Technological Determinism and Permissionless Innovation as Technocratic Governing Mentalities: Psychocultural Barriers to the Democratization of Technology

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Abstract

Despite no shortage of thoughtful analysis concerning how to more democratically develop and assess new technologies, practical progress toward democratized innovation has been paltry. This state of affairs suggests that the barriers to such democratic ends merit more attention. Building upon calls to more seriously examine citizens' understandings of technology as autonomous or deterministic, this paper characterizes the assumptions, beliefs, and patterns of thought undergirding technological determinism and permissionless innovation as technocratic governing mentalities. That is, they contribute to the biasing of political discourses, practices, and organizations toward non-decision making and adaptation with regards to technological change. Indeed, permissionless innovation is quickly becoming the motto of those aiming to legitimate a "hands-off" approach to the sociotechnical "disruptions" sought by Silicon Valley entrepreneurs. Moreover, this paper explores how STS, as both an academic and political endeavor, might better respond to the challenges these modes of thinking present. Drawing upon relevant work within social psychology and communications, several fruitful avenues for engaged research regarding undermining technocratic governing mentalities become apparent. Not only is there a pressing need for accessible and parsimonious counternarratives to technological determinism and permissionless innovation but also rhetorical strategies for making the democratization of technological appear continuous with aspects of status quo systems. Finally, given that technocratic governing mentalities are likely to have practical and material roots, inquiry should be directed toward understanding how different sociotechnical arrangements impact citizens' perception of the desirability and feasibility of democratizing technology.

Keywords

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Introduction

The democratization of technological innovation has long been a goal of many science and technology studies (STS) scholars. Potential participatory models, theoretical reflections on deliberative processes, and post-hoc evaluations of democratic experiments abound in the literature (e.g., Daim et al. 2011; Guston et al. 2014). Despite a panoply of work on possible democratic end-states, the *barriers* standing in the way of democratizing technology have yet to receive much attention (cf. Kleinman 2000; Hamlett 2003). This imbalance has limited STS's potential as a political movement. Indeed, technological development, at least in the United States, hardly seems any more democratically steered today than during STS's infancy. Consumers, retailers, and policy-makers all appear to breathlessly await the next "disruptive" gadget to emerge spontaneously from Silicon Valley. What contributes to the non-democratic status quo's obduracy or resistance to change? How might allied activists and scholars intervene to incrementally lessen the barriers to more democratic technological decisions?

Although a broad range of social, cultural, material, and political variables contributes to nondemocratic technological decision-making, in this paper I will focus on what could be termed the *cognitive* or *psychocultural* barriers to democratizing technology and suggest potential avenues for normative research and strategic intervention. In particular, I am concerned with the hurdles presented by technological determinism, the idea that technology autonomously drives history, and permissionless innovation, the belief that technology best benefits humanity if innovation remains nearly unregulated.

Building upon calls to not merely dismiss ideas like technological determinism for their conceptual crudity but take them seriously as real forces helping to construct social reality (Hecht and Allen 2001, 5; Wyatt 2008), I characterize technological determinism and permissionless innovation as *normative phenomena.* Their foundational beliefs, ideas, and assumptions constitute *governing mentalities* that shape discourse, thinking and action regarding technological innovation to the advantage of a narrow range of elite actors. Because they help *mobilize bias* (within the political organization of technological societies so as to encourage adaptation to technological change) and non-decision-making (regarding the potential consequences of emerging technologies rather than conscious democratic steering) they can be termed *technocratic governing mentalities*.

If my assessment is (at least partially) correct, it suggests that meeting the challenges presented by technological determinism and permissionless innovation will entail drawing from and advancing research lines within social psychology and communications regarding belief formation and challenging system-justifying ideologies. Scholars should not assume, however, that these mentalities persist simply because members of technological societies are not better informed about STS case studies; to do so would risk projecting a "deficit model" onto citizens, repeating the mistake typically made by scientists during moments of pubic scientific controversy (see Wynne 2006). Beliefs like technological determinism endure in part because common interpretations of the sociomaterial experiences of everyday life tend to confirm them (Williams 2002; Wyatt 2008). Hence, careful study is necessary regarding how different material affordances

and constraints scaffold the experiences, psychic states, and patterns of thought that construct citizens' technocratic beliefs.

My exploration of these issues productively synthesizes four different conversations within STS. Although the antidemocratic slant of technological determinism is well recognized (Feenberg 1991, 5-14; Bijker 1995, 281; Wyatt 2008), attention in the literature has only recently refocused on more fully characterizing the political implications first analyzed by Winner (1977; also see Hamilton 2014) as well as the social processes that can lead to the belief that certain technologies are obligatory or unavoidable (Chandler 2012; Dafoe 2015). I extend this perspective to the discourse of "permissionless innovation." Although Silicon Valley techno-libertarianism has already received substantial scholarly attention (see Barbook and Cameron 1996; Turner 2006; Sadowski and Selinger 2014), its most recent instantiation, permissionless innovation, has yet to be characterized as an emerging barrier to the democratic control of technology and a potential target for intervention (see Theirer 2014; Theierer and Hagemann 2014). I describe how permissionless innovation is not only strongly colored by the logics of laissez-faire economics but also involves a well-developed, albeit naïve, view of risk. Furthermore, I draw upon the literature on governing mentalities and political subject formation in order to flesh out my characterization of technological determinism and permissionless innovation as cognitive or psychocultural barriers to more democratic technological politics (see Campbell 2000; Campbell 2005; Agrawal 2005). I contend that, similar to the apparent passivity of many citizens in the face of toxic consumer products (Woodhouse and Howard 2008) or economic inequality (Fraser 2015), acquiescence to technocracy is reflected and reinforced by entrenched ideas, assumptions, and belief systems. Finally, through my exploration of possible responses to technocratic governing mentalities like technological determinism and permissionless innovation, I aim to advance more normative STS research.

Technological Determinism and the Technological Imperative

The specter of technological determinism is ever-present in the history of STS. It recurs not merely as an object of study but also as a pejorative term that some academics use to characterize those perceived to be overstating the influence of technological change on social evolution (Kline 2001, 15497; Dafoe 2015). In this section, I argue that a narrow focus on excising it from academic thinking concerning technology (or using it pejoratively) has distracted scholars from inquiring more deeply into how it works in the minds of citizens as a barrier to democratic technological politics. Mounting an appropriate response to technological determinism (as well as permissionless innovation) will require refocusing attention on such patterns of thought as normative phenomena.

