ORIGINAL RESEARCH/SCHOLARSHIP

The Rule of Virtue: A Confucian Response to the Ethical Challenges of Technocracy

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Abstract

The idea of technocracy has been widely criticized in Western literature in the philosophy and sociology of technology. A common critique of technocracy is that it represents an "antidemocratic" and "dehumanizing" ideology. This paper invites Western scholars to reconsider their oppositions to technocracy by drawing on resources from Confucian ethics. In doing so, this paper synthesizes the major ethical challenges of technocracy mainly concerned by Western scholars in philosophy, political theories, sociology, and policy studies. This paper argues that incorporating Confucian resources such as the rule of virtue into technocracy may be helpful for reexamining these ethical challenges to technocracy that are deeply rooted in Western liberal democratic ideologies. The Confucian rule of virtue means that social policies should be made by the virtuous and capable and these policies need to have impacts on the moral progress of the society. Confucian values provide ethical guidance for technocrats in assessing the moral quality of the sociotechnical systems they build. From the Confucian perspective, sociotechnical systems are often assessed based on the criterion whether and how these sociotechnical systems contribute to a process of harmonization. This paper will introduce some practical cases that demonstrate how technical experts and expertise contribute to organizational and social management. In these cases, virtues and the rule of virtue do play a crucial role: virtues either determine the selection of technocrats and the legitimization of their political power or are embedded in engineering design and affect human behavior in the use context.

Keywords Technocracy · Confucian ethics · The rule of virtue · Comparative ethics · Meritocracy · Engineering cultures

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Introduction

The term "technocracy" was coined by American engineer William H. Smyth (1855–1940) to advocate for a political philosophy that emphasized the crucial role of scientists and engineers in governance (Liu, 2015). However, it was not widely used until the technocracy movement of the early twentieth century in the United States and Canada. The philosophical foundation for technocracy can be traced back to thinkers such as Francis Bacon (1561–1626), Henri de Saint-Simon (1760–1825), and Auguste Comte (1798–1857) who stressed the value of scientific methods in organizing and managing society, which became popular during the Progressive Era (1890s–1920s) to promote efficiency in social and political systems including industry, education, government, and religion (Fischer, 1990).

Economist Thorstein B. Veblen's *The Engineers and the Price System* (1921) provided further intellectual support for technocracy in the United States. Veblen argued that profit-motivated businessmen ignorant of industrial technology should cede power to engineers for the sake of industrial production and efficiency. In August 1932, Howard Scott, Walter Rautenstrauch, Harold Loeb, and others interested in technocracy formed a "Committee on Technocracy" at Columbia University with a shared goal of exploring scientific methods for fixing economic issues during the Great Depression (Akin, 1977). Their proposal for creating an efficient society by employing the expertise of scientists and engineers attracted national and international attention.

In Western literature, the term "technocrat" indicates "one who exercises power by virtue of their technical knowledge" and the term "technocracy" signifies "any social unit in which technocrats play a larger role in determining major policies, in deciding how those policies should be implemented, or both" (Olson, 2016, p. xiii). Because of its long history and broad scope, technocracy has spawned myriad sub-types with divergent features that cannot be formulated with precision. However, all variations advocate two core ideas: (1) the *technological governance* of society using scientific principles, technical measures, and quantitative methods; (2) that *science and engineering experts* should replace politicians.

The idea of technocracy has been widely criticized in Western literature in science, technology, and society studies (STS) and engineering ethics. A common critique of technocracy is that it represents an "antidemocratic" and "dehumanizing" ideology. A Walzerian critique of technocracy is that technocracy overlooks the real meaning of democracy and fails to consider a crucial democratic notion: a policy decision will not be a democratic choice if such policy is not made through a *democratic procedure*, although technocrats may claim that they do have considered public preferences or interests (Gilley, 2017). Sociologists and policy researchers further argue that a government of technical elites has some serious ethical challenges.

Due to the Western liberal democratic ideologies embedded in the criticisms of technocracy, this paper argues that some values of technocracy in policymaking and governance can be reexamined. We argue that there are at least two

reasons that justify the value of reconsidering technocracy in contemporary social and political contexts. First, reflections on technocracy can provide alternative insights into political and policy theories, given that technocratic governance has been considered as one of the three approaches to European science and technology policy in the past 30 years (Landeweerd et al., 2015). Therefore, at least in the methodological sense, technocracy contributes to "a theory of governmental decision making designed to promote technical solutions to political problems" and such theory in turn "supports a political project that advocates experts as the dominant basis for organizing political power" (Fischer, 1990, p. 18).

