfields of development of technology.

At the centre of this study are two group discussions with tech developers conducted in Germany in 2019. Whereas most studies investigate cutting-edge AI-researchers or tech gurus geographically and socially embedded in the large companies of Silicon Valley, the participants of the group discussions were programmers and entrepreneurs who shape new technologies and their use on a local and everyday basis. The first group consisted of three students (only one studying computer science himself) who work together in a student initiative promoting and discussing possible applications of new technologies in start-ups and beyond. The other group consisted of the founder and co-founder of a media technology business (the former a programmer, the latter a business strategist) and a programmer unknown to the two other respondents working in a start-up on industrially applied software. The field of tech development is represented here by two groups belonging to slightly different spheres which will be distinguished in this analysis: (1) the production of technology and (2) the application and promotion of technology. The former includes coders, programmers and technology experts in general who create software or other technological products, the latter contains businesses, policy makers or NGOs who work on promoting and adapting new technologies to novel services and products. While in practice this distinction is increasingly blurred, as many (even within this sample) work

as tech producers and entrepreneurs at the same time, this distinction emerged from the discussions themselves. It serves here to contrast the different roles the groups might attribute to themselves.[1]

The analysis shows that technology is attributed with great power to transform society in a somewhat technologically deterministic vision. Yet, findings also suggest a context-specific rendering of a Solutionist paradigm (Nachtwey/Seidl, 2017). In contrast to the Solutionist principles (i.e. the belief that technological disruptions will solve humanity's problems, and that entrepreneurship and technological solutions can fulfil human potentials that are currently hindered by society's make-up; ibid., 18ff.), democratic control of the shaping of techno-futures is imagined. However, only decisions on technologies' applications, not their production, are considered to be subject to political and social control. Building on the analysis, two differing ideals of how politics should be organized to ensure beneficial technological development are explored.

The article starts with an outline of the theoretical perspectives that guided the research: the sociology of utopias and the sociology of critique. After some remarks on the methodology and data underlying this study, the findings are presented by referring to the two central "focusing metaphors" (Bohnsack 2010, 104) which sum up important characteristics of the discussions and offer an outlook on different models of society and politics implied in the groups' orientations. Thus, the explorative sample and analysis present possible implications for further research on future imaginaries in the technological realm.

Sociological perspectives on techno-futures

The micro-level focus of this research on collective orientations takes into account the interconnectedness of technology and its development, technological discourse and society. The large field of sociology of technology offers different readings of the part technology plays in society. Technology can be interpreted both as a social construct determined by societal factors, and as a force determining societal change (Häußling 2014, 14f.). Fisher points out the relationship between technology and culture by claiming that "technology is not only the material basis of society, but also its ideological foundation" and influences "the construction of reality" (2010, 15). He examines the discourse on network technology and interprets it not simply as a depiction of reality, but as part of a discourse legitimizing modern societies and capitalism (ibid., 2). This points to the ideological and normative impact of technology discourses: The investigated groups' orientations are seen as both *shaped by* and central in *shaping* technology discourses. These discourses, at the same time, are shaped by and shape the development and application of available technologies. In this way, the groups' orientations concerning techno-futures represent a way of making sense of the relationship between society and technology.

Sociological approaches to future imaginaries and utopias inform us about their function as both products of and factors in shaping society. Even though the discussions in this study aimed at how the respondents imagine the future and not specifically at their utopian vision, the sociology of knowledge offers approaches to utopias which can be fruitful to understand what

[1] Häußling introduces the production and the application of technologies in everyday-life or at work as two separate focusses of sociology of technology. He also states that the sociology of innovation has integrated both perspectives as innovations require application and acceptance to come into existence (Häußling 2014, 16f.).

we can learn from future imaginaries more generally. In discussing the future, both dystopian and utopian images were evoked by the groups. Sometimes, they functioned as a background against which to discuss more 'realistic' future scenarios. Both sociological approaches to utopias (Dickel/Schrape 2015) and to future imaginaries more generally (Uerz 2006) help understand the function of future imaginaries that are the subject of this study.