Much of the research within STS over last decades has been aimed at unseating what Bruce Bimber (1994) termed the "nomological" form of technological determinism, the quasi-naturalistic theory that technology drives social adaption and change in predictable, law-like ways. Scholars in the field have sought to illustrate how such theories are empirically false through detailed histories of technological innovation. Whether nomological technological

determinists exist, at least outside of popular media, is uncertain. The historian Robert Heilbroner, for instance, has been sometimes suspected of offering a technological deterministic viewpoint (see Bimber 1994). Nevertheless, he maintained that the heuristic "machines make history" should be used only when also "bearing in mind the socioeconomic meaning we attach to the last word [of the phrase]" (1994, 77).

Indeed, STS predecessors like Jacques Ellul (1964) and Langdon Winner (1977) approached technological determinism as a "normative" phenomenon (Bimber 1994).[2] Despite their frequent and pejorative mislabeling as nomological determinists, such scholars argued that technology proceeded autonomously largely because of sociocultural factors—namely, the elimination of human values apart from narrow interpretations of technical efficiency, economic profitability, or other more technocratic notions of progress, from technological decision making. Technology comes to drive history, in their view, because societies neglect to subject new technoscience to sufficient political scrutiny, instead delegating the responsibility for sorting out desirable technologies from undesirable to the innovators, technocrats, businesses and/or markets. As Rosalind Williams (2002, 125) notes in her reflections on the dynamics of sociotechnical change, "We are faced not so much with technological determinism as with market determinism reified in a technological product" (also see Dafoe 2015). Although ostensibly deterministic scholars like Ellul might be reasonably accused of incorporating too few sociocultural factors into their accounts, strict technological determinists they are not.

If the actual existence of nomological technological determinism within technology studies is questionable, then constructivist STS research over the last decades begins to appear to have been mistargeted (politically speaking). Yet the claim that social constructivism finally laid to rest the supposed determinism of more critical and/or theoretically oriented scholars undergirds one of the main origin stories for contemporary technology studies (see Cutliffe and Mitcham 2001, 2-3). That is not to deny, of course, technological determinism's continued omnipresence within public imaginaries and discourses, particularly of those citizens who are eager to consume new technologies. Nevertheless, the emphasis placed on slaying the dragon of nomological technological determinism among technology scholars has arguably distracted researchers from practically and politically addressing technological determinism as a normative phenomenon (see Winner 2001). Indeed, Wyatt (2008, 175-6) concludes that "it is no longer sufficient to dismiss it for its conceptual crudeness, nor is it enough to dismiss it as false consciousness…[for] it remains as part of a broader public discourse which seeks to render technology opaque and beyond political intervention and control."

Wyatt's claim is well known and probably agreed upon by most STS scholars, and yet it is in need of more specificity. How exactly does technological determinism help render technology beyond political control? My view, simply put, is that it helps to legitimate and reproduce anti-democratic sociotechnical policy regimes via its influence on citizens' patterns of

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[2] Wyatt (2008, 167) also distinguishes "normative" from "justificatory" technological determinism. The latter is mobilized by social actors and the former is the broader decoupling of technology from political accountability. I view justificatory technological determinism as aimed at the foreclosing of politics. Hence, it contributes to technological determinism as a normative phenomenon.

thought. That is, technological determinism is a type of *governing mentality*, "a tacit and often ill-considered pattern of assumptions that fundamentally shapes political relationships, interactions, and dialogue" (Woodhouse and Howard 2008, 46; also see Campbell 2000; Campbell 2005). Governing mentalities are frequent constituents of the broader political process of the *mobilization of bias*: the systematic and consistent operation of predominant values, practices, procedures, and rules that result in some people and groups automatically benefitting but not others (Barchrach and Baratz 1962; Lukes 2005). The mobilization of bias can be viewed, in one sense, as the organizing of non-decision making. That is, the effect of a particular set of biased values, rules, practices, and procedures is the manufactured unthinkability or perceived infeasibility of the choices that would hurt the interests of advantaged groups.

The specific governing ideas associated with technological determinism center on the belief in technological imperatives and the desirability of technocracy. Technological imperatives[3] are rooted in the belief that "can" implies "ought." Given an underlying presumption that technology writ large evolves according to an internal, asocial logic and that technology is taken to be the "*cause* of well-being" (see Smith 1994), the task for humanity under the rubric of technological determinism is merely to provide the necessary operating conditions for the next stage of technological evolution to flourish. This, as Winner (1977) points out, entails that citizens must, in turn, make the appropriate cultural and psychological adaptations to the sociotechnical systems implied by those changes. Not adapting is to risk failing to "modernize" and, hence, progress. Insofar as such beliefs are internalized—or one might say naturalized within the minds citizens and in broader culture—the more active and conscious steering of technological development becomes increasingly unthinkable. Hence, they serve as psychocultural barriers to democratizing technology.

Examples of technological deterministic governing mentalities altering sociotechnical trajectories are legion. Hamilton (2014), for instance, has illustrated how the rhetorical language of "agribusiness" was deployed in the United States in the mid-twentieth century to rationalize governmental efforts to enforce the highly centralized industrialization of farming. As he shows, the term agribusiness "signified, and too often justified, the seeming inevitability of a consumer-driven, technologically determined, corporate capitalist logic of food production and distribution" (561-2). The widespread marshalling of the technologically deterministic discourse of agribusiness, especially by powerful actors, and its eventual popular acceptance resulted in the mobilization of bias toward non-thinking and non-decision-making concerning the potential consequences or downsides of industrialized agriculture.

Despite the presumption of technological autonomy within the governing mentality of technological determinism, what might appear at first to be technological imperatives are actually sociopolitical accomplishments—as social constructivist studies have amply demonstrated. Nevertheless, widespread belief in technological imperatives, as Winner noted

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[3] Technological imperatives are logically dubious (see Niiniluoto 1990). For them to hold true, all possible innovations, or at least all economically feasible technical possibilities, would have to be realized. Given the history of promising but failed technologies, this is clearly not the case.