Second, the powerful role of emerging technologies enabled by artificial intelligence has redefined dominant approaches to social governance. Social governance is either enhanced or challenged by these technologies. Humans are now living in a global society in which emerging technologies such as robotics and data analytics are shaping human life in unprecedented ways. To a large extent, big data and algorithms for dealing with the data "result in technocratic government" and traditional governmental processes "are replaced by new processes run by algorithms" (Janssen & Kuk, 2016, p. 376). Arguably, social governance is technocratic *by its nature*, as it might be difficult for policymakers to resist the ample opportunities brought by emerging technologies that may lead to governance reforms. Meanwhile, emerging technologies play a central role in bringing new and daunting ethical challenges to the society (e.g., data analytics has changed political campaigns).

This paper invites Western scholars to reconsider their traditional liberal and democratic criticisms of technocracy against current social and political realities. More specifically, it argues that incorporating Confucian resources such as the rule of virtue into technocracy may be helpful for reexamining the Western liberal democratic challenges to technocracy. This paper will also provide some practical examples from organizational and social management in which virtues and the rule of virtue shape how technocrats are selected and technological projects are designed. It is worth noting that this paper is not trying to deny the values of democracy, to claim that democracy should be replaced by technocracy, or to suggest that technocracy should become a global form that every country should adopt. Instead, our hope is to invite our Western colleagues to reexamine the traditional liberal criticisms of technocracy, reevaluate the meaning of technocracy in current technological context, and explore insights that they may find useful for rethinking democratic theories of technology.

Nevertheless, it is worth issuing some caveats here before we delve into details. This paper adopts a cross-cultural or comparative approach to the study of technocracy. Therefore, it will encounter some methodological challenges that are common to most comparative philosophical projects including "oversimplifications, excessive stark contrasts, and illicit assimilations" (Wong, 2020a). It is methodologically problematic to assume an oversimplified, stark contrast between the Western culture and the Chinese (or Confucian) culture, due to "the vast range of texts and their intellectual and historical contexts" (Wong, 2020a) in each of the two traditions. A minor step toward addressing such a methodological concern might be specifying what aspects of the two traditions we mainly refer to in this paper. For instance, what we mean by the Western culture is the political and ideological contexts of the Western

societies that emphasize the rule of law, universal human rights, individual autonomy, and the assumption about the government as a necessary evil (Tan, 2004). In contrast, the Chinese or Confucian culture refers to the intellectual thoughts derived from classical Confucianism especially works by Confucius and Mencius. Occasionally, this paper will also mention scholarship from later or even contemporary Confucians such as works by New Confucian Mou Zongsan (1909–1995).

We believe that the discussion of technocracy is highly relevant to scholars in STS and engineering ethics. In particular, a thorough examination of technocracy has profound implications for understanding the appropriate role of engineers and expertise in policymaking. Despite that technocracy has been extensively criticized in the STS literature, it is worth exploring if there are any underestimated positive values of engineers and their expertise for the governance of technology. Such reevaluation of technocracy or technical expertise has further implications for engineering ethics education. Given the unprecedented scope and pace of technological change today, engineering educators need to ask what ethics education is needed for cultivating virtuous engineers who: (1) are sensitive to the powerful role of their expertise in shaping the society; and (2) are capable of wisely utilizing their expertise to build a flourishing society.

The Ethical Challenges of Technocracy

To a large extent, technocrats are those who are technically trained elites selected rather than elected into power (Zheng, 2008). In ideal cases, the selection and promotion of technocrats are expected to be "meritocratic," especially in China which is a country known for the technocratic nature of its political system.[1] In the Western world, the idea of technocracy has been widely criticized by major schools of thought. An early commentary by Yongmou Liu (2016) has conceptualized these criticisms from different Western philosophical traditions. For instance, Marxists criticize that technocracy helps the capitalist system control workers. Humanists argue that technocracy has turned humans into machines. Libertarians accuse that technocracy encroaches on individual freedom. Historicists and relativists criticize that the scientific principles and technological methods employed by technocrats are not adapting to human society. This section summarizes the major ethical challenges of technocracy concerned by scholars in philosophy, political theories, sociology, and policy studies.

First and foremost, philosophers and political theorists argue that the idea of technocracy is simply not compatible with democracy. Political theorist Jean Meynaud characterizes technocracy as being "opposed or hostile to the idea of democracy" and the technocrat as someone who "likes to act in secret, prefers confidential discussion to open debate, and tends towards authoritarianism and absolutism"

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[1] However, in technocrat political systems, as political leaders are often selected but not elected, there are cases in which discriminatory and exclusionary practices may exist (e.g., women and ethnic minorities have not been well represented among senior political positions in China's central government).