Utopias and future imaginaries are interpretations of what futures seem attainable and desirable[2] in a given context. As such, they can orient and motivate a collective's actions (Uerz 2006, 423; Dickel/Schrape 2015, 459). Analysing them thus helps us understand how people make sense of their world and what might influence their actions. Studies of the processes of innovation have also shown how "visions of technology" (Dierkes et al. 1996) shape the development and organisation of and the financial backing for certain technologies (van Lente 1993). In this sense, future expectations also have a tangible material effect on technological development. Urry points to the political implications of thinking about the future (2016). He also stresses the impacts of anticipations of the future on the present, as futures can be performative and bring about their own realisation (ibid., 8f.). Examining the power to own and to make the future, he criticizes a digital utopianism of the Silicon Valley and its companies and Think Tanks as a corporatized vision of the future (ibid., 11f.). Similarly, Pfeiffer analyses the German discourse on "Industry 4.0" and reveals that this seemingly technological discourse is widely shaped by economic actors trying to establish new regimes of production (2015, 14ff.). This shows that the distinction between utopias and 'realistic' future imaginaries is not only difficult to make but might also represent a political evaluation. Many of these studies on techno-futures and utopias focus on the macro-level of (written) discourses and cultural trends (see also Barbrook/Cameron 2001; Dickel 2011, 134f.) or on famous and impactful actors (Turner 2008; McCray 2012). Complementary to that, this study's group discussions allow for a micro-level analysis of the actors' collective orientations concerning technology and the societal future farther from centres of innovation. These orientations are the actors' interpretations of technology and its role in society and, at the same time, may shape their daily work on the production and application of technology.

Utopias and imaginaries also involve ideals of what is just, fair and worth attaining, leading to the second theoretical approach in this analysis – the sociology of critique. In the tradition of Max Weber, Boltanski and Chiapello (2001) have researched the Spirit of network capitalism. They point out that capitalism, in order to exist, needs to mobilise actors through a set of ideals that give meaning to their actions, something they call "polis" or "cité" (ibid., 461f.; Nachtwey/Seidl 2017, 7). These vary over time and change to absorb criticism in order to sustain the legitimacy of a capitalist economy. Further developing this line of study, Nachtwey and Seidl analysed texts about leading tech personalities of the Silicon Valley and noticed the rise of a new polis of digital capitalism which, referring to Morozov's concept, they call "Solutionist" (2017, 19). With this term they refer to the ideology that understands social problems as solvable by the 'right' technology, and disruptions of the market through good ideas of tech entrepreneurs as necessary while public policy appears to be inadequate for solving humanity's problems and may in

[2] Dierkes et al. distinguish between the feasible and desirable as two aspects of visions of technology (1996, 43f.).

fact constrain its potential (ibid., 23ff.). Future imaginaries of tech de-velopers can also contain affirmative or critical dimensions vis-à-vis the present and desirable changes. As Kalbermatter et al. point out in this issue, the changes in legitimisations and ideals mobilising actors to participate in a capitalist system do not only occur historically, but also geographically (Kal-bermatter et al. in this issue, 36). Accordingly, this article explores a German variety of a Spirit of Capitalism as well as possible differences between the fields of technological development. The perspective of the sociology of cri-tique sheds light on the normative dimensions of the groups' techno-futures: Discussions about desirable and attainable techno-futures can contain criti-cisms of the current world, technology's role in society, and more specifically of the Silicon Valley model of digital capitalism. This critique exists in the groups' shared orientations guiding their actions in the field of technological development.

Investigating collective orientations: Group Discussions

To investigate techno-futures as a collective phenomenon, group discus-sions were conducted with two groups: Group 1, situated in the realm of pro-moting and applying technologies, and Group 2, with a focus on the sphere of production of technology. This variation of group contexts allows for a first approach to possible differences between the techno-futures imagined in the two spheres of production and application of technology, despite the limited and preliminary scale of this study.