(1977, 258), legitimates and enables *technocracy*.⁴   That is, the internalization of the ideas and beliefs underlying technological determinism leads citizens and decision makers to see the proper scope of government as consisting in simply obeying and adapting its citizenry to the perceived logic of technological evolution. Insofar as such a regime characterizes sociotechnical governance, technologies really do come to determine or govern societies, only further cementing the perceived naturalness of technological determinism. The governing mentality of technological determinism and technocratic governance regimes form a vicious circle.

The framing of agribusiness as the next technologically determined stage of agricultural development, for instance, was one factor in the eventual shift in farm policy toward supporting corporate subsidies and the more uncritical embrace of new biotechnological innovations, which remains mostly intact to this day. Those who today advocate for more locally rooted and less chemically intensive forms of farming are battling the historical mobilization of bias toward the beneficiaries of corporate-led industrial agriculture that was partly borne out of the rhetoric of agribusiness. The sociopolitical restructurings entailed by this process, of course, are largely absent in public imaginations and public school history books; they are displaced by a triumphant, linear, and technocentric telling of the "green revolution," which in turn helps legitimate future instances of agricultural technocracy.

Understanding technological determinism matters to advocates of functional democracy because it stands in the way of democratic decision making regarding the trajectory of technological development. As a normative phenomenon, technological determinism maintains and reproduces particular sociotechnical regimes. It naturalizes technological changes and shields those responsible for stewarding those changes from criticism. As Sadowski and Selinger note, "by focusing on technology as the dominant force in society—a force that progresses in inevitable ways—technocrats can justify their actions as merely being the outcome of rational, mechanical processes" (2014, 166). In justifying the actions of some as merely the outcome of rational processes, as opposed to reflecting the interests and value disagreements characteristic of politics, the discourse of technological determinism frames such actions as rightfully outside the purview of democratic control.

Innovating without Permission, Innovating without Representation

Although technological deterministic thinking remains prevalent—consider all the overhyped talk of dramatic social transformation surrounding the putatively inevitable arrival of an "internet of things"—another perhaps even more sophisticated technocracy-legitimating discourse has emerged recently. The rhetoric of *permissionless innovation*, like technological determinism, accomplishes a mobilization of bias toward adaptation to technological change for the benefit for entrepreneurs, innovators, and tech firms. However, permissionless innovation differs from determinism, substituting an innovation imperative for the previous technological

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⁴ This definition of technocracy differs from its characterization as the belief that an optimal answer to social problems can be arrived at through the rational application of technical means (see Sadowski and Selinger 2014).

imperative and somewhat recognizing the indeterminacy of technological consequences. Far from being a marginal concept having caché only among a small cadre of techno-libertarians, one witnesses it already shaping policy proposals concerning Internet technologies.

The term "permissionless innovation" appears to have been coined by Google's "Chief Internet Evangelist" Vinton Cerf (2012a; 2012b), who attributed the economic growth-enhancing potentials of Internet technologies to the apparent lack of substantial regulatory oversight to which they are subject. Writers at the Mercatus Center, a free market think tank associated with George Mason University, have taken it up. Senior Research Fellow Adam Thierer (2014, vii) sums up permissionless innovation as "the notion that experimentation with new technologies and business models should generally be permitted by default. Unless a compelling case can be made that a new invention will bring serious harm to society, innovation should be allowed to continue unabated and problems, if they develop at all, can be addressed later." Echoing Cerf, Thierer argues that such a light regulatory hand ought to be applied lest Western societies risk undermining their long-term economic growth and increasing standard of living vis-à-vis consumption. The mentality of permissionless innovation, moreover, puts almost unerring faith in the ability of those potentially affected by innovations to eventually, and ostensibly without unreasonable harm, adapt to them.

Permissionless innovation's importance lies in its normative dimension,[5] as a discourse justifying the detachment of technological innovation from political oversight and control. It differs from technological determinism in that it is guided not so much by a valuation of efficiency (see Smith and Marx 1994) but by the fetishization of human technical creativeness and an unwavering faith in "disruptive" technologies to bring about progress.[6] As Thierer (2014, 3) extols, "permissionless innovation is about the creativity of the human mind to run wild in its

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[5] Similar to technological determinism, permissionless innovation holds little water as nomological theory. One wonders whether or not an environment of permissionless innovation has ever actually existed. Even the ostensibly permissionless Internet is the byproduct of government subsidized research and infrastructure as well as beholden to innumerable regulations and standards (see Mueller 2010; Yglesias 2012). It also overlooks the multitude of social barriers to more desirable innovations that may only be lessened through governmental action. For instance, absent public intervention, the sociotechnical momentum of "brown chemistry" will likely continue to stymie the development of more environmentally desirable greener alternatives (Woodhouse 2006). Its depiction of innovators as having their hands tied by restrictive regulations obscures the fact that regulatory oversight has largely been weakened in the last few decades by advocates of neoliberalization. Finally, the proposed reasonableness of adaptation as a strategy, of course, is rooted in a questionable understanding of technological change. Thierer and Hagemann (2014, 51), for instance, imagine a rosy future for those potentially put out of work by the mass deployment of driverless vehicles, which is rooted in a mythical history of automation: "After all, industries in which individuals have previously been displaced as a result of automation are examples of less-skilled jobs being replaced by more technically skilled and economically advantageous positions." Automation, at least in the United States, has been associated with job polarization or a hollowing out of the middle of the job market with respect to wages and skill-level (Acemoglu and Autor 2011; Autor 2011). Only some of those automated out of a job become engineers and programmers; many sweep floors or remain chronically unemployed.

[6] Permissionless innovation appears to be an outgrowth of what Barbrook and Cameron (1996) called the "Californian Ideology," the mixture of techno-triumphalism and economic libertarianism found in magazines like *Wired* and the writings of tech-gurus like Kevin Kelly.

inherent curiosity and inventiveness." Such unencumbered inventiveness is viewed as necessary to enable new technologies to "usher in amazing, life-enriching changes" (7).