(Meynaud, 1968, pp. 58–59). Langdon Winner points out that major premises of technocracy are totally incompatible with the idea of "responsible, responsive, representative government" (Winner, 1978, p. 146) which is *central* to the practice of liberal politics. In a similar fashion, Andrew Feenberg argues that the deterministic premises of technocracy leave no room for democracy, "whether technocracy is welcomed or abhorred" (Feenberg, 1999, p. 75). Winner has a vivid account of how technocracy as a political philosophy acts in the government and how it shapes technological governance in the society:

> In the technocratic understanding, the real activity of governing can have no place for participation by the masses of men. All of the crucial decisions to be made, plans to be formulated, and actions to be taken are simply beyond their comprehension… They [Technocrats] consider the accomplishments of the new technology so obvious and marvelous that they expect the public to receive them willingly and without asking questions or making demands... The technocrats, being human themselves, understand man's basic needs. They do not need to be reminded of them. In a world being transformed and made better through new devices and techniques, the voice of the public can only be a kind of ignorant carping (Winner, 1978, pp. 146-147).

In a general sense, liberal politicians are concerned that technocracy undermines both the *political* (e.g., the voices of the public are not heard, the moral and political standing of the public is jeopardized as the public are portrayed as the ignorant) and *technical* (e.g., the needs of the public are overlooked which may be beneficial for designing better policies) values of the public.

Second, sociologists and philosophers have pointed out that technical experts may lack sensitivities to the sociotechnical complexities of the technical system which are crucial for making effective engineering judgment. Charles E. Harris (2008) argues that dominant approaches to engineering ethics education place a strong (if not exclusive) emphasis on rules such as rule-based professional codes of ethics, while overlooking the crucial value of virtues in engineering decision-making. Although some scholars may argue that most codes of ethics in engineering do emphasize virtuous behaviors (e.g., act honestly), it can be unclear whether engineers who simply follow codes of ethics are *perceived* as virtuous or their behaviors are actually *motivated* by virtuous predispositions (Harris, 2008). As a result, very limited opportunities, if any, exist in current engineering curricula that allow future technocrats to develop both technical and nontechnical excellences. For instance, technocrats may lack sufficient *sensitivity to the cultures of risk in their organizations* (e.g., what sociologist Diane Vaughn calls "normalizing deviance") and *sensitivity to the complex, interconnected, and interactive processes of a technical system* (e.g., what sociologist Charles Perrow calls "tight coupling" and "complex interaction") (Harris, 2008).

Third, technocrats and their decisions can be potentially influenced by political and economic interests after they assume positions in institutions. There are many discussions about the relationship between technocratic decisions and politics. Sheila Jasanoff points out that the scientific uncertainty and the pressures coming

from political decision-making often lead to "a forced marriage of between science and politics" (Jasanoff, 1994, p. 8). Richard G. Olson (2016) argues that scientific and technical advisory bodies are influenced by politics since they usually serve the interests of political actors. If technical experts want their policy suggestions to be considered, their policies need to reflect the view of the current political regime (Olson, 2016).

Economic factors may also play an important role in shaping technocratic decision-making. Massimiano Bucchip (2009) notes that scientists are less trusted in the public as their views are easy to be affected by interest groups including corporations (Bucchi, 2009). Phil Ryan argues that "for some experts, presenting as objective truth opinions that have been influenced or even purchased by financial backers can be a highly lucrative sideline" (Ryan, 2018, p. 134). For instance, *New York Times* reported that "an examination of 75 thinktanks found an array of researchers who had simultaneously worked as registered lobbyists, members of corporate boards or outside consultants in litigation and regulatory disputes, with only intermittent disclosure of their dual roles" (Lipton et al., 2016). Inn lead to various ethical dilemmas.

Fourth, political theorists worry that technocrats hold a positivist conception of knowledge and the engineering methods they employ often reduce diverse values of our society to technological and material values (Fischer, 1990). Thus, our everyday world can be conceptualized as "a configuration of 'problems' to be technically and administratively engineered by experts" (Fischer, 1990, p. 44). Evgeny Morozov (2013) invites us to be careful about the ideology of "technological solutionism" in social governance, that is, the idea that technology will enable humans to solve all problems and create incentives to get more people to do the right thing. Similarly, Meredith Broussard (2018) challenges the idea of "technochauvinism" which is the belief that technology is always the solution to social problems especially in the age of artificial intelligence. Broad human and social values are often reduced, downplayed, or, overlooked. Critical philosophies of technology such as Marxism often criticize that technocracy turns human beings to "mere cogs in the social machinery" or "objects of control" comparable to "raw materials and the natural environment" (Feenberg, 1999, p. 75). Technocrats have a realist belief that there exists a technological order which needs to be recognized and has a determining role in guiding social management.