The tradition of group discussions of the Documentary Method Ralf Bohnsack developed (2010) is based on the assumption of the collective nature of actors' orientations. Group discussions then aim at observing the "framework of orientations" (ibid., 104) shared by a group through their common knowledge. The focus of Bohnsack's analysis lies on how things are said, on the groups' interactions and on what is understood among respon-dents without explanation (ibid., 103). To this end, a group discussion re-quires a self-dynamic and independent discussion among participants with limited interventions by the researcher (ibid., 106). Accordingly, the first question was simply: "You work in a field that plays a vital part in people's imagination of the future. How do you imagine the future in the next 20 to 30 years?" This open question readily generated an open discussion for about an hour in both groups, which was redirected only once by a question about how the respondents saw their own position in shaping technologies in the context of the discussed opportunities and risks technologies could bring. The self-sustaining nature of these conversations alone demonstrates the sa-lience of future imaginaries in the field of tech development. In a second part, participants were read provocative quotes on AI or technology in general for discussion.

In the process of analysing these group discussions, "focusing metaphors" drawn from Bohnsack's Documentary Method (ibid., 104) are essential to ex-plicate the framework of orientations: "This framework of orientations, as we call it, can only be unfolded by depictions and narrations, that means: it can only be depicted metaphorically. It is the researcher who on behalf of the participants explicates their frame of orientation, who brings it to terms." (ibid.)

Focusing metaphors constitute highlights of "the dramaturgy of the discourse" in which the groups' "conjunctive space of experience" (ibid., 105) documents itself. This method has a strong formal focus in analysing the group's interactions and the organisation of the discourse (ibid.). In addition to this, the analytical scope was widened to include a microanalysis of language following Jan Kruse's integrative method (2015) which involves theoretical and linguistic heuristics according to the research questions (ibid., 462-533). The linguistic analysis focused on metaphors, agency and positioning and general semantic characteristics of the material. This allowed for a close description of the groups' characteristics in six categories: their characterisation of technology and of society's future, their self-positioning, the role of other societal actors in shaping technological development, the role of humanity in tech development (or the anthropology underlying the imaginaries), and the question of what a just future might look like.

Focusing Metaphors: Society as a Football Stadium and Programmers as Mediators

This section presents the central findings based on the identified 'focusing metaphors' of both discussions. After a short overview over the group discussions' content, the focusing metaphors will be described in detail as they contain many of the groups' characteristics in a nutshell. These metaphors also allow for further exploration of the implicit imaginaries of politics and technology's role in it. The metaphors give insight into different models of a technologically transformed societal order which can inspire further research on future imaginaries in the technological realm.

The group of students who work together in a start-up initiative (Group 1) promote the use of new technologies and organise educational events on these topics. The group is mainly oriented towards making technology and its benefits accessible to a wider range of institutions and individuals. The respondents discuss ideas of how the economy should be restructured to grant free access to new services, such as a universal basic income or a money-free and needs-based organisation of society. A beneficial use of technologies, according to the respondents, requires a *global* authority able to initiate these changes in a competitive global economy as well as public debates on what services and goods society wants and needs.

The discussion conducted with workers from small tech businesses (Group 2) puts more stress on potential misuses and negative effects of technology. The respondents problematise monopolies in the tech world which don't benefit most people but enable few to profit from the new technologies and control others. They lament the lack of technological knowledge among the general population and especially among politicians which leads to harmful uses; accordingly, they see technological education as the key to a democratic control of technological development.