Permissionless innovation can be described as a governing mentality that threatens to mobilize bias for the benefit of a select population of consumers, innovators, and large tech-firms. Because it is undergirded by an assumption that the benefits of innovation are (near) universally distributed and that the harms are relatively insignificant, this bias is hidden from view. Permissionless innovation is also rooted in a fairly optimistic view of technological change and risk. Consider Thierer's (2014, 2) assertion that "more often than not, humans adapt to new technologies and find creative ways to assimilate even the most disruptive innovations into their lives." Those put out of work or into menial jobs through automation and new "sharing economy" apps like Uber or Airbnb, workers in developing nations who sift through toxic e-waste, and others harmed from such "progress," however, are unlikely to describe themselves as creatively adapting; they might even say that they are struggling to make a living. The "we" benefiting from the "life-enriching changes" alluded to by advocates of permissionless innovation seem to be not everyone but rather a more select group: affluent consumers and owners of tech-firms.

Innovators, for their part, are assigned the right to innovate with abandon, except in cases where a "compelling" argument for harm can be made. At the same time, the discourse of permissionless innovation presents technologists as hamstrung by unnecessarily precautious rules and regulations and, hence, in need of liberation if they are to invent wondrous new technologies. New innovations, so citizens are told, are poised to "disrupt"[7] apparently stale markets, such as transportation and hospitality, and even governmental services like education. However, in contrast to Thierer's (2014) depiction, regulations exist in these areas not simply for reasons of risk-aversion but because they represent the interests of those potentially harmed. For example, critics note that the disruption of hotel taxes by informal room renting services like Airbnb undermines the funding for the code inspections needed to insure that tourists are not exposed to health risks (Gallun and Marotti 2015). "Ridesharing" apps like Uber and Lyft attempt to disrupt not only corrupt private taxis services but also cooperatively run taxi services like Alexandria Union Cab[8], both of which afford workers more stable livelihoods and surer access to benefits than either of the two apps (Rogers 2015; Liss 2015). Regulations serving to benefit these populations, however, are often barriers to tech firms' profit maximization. The rhetoric of permissionless innovation shifts attention away from the democratic decision-making rights of stakeholders who are potentially affected negatively by technological innovation and toward the liberties of innovators, corporations, and affluent customers.

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[7] The disruptive innovation literature, of course, is fairly broad (see Yu and Hang 2010). My focus is not on it as a market strategy for firms per se but rather the public discourse of disruption as a justification for eliminating precautionary regulations.

[8] Alexandria Union Cab is a cooperatively owned taxi service of around 225 drivers. Employee owners not only earn a better living by enjoying lower "stand dues" but also have a say in running the organization (see Liss 2015).

Similar to technological determinism, the governing mentality of permissionless innovation risks mobilizing bias in policy toward non-intervention and adaptation.⁹ Any implementation of conscious democratic steering would, of course, entail some degree of precautionary regulation and, hence, that someone's "permission" be sought prior to the deployment of new innovations. Hence, through the disavowal of "permission," permissionless innovation is likely to serve as a technocracy legitimating discourse. However, it justifies technocracy differently than technological determinism. Although it ultimately relies on a teleological and optimistic reading of technological change, the presentation of technology as unfolding according to an easily recognizable, internal, and mechanistic logic is eschewed. *The core idea behind disruption, in contrast to technological determinism, is indeterminacy.* In contrast to the typical mobilization of indeterminacy within STS, which highlights risk and the need to proceed prudently (see Woodhouse 1992; Woodhouse 2013), the foregrounding of indeterminacy within permissionless innovation discourse places the emphasis on the possibility—the *contingency*—of new technological wonders. Yet it is presumed that, even though new innovations' broader effects are uncertain, their consequences will inevitably be more positive than negative.

Privileging the potential for benefit over the risk of harm threatens to derail more precautionary and democratic approaches. Indeed, permissionless innovation frames the shift in the burden of proof from those potentially harmed to innovators entailed by the precautionary principle as a "trial without error" approach to emerging technologies (Thierer 2014, 17; Thierer and Hagemann 2014). That is, permissionless innovation discourse depicts advocates of precaution as demanding that no new technology be deployed at any scale unless it is absolutely proven that no risk of harm exists. The risk-aversion of precautionary approaches is painted as a kind of pathological technophobia, threatening to stifle the development and deployment of supposedly universally beneficial and growth enhancing innovations.

The depiction of precaution within permissionless innovation is rooted in a weak understanding of the literature on technological risk. While invoking Aaron Wildavsky's (2000) criticism of strictly precautionary approaches as sometimes coming close to demanding "trials without error," those championing permissionless innovation forget that Wildavsky argued not for the absence of intervention but rather *incrementalist trial and error learning*: ensuring that the potential errors from new technologies are as small and few enough in number as possible so that citizens would have the capacity to learn from them and, at the same time, making reasonable efforts to avoid foreseeable harms (also see Morone and Woodhouse 1986). Moreover, such a depiction denies the considerable debate regarding when to apply the precautionary principle and ignores that some see it not as requiring "no innovation until absolutely certainty of safety is achieved" but merely that decision makers "not use 'lack of full scientific certainty' as a reason for not taking measures to prevent…harm" (Fischer, Jones and von Schomberg 2006, 2; also see Taleb et al. 2014). While there is extensive debate about the meaning and application of the

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⁹ Permissionless innovation legitimates and justifies what Winner (1977) called "reverse adaptation": the tendency for societies to adjust their practices and expectations to match what new technologies have to offer rather than demand that technologies be designed to suit their values.

precautionary principle, advocates of permissionless innovation take an extreme, if not strawperson, version of the precautionary principle as their target.

This line of thinking, even if rooted in an unfair understanding of precaution and the literature on risky technologies, could nevertheless be effective in framing those wishing to lessen technological risks as narrow-minded technophobes imposing a "stasis mentality" (Thierer 2014, 13) on the rest of humanity. Those who accept and internalize permissionless innovation discourse are likely to believe that the only opportunity for experimenting with and genuinely learning how to realize the best from technologies lies in giving innovators a free hand. Precautions pursued in fear of the worst-case scenario will be perceived as inevitably stifling possibilities for realizing the best-case scenarios. Hence, precautionary measures become framed as a threat to progress writ large. Realizing the benefits of new technological wonders is viewed as assured only through protecting the liberties of innovators at the cost of forms of risk mitigation typically assured through democratic process.