In addition to the four classic critiques found in the literature, there have been some new worries regarding technocratic governance that result from the increasing adoption of emerging technologies (e.g., data mining, artificial intelligence) in addressing social issues especially in technocratic regimes such as China. The employment of emerging technologies enabled by artificial technologies may bring serious ethical challenges (e.g., discrimination, violation of human rights) to the public and the society.[2] To a large extent, the employment of data science has turned social governance into a kind of technocracy (given the crucial role of data

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[2] Most critics of technocracy may still find the four criticisms listed earlier still apply to the new context of social governance which is mediated by emerging technologies, although they may find that discussions on the four critiques may become more complicated.

in informing and optimizing policymaking). Luciano Floridi and Mariarosaria Taddeo (2016) argue that the collection and analysis of large datasets can bring ethical challenges that are *unique* to the nature of emerging data technologies. Data technologies such as data-mining, -linking, -merging, and re-using of large datasets can potentially generate concerns such as the re-identification of individuals and the identification of types of individuals (may lead to group discrimination and group-targeted forms of violence) (Floridi & Taddeo, 2016).

To a large extent, emerging technologies enabled by artificial intelligence have redefined the meaning of technocracy and made social governance more challenging.[3] It might be more challenging to generate any immediate judgment on the new technocracy enabled by big data and artificial intelligence, compared to traditional forms of technocracy. For example, it might be more challenging to draw an easy conclusion whether a sociotechnical system such as surveillance technology or facial recognition humanizes or dehumanizes the society. A society that employs facial recognition in its social governance may argue that they want to protect personal security in the public and increase social trust. However, such technology may also have a potential danger of jeopardizing individual privacy or being used for enhancing the government's political power. Therefore, the new technocracy enabled by artificial intelligence leads to a paradox: it can both humanize and dehumanize the society at the same time.

These ethical challenges further redefine the professional responsibility of data scientists working in the government and policy areas, which is different from and more than the traditional responsibility of scientists depicted in most textbooks (e.g., scientists do not fabricate or falsify data and not plagiarize). The increasing complexity and autonomy of algorithms challenge the dominant theories of moral responsibility as data technologies often generate both consequences (sometimes undesired) and opportunities that are difficult for data scientists to foresee or control (Floridi & Taddeo, 2016).

A Confucian Response to the Western Criticisms of Technocracy

In this section, this paper will provide some preliminary responses to the classic criticisms of technocracy summarized in the last section, by employing resources from Confucian ethics. It is worth noting that these Confucian ethical resources represented by the idea of the rule of virtue (*dezhi*, 德治) supported and justified the development of the technocratic tradition in the Chinese history. From the Confucian perspective, there are at least two components in the integration of the rule of virtue into technocratic governance. In this sense, this paper expands the traditional, Western, narrow meaning of technocracy. The two components of the integration of the rule of virtue into technocracy are: (1) effective technocrats or technical leaders are selected (not elected) on the basis of their *moral* and *intellectual* virtues which

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[3] Ideas and examples in this paragraph were mainly derived from a reviewer's comment.

are superior to those of the average; and (2) the policies and the sociotechnical systems designed by these technocrats are expected to have positive impacts on the moral progress of the society.

Among the four major criticisms of technology summarized in the last section, the first one is mainly concerned that the idea of technocracy is against some democratic ideas particularly the value of democratic deliberation and public participation in policy-making. Technocracy in the West is often perceived by liberal thinkers as incompatible with democracy. As a result, technocrats assign limited opportunities, if any, to the public to freely express their views and participate in policymaking.

As argued by philosopher Carl Mitcham, public participation is crucial in technical decision-making as it "realizes potentials inherent in human beings as political animals" and the public would "develop [motivation and information] in the very process of participating in an open, democratic culture" (Mitcham, 1997, p. 43). Philosopher Pak-Hang Wong (2013a, 2013b) questions the effort to view public participation as a *universal* moral requirement in technological governance and argues that the liberal democratic ideas underlying public participation are "foreign" to the Confucian ethical–political tradition. The liberal democratic tradition views the person as an "independent, rational, and self-determining being" who has "a right to be free" (Wong, 2013a, p. 357). Such person "should be consulted about and given justifications for any decisions and actions that interfere with [her] ways of life" (Wong, 2013a, p. 353). In contrast, the Confucian notion of equality places more emphasis on the *moral* aspect than the *political* aspect of equality and Confucians such as Mencius advocate that everyone is born with the same potential to be morally good.