The metaphor of a referee in football stands at the centre of the first group's discussion and represents the regulation of digitalisation and reactions to it. In this section, the respondents talk about abuses of technologies (fraud in the cryptocurrency business for instance) and about the negative effects on public acceptance of technologies. They then express the need for

an international authority to regulate innovations, at which point one respondent begins to use the metaphor of the referee for state authorities. He refers to football fans not accepting video-assisted-referee (VAR) systems and compares this to digitalisation: The economy could reject too much regulation, just as fans get annoyed while waiting for the referee's VAR-based decisions. Another respondent answers that in football, fans have always protested new rules that were suddenly implemented, for instance the offside rule, but accept them with time. He suggests the same reaction can be expected in the context of technological innovations: People will eventually get used to them. The third respondent then explicitly compares the fans in a football stadium to society: As with the VAR-system, society simply has to make choices on new technologies. The conflict about VAR-systems poses a simple optimizing problem: People can either decide that their priority is to minimize the mistakes made by the referees or to minimize the time they wait for a decision. Accordingly, the respondent argues that society's preferences for how to apply new technologies can be implemented after a democratic decision-making process.

This section reveals many of the group's characteristics. As the discussion primarily focuses on the applications and implementation of technologies, society and the public are often equated with the economy or entrepreneurs. This economic orientation is also expressed in the shifting meaning of the metaphor: Initially, the fans represent the economy refusing changes in regulation imposed by an undefined authority, but then the respondents talk about public scepticism and acceptance of technological change in general. Similarly, VAR systems at times stand for regulating policies that could alienate the economy, at times for technological innovations more broadly to which society reacts sceptically. In other parts of the discussion, the group's common aim is described as spreading knowledge about possible beneficial uses of technology to overcome the sometimes hostile first reactions to technology. This anthropology of hesitant but adaptive humans is present in the metaphor as well: Humans are sometimes sceptical towards technological progress, but when they learn more about technology, it can be used in a beneficial way. As one respondent argued, people first didn't like the offside rule "but then that's what made the sport more exciting, and it could be the same with VAR technologies".[3]

Additionally, the production of technology here is imagined as an autonomous process without human agency: It just happens, such as the regulation changes in football seem to simply occur without the discussion ever touching on any active actor making decisions on the changes. The application of technology on the other hand should be a democratic process: Society needs to decide how it wants to apply technology. However, these choices are somewhat reduced to simple optimization problems in reaction to new opportunities offered by technology. In the idealized image of a fan crowd, everyone has a voice, and definite yes-or-no answers can be given to new technologies and then easily implemented without conflict. This is a somewhat democratic rendering of the Californian Ideology: The importance of a democratic decision on innovations and regulations is stressed; however, this democratic vision of a football stadium is reduced to a simple binary vote in reaction to technologies.

[3] The quotation is my own translation of the original German transcript.

The referee metaphor implies a general interpretation of politics in a classic liberal approach. The political system imagined as a referee represents an impartial regulator who enables individuals to benefit from technological changes and protects them from fraud. Technological changes and the following regulations also require public acceptance though. Thus, the state appears to fulfil the function of surveying opinions and needs and of acting according to the majority. This becomes salient not only in the stadium-metaphor, but also in a different part of the discussion, where one of the respondents imagines that a good AI would collect data from direct, phone-based referendums and integrate them into decision-making. Technology in this view is a tool that will either be deemed useful or useless by the public. At the same time, it is a tool that can support the government's efficiency and decision-making by collecting data. Hence, technological development represents an exogenous force that takes place independently of the social and political. Technologies subsequently enter the political arena as the subject of a debate on their implementation and as enhancers of democratic rule through data collections. In general, this metaphor hints at a very classic liberal notion of politics as the protection of individual security and arbiter of peace and collective interests.[4] This can be seen most clearly when one of the respondents calls for a 'Cyberpolice' to protect the good AI from hackers. Yet, the respondents stress several times that a global authority and not nation states should perform these functions.