Permissionless innovation threatens to mobilize bias within technological regulation to the advantage of a small number of socioeconomic elites: Silicon Valley innovators, tech-firms, and affluent consumers. A technological regime organized around its principles would amount to "innovation without representation"[10] for ordinary citizens. Even though numerous groups apart from consumers, innovators, and corporate shareholders might shoulder the burden of the externalities produced through disruptive innovation, permissionless innovation denies such groups their main avenue to shape technological decision making: political action and regulation. Permissionless innovation assumes a false binary between technological stasis and adaptation to the changes wrought through minimally regulated disruptive innovation. As a result, permissionless innovation discourse makes the more proactive and democratic steering of technological development seem stodgy and technophobic, painting precautionary efforts as barriers standing between the present and future technological wonders. Hence, similar to technological determinism, it makes greater democratic control of technology appear to be a fool's errand. Insofar as its underlying assumptions, ideas, and beliefs are widespread and entrenched, citizens and policy makers will be disposed toward non-decision-making regarding technological risks and adaptation to technological change. Hence, permissionless innovation is well positioned to become a psychocultural barrier to the democratic control of technology

The beliefs and assumptions characterizing permissionless innovation are not yet as widespread and entrenched as those of technological determinism. Indeed, the term is primarily mobilized by a small but influential group producing texts for techno-libertarian blogs[11] and for think tanks like the Cato Institute and the Mercatus Center. Yet there are signs that it is becoming more prominent in the thinking of important decision makers and in public discourse. For example, Tom Wheeler (2015), chairman of the United States Federal Communications

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[10] Given the recognition that technologies can be as influential in shaping people's lives as political legislation, a commitment to democracy, a system in which the polity participates in deciding the structures that shape their lives, requires extending democratic representation to technological innovation (see Goldman 1992; Sclove 1995; Winner 2012)

[11] See *The Technology Liberation Front:* http://techliberation.com/.

Commission, recently invoked the phrase when proposing new net neutrality regulations: "My proposal assures…the rights of innovators to introduce new products without asking anyone's permission." Others, moreover, have embraced the term in arguing for disruption-enhancing (de)regulation regarding medical technology and aerial drones (Carr 2014; De Rugy 2014). Therefore, there is good reason to be concerned that permissionless innovation could end up as influential for shaping policy regimes and public inaction as technological determinism. Given that very real possibility, how might permissionless innovation be opposed and how could STS aid the opposition?

What Is to Be Done? Intervening into Citizens' Thinking on Technology

As Williams (2002) has noted, "even if the theory of technological determinism can be refuted, the experience of technological inevitability is convincing" (p. 118). If my above characterization of technological determinism and permissionless innovation as psychocultural barriers is appropriate, STS should further explore how technocratic governing mentalities are sustained. It is not enough to simply recognize the seeming unshakeability of the experience of technological inevitability. STS scholars and activists must find ways to understand and intervene in those experiences. Doing so entails drawing upon and extending several research lines regarding belief formation, misinformation, and system-justifying ideologies. Technology studies scholars, moreover, could work with psychologists to explore how different techno-material experiences help construct people's beliefs about the nature of sociotechnical reality, especially those that scaffold techno-libertarianism.

Technological change might seem inevitable and certain technologies perceived as "obligatory" or unavoidable for a range of reasons (see Chandler 2012). As anyone who has introduced STS to undergraduates will know, technology often seems autonomous to people because they too easily or strategically forget the social factors shaping innovation. Such forgetting may be driven by the taking of an overly abstract perspective; grasping the complex sociotechnical interactions and micropolitics shaping technological change is more cognitively challenging than embracing simple linear models of technological advancement. Individuals, moreover, might perceive technologies to be obligatory in response to the feeling that they are competing with others (also see Dafoe 2015). Material dependencies created by the obduracy of large sociotechnical systems can lead people to feel unable to do without or alter status quo technologies, a feeling no doubt exacerbated by ideas about progress, moral beliefs, and the normalization of what was previously considered fairly radical. Given the vastness and momentum of large sociotechnical systems and the continual pressure many members of technological societies face to adapt to a continually changing technological landscape, it is no wonder that individuals might come to feel powerless and embrace a belief in technological determinism. The foundations for the beliefs undergirding permissionless innovation are no doubt found in the various progress myths championing modern technology as unambiguously beneficial and linear versions of history imparted on citizens by mass media and during their

years in school. If permission was rarely sought for previous technologies and everything has worked out for the best why would permission be necessary for future innovations?

Certain factors are probably more salient than others in explaining the perceived obligatoriness or inevitability of specific technologies. For instance, a felt sense of competition might explain the degree to which students (and their parents) believe that they need Adderall and other drugs meant to treat attention deficit and hyperactivity disorder. Pill popping, in turn, becomes normalized and/or justified by the dominance of neoliberal moralities that uphold individual career success as *summum bonum* and individuals as responsible for that success (Esposito and Perez 2014). Embracing cognitive-enhancing pharmaceutical technologies seems obligatory in an educational culture emphasizing cut-throat levels of grade competition wherein citizens' psychological sense of self is also rooted in the moral responsibilization of individuals. Insofar as these cultural and technical systems have gained substantial momentum, individual members of technological societies are likely to feel powerless to do anything but adapt to them.

In contrast, the "need" for an automobile has as much to do with the practical and material barriers to alternative forms of transportation created by contemporary urban form to other modes of transportation (Kirkman 2009) as "car culture" based progress myths. That is, to the extent that people have internalized suburban ideals of the good life, beliefs in motorized transportation as inherent to "modern" living, as well as racial and class based fears in association with urbanity, the possibility of intentionally steering toward societies without automobiles becomes nearly unimaginable. If anything, in this context, the view that innovators should be given a free hand to develop driverless cars and ridesharing systems that disrupt public transportation and cab services becomes increasingly attractive. Such technologies offer a psychically alluring promise of sustaining the autocentric good life.