Thus, the Confucian idea of personhood is "developmental and virtue-based" which implies that "individuals may well indeed be different in their degree of virtuousness and capability", due to different efforts they put into the lifelong project of developing virtues and capabilities. More specifically, Confucian ethics highlights five constant virtues that are critical for becoming *junzi* (morally superior persons, 君子): *ren* (benevolence, 仁), *yi* (righteousness, 义), *li* (ritual propriety, 礼), *zhi* (wisdom, 智), and *xin* (trustworthiness, 信) (Csikszentmihalyi, 2020). Among the five virtues, *ren* is the most fundamental one which often grows out of the cultivation of affective dispositions toward close family members and then extends to members of other communities in the society.

As a result, the power of decision-making should be distributed unevenly in the society as "individuals' degree of virtuousness and virtuous capacity vary" and "virtuousness and capacity serve as the criteria for being decision-makers" (Wong, 2013a, p. 359). In this sense, Confucians would argue that technological governance should be led by virtuous and capable people. However, critics of technocracy may still argue that there is no guarantee that technocrats will be willing to listen to the public and incorporate public needs into policymaking and design, after they seize the political power.

Such criticism leaves limited space for the possibility that public values could potentially constitute a factor or variable (by using an engineering term) for the engineering system that technocrats construct in which empirically informed resolutions to social problems are formulated. In fact, the sensitivity to public needs should be indispensable for a competent technocrat to make scientifically sound policies. An

engineer will not be called a competent engineer if one neglects the needs of users and the public. Winner (1978) points out that there is (or should be) some place for public voice in a technocrat system and technocracy is not completely incompatible with public values. As argued by Winner,

> This [Technocracy] still leaves open the possibility that the populace could voice its desire for the goals and kind of distribution that a system run by experts would obtain. Voting would reflect the wishes of the people, which could then be enacted in the technically best way. But at least in the formations we have seen so far, this is not at all the way that theorists of technocracy have seen the matter (Winner, 1978, p. 146).

Nevertheless, as Western critics may argue, even if some technocrats may be interested in incorporating public values into their decision-making, such consideration about public interests may still be based on a dismissive, paternalistic attitude: technocrats believe they know well or even better of the values of the public (Winner, 1978). As a result, it is likely technocrats may project their own ideas and values on the public rather than listen to the public needs. In this sense, technocracy again is not compatible with democracy. Wong (2013a, 2013b) questions such concern by introducing recent reinterpretations of Confucian political philosophy. According to Wong, the idea of "self-restriction" proposed by New Confucian Mou Zongsan suggests that virtuous and capable Confucian leaders are often required to "restrict themselves in the political realm" and "suspend their moral and political superiority and refrain from imposing their view(s) of the good on the public" (Wong, 2013a, p. 362). Confucian leaders understand that their full virtues need to be realized in the public world, whereas such public realization of full virtues calls for harmonious social structures. Thus, they are willing to restrict their virtues (including both moral and intellectual virtues) to harmonious social structures. Confucians may suggest that technocrats not be arrogant.

Furthermore, readers may also wonder whether less effective technocrats can learn from Confucianism to become more sensitive to public needs. There are at least four typical approaches to the cultivation of moral imagination and sensitivity in Confucian ethics that can be useful for engineers: (1) reflective observation of social interactions (e.g., reflecting on how people interact with each other and how the engineer interact with others); (2) moral thought experiments (e.g., cultivating moral imagination by engaging in thought experiments); (3) analogical extension of familial relations (e.g., extending moral concerns about family members to others); and (4) the "as-if" rituals (e.g., imagining as if stakeholders were present) (Zhu, 2020). Certainly, for a technocrat to become more morally skilled at empathizing public needs, a more fundamental condition is whether such technocrat has the will or determination to consider learning morality as her life-long goal.

The roles technocrats play are *pragmatic* as their roles are evaluated *in relation to* their capabilities to formulate effective social policies. The realization of their virtues is essentially social as it takes place in the social application of their expertise. Being arrogant and ignoring the public will separate themselves from the social context and prevent them from realizing their full virtues in the public world.