The central metaphor of Group 2 evolves around the controversial discussion of the quotes from the second part of the discussion: "[Algorithms] are always rooted in the value systems of their creators."[5] While two respondents argue for the statement's validity, stating that every researcher is always part of a value system, and that programming like any other activity is socially embedded, the third respondent rejects the notion and stresses that algorithms merely automate things and find solutions to problems. In defense of the statement, the example of Flickr is mentioned, whose notorious algorithm marked black people in pictures as monkeys. The respondents elaborate that this incident was not the result of explicit racism, but simply ignorance and a limited worldview of mostly white male programmers. They claim that algorithms are based on the data they are fed and thus on programmers as socially shaped humans who inscribe their bias in the data. Here, data serve as the bridge between the technological and the social sphere. In a more just and equal society, the group of programmers would then have to be more diverse. This would allow them to consider different experiences in the data that algorithms and AI are based on. In this view, the programmer communicates and mediates between the social and the technological world. Still, the third respondent remains critical of the notion of socially shaped algorithms. In a very abstract definition, this respondent describes algorithms as merely mathematical principles, pre-existing their use by humans. This abstract view of algorithms reduces the act of creating technology to an act of materializing what already exists in an abstract sphere.

These ambivalent views on the responsibility of programmers resonate with the discussion in general: The respondents jokingly quote the characterization of programmers as a new type of priest in another part of the discussion. Therein they refer less to the function of a priest as a preacher, but to the role of mediating between two worlds. The programmer as a priest es-

[4] This ideal of politics comes close to what Frankenberg describes as the Locke method of government (2010, 27ff.). Locke imagined that the state was based on a social contract in which the legislature is limited by the personal rights to property and freedom. It represents the majority and installs a rule of law that guarantees security to the subjects and checks and balances to limit the state's power. In the image of an AI collecting all relevant opinions for decision-making, this function of the state is even imagined to be ceded to technology entirely.

[5] Nigel Cameron, in: *Imagining the Internet. The 2016 Survey: Algorithm impacts by 2026*. http://www.elon.edu/e-web/imagining/surveys/2016_survey/algorithm_impacts-_credit.xhtml (23/09/2019).

tablishes contact with and understands the technological world the rest of society cannot access but through his privileged knowledge, just as a priest in medieval times was the only one able to read religious scripture. A *technological* and a *social/political* sphere are distinguished in the discussion quite clearly. Through this separation, the respondents acknowledge their own moral responsibility as programmers, but also characterise technological progress as automatic and inevitable. Programmers do not seem to have much control over society's use of their products. Once technological inventions are out in the world "society has to learn to deal with it".**[6]** As in Group 1, humans sometimes seem to be too slow to adapt to a rapidly evolving and unstoppable technological development. Yet, adapting to a changing world is generally a part of the dynamic human nature. The problem identified in the discussion is then that politicians and non-programmers in general do not know enough about technologies to regulate them efficiently, which permits misuses and abuses by tech monopolies.

In this group, imaginaries of the technological future relate much more to conflict as areas of contention and power struggles are identified: In a more just society, the class of programmers as new priests must be more diverse and include a large spectrum of experiences to create a technology beneficial for all. Additionally, general education, technologically more informed politicians and the implementation of open-source values are the solutions to ensure a just future with democratic control of technologies. This view relies less on the imagination of an ideal public sphere in which decisions about technological applications can be made and instead takes into account the conflicts that the design and use of technologies can bring about for instance between employers and employees. Generally, technocratic implications are present in the main demand for the political and social sphere to converge with the technological sphere. Yet, a democratic techno-future is envisioned in which wide-spread knowledge ensures social control of the technological sphere as technological progress alone does not guarantee equitable social progress.