Upon close examination of many of these factors, one quickly recognizes that advocates for more democratic and consciously steered technological societies are likely to find themselves in a Catch-22. Addressing some factors, such as dependency and competition, requires making structural and material changes that are only likely be effectively pursued if and when citizens and policy makers believe that technology is or ought to be under human control. Yet the experience of dependency and competition pressures, as well as the complexity and difficulty of steering sociotechnical systems, can undermine the belief that control of technology is possible. For instance, substantially lessening the obligatoriness of the automobile within the American urban landscape in the foreseeable future would require a much more deliberate and coordinated steering of building codes, highway and road design, and transportation planning than exists at present. However, various social, cultural, and political barriers stifle even fairly insignificant deviations from established urban form (see Hommels 2005; Dotson Forthcoming). Proposals to alter status quo urban form butt up against entrenched visions of how buildings ought to mesh with public space, already established professional practices, and opposition by social groups with incongruent interests. Such obstacles can render proposals for even fairly insubstantial changes all but infeasible. People can hardly be expected to hope for the democratic steering of technology more broadly when obduracy or obligatoriness characterizes even fairly non-radical attempts to alter status quo technologies. The challenge for STS scholars, therefore, is to inquire

into how beliefs in technological determinism can be effectively challenged prior to, or perhaps alongside, large-scale structural changes. Might there be an experiential threshold for believing in the feasibility of technological governance? Discovering such a threshold is likely to be the most fruitful short-term avenue of inquiry regarding altering the beliefs of lay technological determinists. Indeed, psychologists have found that established misinformation, such as the belief that Barack Obama was born in Kenya, is rarely eliminated by simply providing believers with more accurate information (Lewandowsky et al. 2012). This literature suggests that framing interventions as a correction of misinformation, or providing an alternative story that is too complex, can actually further entrench ill-founded beliefs—a so-called "boomerang effect" (Byrne and Hart 2009). Similar dynamics would stymie "fact-based" attempts to sway ardent technological determinists. Hence, it seems improbable that the better public communication of STS findings alone would unseat technological determinism, though it might be better than nothing. The literature suggests that the most effective approaches are characterized by repeating coherent and parsimonious messages (see Lewandowsky et al. 2012, 122). How might citizens be more often subjected to the kinds of experiences that set the stage for challenging their beliefs in technological determinism? Researchers could look to social groups, such as the Amish, who do not regard technological change as an unstoppable juggernaut but instead as under human control (see Wetmore 2007). Ensuring that citizens gain experience with institutional or community-scale implementations of technology assessment might make large-scale technological governance seem more feasible. Indeed, doing so would be analogous to the decentralization of forest governance to Indian villages that led residents to increasingly incorporate the valuation of environmental protection into their identities as political subjects (Agrawal 2005). Finding ways to implement small-scale and decentralized forms of technology assessment could help citizens begin to see technological governance as part of their identity as political subjects. At the same time, even small-scale applications of technology assessment might face the same Catch-22 as the broader democratization of technology. Buy-in into the process will remain challenging when technological determinism remains widely accepted. Therefore, it seems that some research attention needs to be focused on how evoke a sense of feasibility as an exercise to help prime technology assessment participants to see the process as worthwhile.

One possibility for closing the experiential gap concerning the perceived feasibility of technological governance would be to utilize stories that draw readers into "experience-taking." Indeed, psychological studies have found that having participants read a story about someone's experience voting can promote actual voting behavior; similarly, having them read a first-person narrative depicting the everyday life of a protagonist who only reveals themselves to be part of a minority group (African-American or homosexual) late in the story encouraged more positive and less stereotypical perceptions of that group and the character's behavior (Kaufman and Libby 2012). Could well-designed narratives draw citizens into experience-taking for characters involved in the social and political steering of technology?[12] Experiments with such narratives

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[12] There may be realizable synergies between such efforts and the speculative design movement (see Dunne and Raby 2013). The latter advocate the creation of media experiences and physical objects that spur users to more frequently re-imagine the status quo and dream of (sometimes impossible) futures.

would probably begin by developing historical, fictional, and/or quasi-autobiographical accounts of technological change that are not merely free of unnecessary academic jargon but readable and engaging for citizens without several years of university reading under their belts. One starting point would be to depict technological innovation in a manner completely opposite to dominant contemporary accounts: Rather than center around the lone maverick or eccentric genius, they would highlight social negotiation, the challenges of sociotechnical obduracy, and the workings of power.

The above strategies would likely be most effective in combating technological determinism. What about challenging or undermining the teleological beliefs and free market ideologies that form the foundation of permissionless innovation? Ideology has long been recognized to be a powerful force in shaping people's willingness to accept or question different sets of facts. When presented with information dissonant with their political worldviews, people tend to engage in highly skeptical "motivated reasoning" in order to remove the dissonance through the rejection of the information rather than their worldview (see Nisbet, Cooper and Garrett 2015). Belief in the unwavering goodness of laissez-faire free-market economies, for instance, is highly predictive of skepticism about the reality of anthropogenic climate change (Lewandowsky, Oberauer and Gignac 2013). Challenges to audiences' worldview and identity, moreover, render attempts to correct misinformation ineffective (Lewandowsky et al. 2012). Indeed, studies where climate skeptics were provided with challenging information or participated in deliberative forums found them to be generally unmoved afterwards, if not even more entrenched in their skepticism (Hobson and Niemeyer 2013). Therefore, insofar as actors' beliefs in the desirability of permissionless innovation or the autonomy of technology are deeply integrated with their identities and worldviews, simply communicating STS research problematizing the relationship between innovation and social progress or participating in technology-assessment-style deliberation may be unlikely to unseat technocratic governing mentalities among the more entrenched.

Hence, the challenge for advocates of technological democracy is to undermine technocratic beliefs without appearing to excessively threaten important aspects of the intended audience's worldview and identity. Those opposed to the sociopolitical changes needed to mitigate or avert the predicted harms of advancing climate change or other "no-growth" proposals, for instance, do so partly in response to the fact that such changes are rarely presented as aligning with their valuation of individualism and/or free enterprise (Campbell and Kay 2014). Some have suggested utilizing "broker" frames in order to steer around such hurdles (Hoffman 2011). Depicting meeting the challenges faced by global climate change as compatible, if not reliant, on individual entrepreneurialism is but one example. Others have found that describing environmental harm in terms of purity, a moral frame typically more salient to conservatives, rather than in terms of harm and care, tends to be helpful in reducing the gap between liberals and conservatives regarding environmental issues (Feinberg and Willer 2013).