Technocrats with mature expertise but immature virtues can be extremely danger-ous to the society. In the Confucian tradition, the virtue of self-restraint has his-torically been a *moral ideal*. In ancient China, emperors were all taught by their Confucian teachers to develop self-discipline and ensure that their exercise of power was aligned with the mandate of the heaven (caring about the welfare of their peo-ple). More recently, in early 2000s, Chinese Academy of Engineering (CAE) whose members often serve "technocrat" roles in the central government, created moral codes for their members to self-discipline their unique power in science and technol-ogy policymaking (Cao et al., 2013).

The second criticism of technocracy in the last section is concerned that tech-nocrats may lack moral sensitivities or critical attitudes toward the complexities of sociotechnical systems. For Confucian technocrats,[4] they must demonstrate both intellectual and moral sensitivities. However, the Confucian framework of culti-vating sensitivities is broader than Harris' (2008) framework. Confucian moral sensitivities may refer to personal and professional moralities *in general*, whereas Confucian intellectual sensitivities may refer to the virtues closely associated with the technocrat's training as an *expert* including both Harris' "technical" (e.g., sen-sitivities to risk and complex interaction in a technical system) and "non-technical" (e.g., techno-social sensitivity, respect for nature) excellences (Harris, 2008). Nev-ertheless, Confucian scholars further emphasize that moral sensitivities should be prioritized over intellectual sensitivities for evaluating and promoting a technocrat (Liu, 2015). Harris (2008) worries that too much emphasis has been placed on rules in current engineering education which has caused the lack of sensitivities among practicing engineers to the technical system and the broader society. Thus, to cul-tivate the technical and non-technical sensitivities, Harris (2008) advocates for the integration of humanities (or more broadly "liberal arts") into engineering educa-tion. Coincidentally, the focus on cultivating virtues and the moral self is central to the Confucian tradition. Technocrats are expected and encouraged to demonstrate these virtues as a way of distinguishing themselves from others and influencing oth-ers. Thus, as this paper suggested earlier, it makes more sense that Confucians prior-itize moral virtues over technical or intellectual virtues.

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[4] The notion of "Confucian technocrats" mainly refers to technocrats whose views of technology and society are deeply influenced by Confucian values. Nevertheless, we are not suggesting that these Confu-cian technocrats need to learn Confucian classics and apply teachings from Confucian classics into their engineering and management work. Contemporary technocrats in China may have never systematically learned Confucian classics, but they may still be called Confucian technocrats insofar as the values that guide through their everyday decision-making are either influenced by or aligned with key ideas in Con-fucianism. In other words, one does not have to learn Confucian classics to be a Confucian insofar as *this person acts like a Confucian* (it is possible that this person grew up in a family or a community which is dominated by Confucian values). Critics may also argue that in the Chinese intellectual history scholars from other schools of thought such as Daoists and Mohists might care more about technological innova-tion than Confucians. While we do agree that Daoists and Mohists historically showed greater interests in scientific and technological practices, we argue that quite a few teachings in Confucian ethics are in fact valuable for reflecting on the social impacts of technology and therefore "Confucianism matters in ethics of technology" (Wong, 2020b).

In Chinese politics, arguably, the most qualified leaders are ideally those who have passed "numerous rounds of 'tests' on their competency in promoting economic development driven by technological change" (Zhu, 2017a, p. 15). The sensitivities to sociotechnical systems are thus cultivated and evaluated through these tests. Ideally, leaders in the government are chosen based on their expertise and performance in previous positions where they employed expertise to formulate effective social policies (Zhu, 2017a). Liu (2015) argues that such idea of the "exaltation of the virtuous and the capable" was prevalent among early Confucian scholars including Confucius, Mencius, and Mozi. Most readers are probably familiar with the technocratic nature of Chinese political structure and governance. Many Chinese political leaders were trained as engineers and they had extensive experience working in state-owned technical companies where they started their professional careers as "frontline technical workers (*yixian jishu gongren*, 一线技术工人)." As indicated earlier, Harris' technical and non-technical excellences for engineers are virtues that are cultivated based on rich practical experience across their whole career.

Scholars in engineering education might argue that there are opportunities in the engineering curriculum designed for students to learn professional ethics in more practical and engaged ways such as project-based learning, internships, and cooperative education programs. However, these experiential learning programs constitute only a small portion of the engineering curriculum. Cultivating the virtues advocated by Harris (2008) needs to go beyond current four or five years of undergraduate engineering education. Therefore, the idea proposed by Harris (2008) (and many other Western scholars) that humanities education needs to be integrated into the engineering curriculum invites engineering educators to cultivate ethics as a life-long learning skill among engineering students. The Confucian approach to selecting technocrats enables technical experts to cultivate these virtues throughout their whole professional career starting from front-line technical workers. After they have passed numerous rounds of tests, a few technical experts are able to be promoted to leadership roles and by then their technical and nontechnical virtues are better developed and tested.