This metaphor implies a more cybernetic vision of how society and politics should work. In contrast to Group 1's metaphor, technology and politics do not seem to always interact in harmony. The clear separation of the two spheres implies that their modes of operation are not compatible yet. Instead of an image of the political sphere as the enabler of a smooth implementation of technological progress, it is envisioned as deficient in dealing with technology. Therefore, a convergence of the two conflicting spheres is seen as a necessary step to adapt to an already changed world. The political does not hold the role of a levelling arbiter, but of an entity in dynamic exchange with the technological field. This vision of the political comes close to what Mersch calls *leftist cybernetic* imaginations of society, where order emerges from reflexivity and constantly evolves in an ongoing process of development and learning (2013, 82f.). The respondents' metaphors imply an *"Order from Noise"* (ibid.) in which expert knowledge is seen as crucial feedback for decision-making on a societal level. The programmer as expert and priest communicates between the two separate worlds of society/politics and technology. The convergence between the political and the technological as well as a wide representation of the population in the group of priests seem to be the premise for stopping harmful technological transformations. This vision

[6] The quotation is my own translation of the original German transcript.

runs the risk of ignoring the value of political will-formation and political transformation while focusing solely on the technologically possible. Technological development in this metaphor appears as a process exogenous to society, but politics must then understand and adapt to the new technologies. Thus, technological expertise could become the determining factor in a cybernetically controlled order where programmers serve as a connection and feedback between the spheres of technology and politics.

Discussion: Solutionism in a Social Market Economy?

The analysis points to some contributions which the study of tech developers' collective orientations can make to research on techno-futures and the Spirit of digital capitalism. Generally, the group discussions reveal how tech developers interpret society and social change. Both groups interpret technological progress as the driving force for social change. The respondents themselves seem to distinguish two separate spheres: (1) the production of and (2) the application and use of technology. In both groups, the production of new technologies seems to some extent inevitable and takes place within a separate technological sphere. As powerful technologies such as AI and automated work processes are imagined, technology becomes less of an instrument created by humans toward a certain end but more of an autonomous force. As such, it is not accessible to critique until it enters the sphere of application. The political and social control of the technological future is rather concerned with what is doable and desirable in the application than in the production of technology. Group 1 is concerned with a better appropriation of technologies and works to that end by educating people about beneficial applications of technological innovations. Group 2 demands a better societal adaptation to new technological forces and thus calls for further technological education of politicians and citizens.

The comparison of the groups' metaphors hints at two possible, differing ideals of the role of technology in political decision-making. In the metaphor of the state as a referee, the guiding ideal is a majority rule deciding which technological option might optimize societal problems. In the metaphor of technology as an abstract entity and programmers as priests, new technology appears as new information in the political environment that needs to be understood in order to make new decisions. This implies that technological considerations should become a guiding principle of political decision-making. In both visions, the imagination of available technologies in the future shapes the respondents' imagination of a future society in a somewhat technologically deterministic fashion. These findings are in accordance with analyses of utopias that critique the overemphasis of the transformative powers of technology and underestimate its social character (e.g. McCray 2012; Dickel/Schrape 2015). Yet there are differences in the imaginaries of politics: The first vision implies a rather harmonious, grassroots democracy based on the ideal of beneficial implementations of technology whereas the second vision includes conflicts that can be mitigated by technologically well-informed, diverse representatives in both the political and technological sphere. This study complicates assumptions about the world of technological development. A wider research sample could amplify these tentative results and allow for a more detailed description of different orientations within sev-

eral fields of technological development, including for instance basic research in technological fields or political regulators of technological innovations.

Other authors have closely investigated the practice of coding and noticed an ascription of omnipotence of coders in their universe (Weizenbaum 1977, 160; Thompson 2019, 14ff.) in which they can even bring "something to life that might escape [their] control" (Thompson 2019, 15). The call for more knowledge about technology in society and politics generally points to the self-characterization of the respondents as neutral, rational technological experts that Ellrich highlights as a characteristic of a "digital elite" (2004, 82). This description is at the same time contradicted by the strong orientation towards a democratisation of technological knowledge (Bednarik 1965, 180), which points to a new type of a technologically driven elite that is not aiming at cementing their own power (Ellrich 2004, 84f.). In light of these studies, the call for more technological knowledge about the applications of and adaptations to technology results from the image of technology as the independent force driving society. Technological knowledge then becomes the paradigm that education and political action need to follow to be able to understand and shape societal transformations. This implies a technologization of society in techno-futures. Political and social transformations appear as primarily mediated through technological developments. Society and politics rather react to (or adapt to) technological transformations than shaping them. When technology appears as an exogenous, yet central force in shaping society, its development is in danger of being naturalized and inaccessible to critique and intervention.