Some, of course, might demur regarding such strategies. Are they not manipulative? I think that objecting to these strategies on such grounds is misguided for a number of reasons. First, it seems to presume that a non-manipulative framing of controversial issues exists. For

instance, it implies that individual entrepreneurialism is naturally at odds with admitting the existence of global climate change. Otherwise, it would not be manipulative to frame facing up to the challenges of climate change in such terms; one would simply be better informing them. However, most STS scholars will probably agree that there is no neutral or natural framing of reality, only competing partisan perspectives. Second, it signals a failure to adequately grasp one's political opposition. As George Lakoff (2002; 2008) well articulates, non-progressive political actors are already mobilizing what might be termed "manipulative" framings and metaphors in order to sway the minds of American citizens—and frequently successfully at that. The tendency of many progressives to want to keep their hands "clean" and only "give people the facts" simply renders them less politically effective than their opponents. Finally, as a democratic partisan, I maintain that taking advantage of such "manipulative approaches" is justifiable if it can aid the democratization of technological innovation.

How might climate change framing strategies be extended to promote the acceptance of technological steering? Potentially effective "broker" frames would leverage liberty or rights-oriented rhetoric rather than only talk about equality or harm and would be careful not to frame interventions too exclusively in terms of one vision of the good life. That is, movements to democratize technology would, at least in its early stages, lessen their emphasis on anti-consumerism and think strategically about which audiences will be swayed by social justice-oriented language. The more active steering of innovation could be framed as enhancing the ability of citizens to more reliably receive the technologies that best suit their needs: Cars that handle better and are easier to repair or smartphones that enhance family life rather than detract from it. The democratization of technology can just as easily be depicted as an expansion of individual liberty as a battle for sociopolitical equality. Of course, many advocates of more democratic and socially-just technology might balk at sometimes framing their efforts in terms of so-called "first world problems." However, an insistence on an ideologically pure framing is likely to act as a barrier to buy-in for those still steeped in status-quo worldviews.

Extra hurdles result from that fact that, like climate skepticism, technological determinism and permissionless innovation are "system-justifying ideologies." That is, they help to "justify and rationalize the way things are, so that existing social, economic, and political arrangements [are] perceived as fair and legitimate" (Jost and Hunyady 2005, 260). The strength of such ideologies is visible in the apparent willingness of poor Americans to elect conservative politicians promising to dismantle the very social programs they depend on. Despite the harms produced, even to believers, part of the attraction of system-justifying ideologies stems from the psychic benefits they provide—namely, a sense of order and lessened anxiety within what is perceived to be an unstable and dangerous world. Hence, discursive interventions attempting to motivate people to recognize the uncertainties and complexities of sociotechnical reality and technological change could be rejected simply because they can evoke an uncomfortable sense of disorder.

Given this, STS scholars ought to devise communicative strategies that aim to not merely pull the rug out from under citizens in regard to their beliefs about technocratic progress, but strive to provide equally stable-feeling counter-narratives. Mobilizing stories depicting

technology as increasingly coming under public control of technology throughout history, even if not totally empirically correct, could help normalize the idea of democratizing technology among some citizens. Another possible strategy would be to attempt to evoke a greater tolerance for uncertainty regarding technological change in members of technological societies through alternative framings. Advocates for the democratization of innovation could learn from experimental successes with climate change beliefs. For instance, framing pro-environmental changes as a patriotic facing of the environmental unknown and therefore a kind of change sanctioned by the status quo system has been found to limit the effects of system justification (see Feygin, Jost, and Goldsmith 2010). Efforts against technological determinism and permissionless innovation could better lessen the psychological barrier posed by system justification by framing the application of democracy to technology as a continuous extension of similar existing cultural systems, even if they signal a radical break with the political status quo in other ways.

A longer-term strategy would involve inquiring into the experiential or material roots of techno-libertarian ideologies like permissionless innovation. That is, how do different sociotechnical arrangements help support the belief that technologies are unequivocally liberating and, hence, not in need of democratic steering? Fred Turner's (2013) recent work on the "democratic surround" provides a potential launching point for such work. The democratic surround is a multi-image, multi-sound-source media environment developed in the mid-twentieth century that allowed viewers to move through it at their own individual pace. The aim of such approaches was to mold citizens' thinking but avoid cultivating the mass-scale personality cults and authoritarian personalities seen as infecting an increasingly fascist Europe. A democratic surround affords viewers the freedom to move and seemingly self-curate their own media experience, albeit within the range allotted to them by managers. For instance, in *The Road to Victory* installation, viewers chose their own path through a collage of images depicting America's economic, technological, military, and moral achievements leading up to victory in World War II. As Turner argues, such media approaches aimed to foment a new mass psychology premised on a high valuation of the experience of individualized decision making even while they subtly subjected viewers to propaganda. Designers hoped that arranging the carefully selected message in a way that viewers had to choose how to navigate it would prevent the development of the "mass man" personalities they associated with traditional propaganda. Rather than evoking an "unreasoning fealty to a single source of illumination" (28), it was believed that multi-source democratic surrounds would engender a greater sense of individualism.

Despite the presence of the adjective "democratic," the democratic surround remains a form of soft social control exercised by elites—Turner only utilizes it because he hopes such media technologies could someday be put to more substantively democratic purposes. By providing ostensibly liberating opportunities for individual choice within a larger media framework devoid of collective and substantially democratic decision making, participants are likely to be drawn into believing they are in possession of a degree of informational freedom and agency they do not actually have. By ensuring that choice remained highly salient in the experience of the democratic surround, participants' actual lack of informational control is

obscured. Viewers are led to feel individually empowered even while they take in messages designed for them by elites. A relatively inconsequential, engineered experience of liberty stands in for the actual practice of democracy.