Such Confucian approach to selecting technocrats may sound valuable in response to Harris's worry that engineers lack technical and nontechnical excellences. A Confucian perspective on ethics education is that virtues are reliable and "global" virtues, if these virtues can be tested over a much longer period or even one's whole professional life. Western critics may question that some leaders may be promoted due to the close relationships they have with their supervisors rather than their actual merit. However, this paper would argue, even if some political officials may gain power through relational bonds with higher level leaders, their political legitimacy can always be checked, criticized, and challenged by their subordinates and/or peers based on technological meritocratic criteria (Zhu, 2017a).

It is worth noting that there are certain interactions between relationship or *guanxi* (关系) and virtue in a Confucian society. On the one hand, virtues are often understood and cultivated in relational ways. We all assume different social roles and these roles do not only describe the relationships we have with others but also prescribe the responsibilities we have to others and the virtues are cultivated in these relationships. Becoming a virtuous person is something either we do together, or

not at all (Ames, 2020). A leader develops virtues such as *ren* (benevolence, 仁) in her relationship with her subordinates. While interacting with her subordinates, she takes such relationship with her subordinates as a resource for ethical cultivation and grasps opportunities to reflect on what it means to be a virtuous leader and what the virtue of *ren* means in such a context. Meanwhile, her subordinates reflect on what it means to be virtuous subordinates and what virtues are required for living the subordinate role well. On the other hand, only relationships that are conducive to the cultivation of virtues that are reliable, sustainable, and worth further maintaining and pursuing. Only these relationships are good for broader social and organizational contexts. People who work in relationships detrimental to their cultivation of virtues will not be good for their emotional development or longer term professional careers. If a leader promotes someone based on her relational bonds with this person rather than such person's actual merit, it is evident that this leader is doing something detrimental to her own self-cultivation and therefore putting her relationship with all subordinates in danger (e.g., generating mistrust in the group).

Nevertheless, we do admit that it is unrealistic to expect that such Confucian technological meritocratic system will fully eliminate corruption. We are not arguing that such meritocratic system will lead to less or no corruption compared to Western democratic system. Our major goal here is to indicate that there are some *possible theoretical and yet ideal* responses to the Western scholarly criticism that the combination of ineffective technocracy and the Confucian focus on relationship building often lead to nepotism and corruption. Similar to ineffective democracy that often results in serious social issues (e.g., social injustice, underrepresentation of certain vulnerable groups), ineffective technocracy can also lead to social and political challenges such as corruption.

The idea that Confucian technocrats need to pass numerous tests throughout their professional life may also provide some responses to the third criticism of technocracy depicted in the last section: technocrats are prone to be influenced by political and economic interests after they seize power. It is worth noting that the tests Confucian technocrats go through are often conducted by both supervisors and peers (Bell, 2015). Insofar as a small portion of technical experts can finally become technocrats, these technocrats are more reliable than others who have not been able to pass all the tests. Also, in contrast to the Western technocrats who often serve the interests of some economic and political actors, Confucian technocrats do not need to serve the electoral democratic system. Compared to some Western technocrats who tend to separate the technological from the political, Confucian technocrats see the two things are not separable: Confucian technocrats often view their technical leadership roles are inherently political as the competency in completing these tasks well demonstrates their potential for being good political leaders (Dodgen, 2001).

In this sense, Confucian technocrats are distinct from traditional Western technocrats who are consciously not interested in politics and ideologies and consider *technologies as apolitical*. As noticed by Yongnian Zheng, traditional technocrats "are more interested in technical matters than political issues" and "they concern themselves more with tasks than power" (Zheng, 2008, p. 5). A Confucian technocrat will not simply see their tasks as *merely technical* but also as *political and ethical*. In ancient China, Confucian scholars who were promoted to positions that oversaw and

managed nation-wide hydraulic projects often emphasized more the *political significance of their work* (e.g., the importance of controlling floods in solidifying and unifying the nation-state) than *the technical sophistication of engineering* (Dodgen, 2001). So rather than being worried about technocrats and their technical decisions can be easily influenced politics, Confucian technocrats are more proactive and willing to take the challenge to politicize technical projects.