In both groups, some aspects of a 'Polis of Solutionism' (Nachtwey/Seidl 2017) – as the belief in technological solutions to societal problems – are present. Yet the respondents distance themselves from monopolistic, opaque companies who amass data for profit. This may reflect a specific German rendering of the 'Californian Ideology' and 'Cybercultures' which demands public action to prevent inequalities (Barbrook/Cameron 2001, 17). The variations of the 'Polis of Solutionism' could form the basis of a "temporally situated and culturally particular" (Jasanoff 2015, 19) sociotechnical imaginary. As larger tech companies are criticized, the respondents do not buy into a Solutionism that legitimises entrepreneurial activities as the primary force shaping society (Nachtwey/Seidl 2017, 22f.). The demand for political regulation and individual appropriation of technology (Group 1) and a wider distribution of technological knowledge (Group 2) is evidence for a social market economy-version of Solutionism in which citizens gain some control over the technological transformations. In the demands for more education, ideals of equality shift to the immaterial sphere: Knowledge and transparency become the most important factors to create a just world. Technocratic aspects are still present in the call for technological expertise to rule societal change, but the respondents envision a more socially controlled Solutionism with some democratic legitimacy and provisions against the abuse and economic exploitation of new technologies. This might reflect general differences between the Silicon Valley and the European context, in which the state is believed to have the task to intervene to protect all citizens' interests, "not leaving everything up to the vagaries of market forces" (Barbrook/

Cameron 2001, 16). Investigations into European variations of the Spirit of digital capitalism could further differentiate this concept.

Conclusion

The findings of this limited study point to important aspects in the making of society's future. Tech developers are endowed with significant power to structure our reality (Thompson 2019, 11). Imagining the production of technologies as a separate sphere, the making of techno-futures becomes in large part the mission of a few, imagined as a neutral and apolitical process. Society's impact in this view is limited to a democratic appropriation of and adaptation to new technologies. These orientations imply a technologization of the making of societal futures as society seems to react post-hoc to technologies rather than to consciously shape them.

Researching the actors of the production and application of technologies further can not only reveal orientations that manifest in the technologies created, but also interpretations of our world that shape the way we think about and organise our society. This research needs to reach beyond the central actors of Silicon Valley and a general technology discourse, as a broader geographical and cultural variation of techno-futures is to be expected among actors in the development of technologies around the world. Techno-futures might orient the development of technology, the way in which politics and society deal with it and the social order it might bring about. Sociological research on these orientations must critically accompany the development and design of technology as well as its implementation into everyday use.

References

Barbrook, R.; Cameron, A. (2001) The Californian Ideology. In: Ludlow, P. (ed.) *Crypto Anarchy, Cyberstates, and Pirate Utopias*. Cambridge; London: MIT Press. http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.460.8355#?

Bednarik, K. (1965) *Die Programmierer. Eliten der Automation*. Wien; München: Verlag Fritz Molden.

Bohnsack, R. (2010) Documentary Method and Group Discussions. In: Bohnsack, R.; Pfaff, N.; Weller, W. (eds.) *Qualitative analysis and documentary method in international educational research*. Farmington Hills, MI: Barbara Budrich.

Boltanski, L.; Chiapello, E. (2001) Die Rolle der Kritik in der Dynamik des Kapitalismus und der normative Wandel. In: *Berliner Journal für Soziologie* 11(4): 459–77.