The democratic surround, however, is not the only technology whose design amplifies the experience of freedom and obscures constraints. Many everyday technological experiences lend themselves to the view that technologies are simply liberty-enhancers rather than as also barriers to realizing alternative conceptions of the good life (Dotson 2012, 331). As Briggle and Mitcham (2009) have put it, "the experience [of contemporary sociotechnical networks] is one of freedom and autonomy. The reality is one of interdependence" (380). Indeed, elements of the democratic surround appear omnipresent in affluent technological societies. Shopping in a department store, driving one's car on the Interstate, and surfing the Web all tend to evoke an experience of freedom via individual choice but nevertheless within constraints largely set up by distant managers. Consumers have little direct say in what kinds of products end up on store shelves, car-driving is freedom-enhancing only within the narrow constraints erected by automobility and car-culture itself, and the character of the Internet is strongly shaped by the protocols and codes built into it by technical experts (Galloway 2006; Lessig 2006).

Insofar as major sociotechnical systems are primarily experienced by users as freedom-enhancing, despite their democratic deficits, I contend that users will be less inclined to question the libertarian mythos undergirding discourses like permissionless innovation. In much the same way that the experience of increased individual security achieved through purchasing bottled water or organic consumer products can dampen citizens' motivation to pursue democratic political action to clean up waterways or more strongly regulate the chemical industry (Szasz 2007), the feeling of technologically enabled liberty offered by "democratic surround" style technologies seems likely to inhibit citizens' belief in the need for democratic technological steering. That is, if certain highly salient aspects of people's experiences interacting with major technological systems lead them to view them as primarily freedom enhancing, they are unlikely to see governmental intervention into innovation as anything but a constraint on liberty. Hence, such experiences provide a material basis for a belief in permissionless innovation and, from a democratic standpoint, should be reformed or limited.

The claim that many prevailing technologies help to scaffold technocratic governing mentalities like permissionless innovation appears to have at least a kernel of truth to it, given the preponderance of libertarian thinking among technophiles. Nevertheless, research investigating the relationship between technological experiences and the formation of ideologies standing in the way of more democratic technological governance remains undone. Which technologies most evoke or help sustain techno-libertarian beliefs? How could technological experiences be redesigned to steer users toward a more substantive sense and practice of democracy?

Through this brief review, a number potentially fruitful strategies and avenues for future inquiry have become apparent. Belief in technological determinism is not necessarily built upon citizens' ignorance of the sociopolitics of technological innovation, but more importantly on social processes (e.g., competition) and sociomaterial factors (e.g., obduracy and technological momentum). Intervening with alternative framings could help, if they are focused on establishing

alternative views rather than critiquing technological determinism. However, given that common interpretations of everyday life can seem to confirm the beliefs that undergird technocratic governing mentalities, research could be dedicated to exploring possible "experiential thresholds" for people's beliefs in the feasibility of democratic controlled technology. Communication research techniques could be used to investigate whether narrative "experience taking" can provide a sufficient threshold. The fact that technocratic governing mentalities like permissionless innovation serve as system-justifying ideologies suggests that inquiring into how to build stable-feeling counter-narratives, or helping people cultivate a tolerance for uncertainty and ambiguity as it relates to technology, will be very important. Finally, I have suggested that future research ought to explore the extent to which sociotechnical systems that resemble Turner's (2013) "democratic surround" provide an experiential basis for permissionless innovation as well as how systems that steer users toward the practice of and belief in substantive forms of democracy might be designed.

Conclusion

My purpose in this paper has been to explore technological determinism and permissionless innovation as normative phenomena, in addition to proposing how STS might go about more effectively opposing them. According to my characterization, these ideas affect technological societies insofar as they act as governing mentalities, shifting political discourses and helping to mobilize an anti-democratic, non-intervention bias within the organization of governance surrounding technological innovation. The social psychological literature suggests that scholars and activists are unlikely to unseat technocratic governing mentalities by simply deconstructing their underlying ideas and showing them to be simplistic or outright false. Insights from social psychological research on the making and unmaking of beliefs suggest a number of potentially fruitful avenues for lessening the barriers posed by technological determinism and permissionless innovation. Moreover, I have outlined how STS scholars might add to the psychological literature through the exploration of how techno-materiality scaffolds different sociotechnical ideologies.

There are, of course, drivers of technological determinism and permissionless innovation besides the psychocultural processes that I have focused on. Dafoe (2015), for instance, has proposed military-economic competition as a micro-process helping to drive the macro-process of technological determinism. Some readers might be tempted to dismiss my account of the psychocultural aspects of technocratic governing mentalities in favor of economic explanations. Yet I contend that it would be shortsighted to do so, because even the ostensibly determining force of so-called "free markets" in part stems from the quiescence of people in the face of economic injustice (Fraser 2015). That is, market forces can determine only insofar as actors are disposed to allow them to do so, and much the same is true for technological innovation. Psychological or cognitive barriers align with and reinforce cultural, economic, material, and political ones, all of which merit more investigation.

Gabrielle Hecht and Michael Allen (2001, 5) have noted that although "technology may not drive history…the fact that influential people believe that it does has real consequences." Hecht and Allen were mainly articulating an historical observation, and my intention has been to extend their recognition to an exploration of potential research programs focused on targeting and partially lessening the power of such beliefs in the present. That is, I have built upon the suggestion that STS scholars take social construction "even more seriously" (Woodhouse 2005) by more effectively leveraging social scientific inquiry into insights into how to reconstruct the status quo. Indeed, part of my broader aim is to help nudge STS scholarship toward research more easily leveraged into practical political benefits. Could STS research into how historical social groups have enrolled others or done the boundary work to exclude political enemies provide insights for activists and academics currently battling climate change denialists or advocates of natural gas fracking, for example?

Engaging in such inquiry styles would entail very different modes of scholarship than undertaken by most STS researchers: scholars would not merely perform careful and considered inquiry into the social shaping and social consequences of science and technology but would also actively attempt to ensure that the best heuristics coming out of such inquiries become commonsensical, at least among sizeable, vocal, and motivated populations. Disagreement about which heuristics should be mobilized is to be expected and would be largely desirable. Nevertheless, I imagine most readers would agree that a technological society where the assumptions and thought patterns underlying ideas like technological determinism and permissionless innovation were rare among citizens, if not unimaginable, would be a more desirable place to inhabit. STS scholars should aspire to no less than helping to realize just such a society.

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