Dickel, S. (2011) *Enhancement-Utopien: Soziologische Analysen zur Konstruktion des Neuen Menschen*. Schriftenreihe Wissenschafts- und Technikforschung 7. Baden-Baden: Nomos.

Dickel, S.; Schrape, J.-F. (2015) Dezentralisierung, Demokratisierung, Emanzipation. Zur Architektur des digitalen Technikutopismus. In: *Leviathan* 43(3): 442-463.

Dierkes, M.; Hoffmann, U.; Marz, L. (1996) *Visions of Technology. Social and Institutional Factors Shaping the Development of New Technologies*. Frankfurt a. M.: Campus-Verlag.

Ellrich, L. (2004) Die unsichtbaren Dritten – Notizen zur 'digitalen Elite'. In: Hitzler, R. (ed.) *Elitenmacht. Soziologie der Politik 5*. Wiesbaden: VS, Verlag für Sozialwissenschaften: 79-90.

Fisher, E. (2010) *Media and New Capitalism in the Digital Age. The Spirit of Networks*. New York, NY: Palgrave Macmillan.

Frankenberg, G. (2010) *Staatstechnik. Perspektiven auf Rechtsstaat und Ausnahmezustand*. Suhrkamp Taschenbuch Wissenschaft 1968. Berlin: Suhrkamp.

Häußling, R. (2014) *Techniksoziologie*. Baden-Baden: Nomos, UTB 3528.

Imagining the Internet. The 2016 Survey: Algorithm impacts by 2026. http://www.elon.edu/e-web/imagining/surveys/2016_survey/algorithm_impacts_credit.xhtml (23/09/2019).

Jasanoff, S. (2015) Future Imperfect: Science, Technology, and the Imaginations of Modernity. In: Jasanoff, S.; Kim, S.-H. (eds.) *Dreamscapes of Modernity. Sociotechnical Imaginaries and the Fabrication of Power*. Chicago; London: The University of Chicago Press.

Kelly, K. (1994) *Out of Control. The New Biology of Machines, Social Systems and the Economic World*. Reading, Mass.: Addison-Wesley.

Kruse, J. (2015) *Qualitative Interviewforschung. Ein integrativer Ansatz*. Weinheim; Basel: Beltz Juventa.

Kurzweil, R. (2010) *The Singularity Is Near. When Humans Transcend Biology*. London: Penguin.

van Lente, H. (1993) *Promising Technology: The Dynamics of Expectations in Technological Developments*. Delft: Eburon Publishers.

McCray, P. (2012) *The Visioneers. How a Group of Elite Scientists Pursued Space Colonies, Nanotechnologies, and a Limitless Future*. Princeton: Princeton University Press.

Mersch, D. (2013) *Ordo ab Chao - Order from Noise*. Transpositionen. Zürich: Diaphanes.

Nachtwey, O.; Seidl, T. (2017) *Die Ethik der Solution und der Geist des digitalen Kapitalismus. IfS Working Papers Nr. 11*. Frankfurt a. M.: Institut für Sozialforschung.

Pfeiffer, S. (2015) Warum Reden Wir Eigentlich Über Industrie 4.0. Auf Dem Weg Zum Digitalen Despotismus. In: *Mittelweg 36* 24(6): 14-36.

Thompson, C. (2019) *Coders. Who They Are, What They Think and How They Are Changing Our World*. London: Pan Macmillan.

Turner, F. (2008) *From Counterculture to Cyberculture. Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism*. Chicago: University of Chicago Press.

Uerz, G. (2006) *ÜberMorgen: Zukunftsvorstellungen als Elemente der gesellschaftlichen Konstruktion der Wirklichkeit*. München: Wilhelm Fink Verlag.

Urry, J. (2016) *What Is the Future?* Cambridge, UK;Malden, MA: Polity Press.

Weizenbaum, J. (1977) *Die Macht der Computer und die Ohnmacht der Vernunft*. Suhrkamp Taschenbuch Wissenschaft 274. Frankfurt a. M.: Suhrkamp.