As the fourth criticism of technocracy summarized in the last section indicates, Western critics of technology such as Andrew Feenberg (1999) worry that technocrats hold a positivist conception of knowledge and the engineering methods tend to reduce diverse values to simply technological and material values. A Confucian response to this criticism could be that there are different kinds of values and some values are prioritized over others in a given society. Contemporary global ethicists such as Heather Widdows (2011) tend to categorize human rights into three different groups or "generations": first generation rights are civil and political rights, second generation rights are economic, social, and cultural rights, and third generation rights are rights of (indigenous) peoples. Confucians argue that economic, social, and cultural rights (e.g., social wellbeing) are more fundamental than civil and political rights (Wang, 2002) and the right to subsistence is an essential part of Confucian constitutional rights (Kim, 2015). In this sense, a Confucian technocrat would agree with Western technocrats and argue that technocracy as a policymaking method promotes (but does not limit to) material values. In fact, one of the early pioneers in American technocratic movement Harold Loeb (1891–1974) suggested that technocracy should only be a means rather than an end for ultimate social goals and "material security constitutes the basic prerequisite to meaningful freedom" (Akin, 1977, p. 116). Technologies thus become instrumental and technological assessment is based on the efficiency of technologies in realizing values that are more fundamental and beneficial for a harmonious society. Traditional Western technocrats might be accused of reducing diverse human values to narrow technological and material values and dehumanizing the society. In contrast, Confucian technocrats may claim that they are more proactive, as they strive to seize every opportunity in engineering design to interpret and integrate moral values. In this sense, arguably, Confucian technocrats are more interested in *humanizing* rather than dehumanizing the society.

Nevertheless, philosophers such as Shrader-Frechette (2017) may further worry that such emphasis on social and economic values over other values would lead to a kind of utilitarian, cost–benefit thinking: economic benefits may excuse environmental injustice (e.g., cheaper housing near polluting sites is worth killing or sickening innocent people). As pointed out by Shrader-Frechette (2017), technical experts such as environmental scientists can employ flawed analytic techniques to generate environmental injustice. While this paper totally agrees with Shrader-Frechette's worry, it also wants to explore if there are any opportunities for contemporary idealist technocrats to optimize traditional technocratic methods. From the Confucian perspective, the ways in which technical expertise is employed by technocrats need to be checked by their moral virtues to avoid misuse of expertise that may generate injustice. A truly good technocrat is expected to *be able to* make policies that exemplify virtues such as *ren* (benevolence, 仁)

and *yi* (righteousness, 义). To Confucians, knowledge, technologies, artifacts, and policies are never value-neutral and need to be regularly checked by moral self-reflection. Therefore, when choosing a leader, it is better to have a less technically skilled moral exemplar than a morally incompetent but technically skilled expert.

When technocrats who have passed numerous rounds of tests on their morality and expertise are promoted to the leadership, the Confucian idea rule of virtue requires these selected technocratic leaders to create sociotechnical systems that exert positive impacts on the moral progress of the society. In addition, Confucian values provide ethical guidance for technocrats in assessing the moral quality of the sociotechnical systems they build. Sociotechnical systems are often assessed based on the criterion of whether and how these systems contribute to a process of harmonization (e.g., a continuous negotiation and adjustment of relationships between humans, society, and technology) (Wong, 2012). A major Confucian concept for a virtuous technocrat to create harmonious social relationships is the idea of *zhongyong* (the doctrine of the mean, 中庸).The idea of *zhongyong* provides guidance for technocrats' own decision-making. Competent technocrats need to avoid extremes, explore appropriate ways of handling changing situations, and embrace and balance various possibilities (Yuan & Wen, 2014). Inspired by the idea of *zhongyong*, technocrats need to be aware that decision-making is a "shifting equilibrium" and it needs to "optimize the creative possibilities of the ever changing circumstances" (Ames & Hall, 2011, p. 8). Such optimizing process requires technocrats to be sensitive to the ever-changing nature of decision-making, experience the flow of all kinds of events, and open to various possibilities to consider and balance different viewpoints.

Since the early periods of Chinese philosophy, not only Confucianism but also other schools of thought such as Daoism have debated about the impact of technologies on one's moral self and the broader social environment in which one dwells (Zhu, 2010). For instance, early Confucians and Daoists debated about whether the value of efficiency embedded in mechanical engineering technologies such as a shadoof would affect the development of the user's moral self. Daoists argued that the mechanical mind can contaminate one's simplicity and spiritual life. In contrast, Confucians argued that Daoists only saw one side of technology but overlooked the social welfare such technology could bring (Zhu, 2010). Thus, Confucian technocrats are expected to use their morality and expertise to design technologies that are conducive to human flourishing: a continuous and optimized process that fulfills the social roles one assumes in familial and communal contexts, promotes self-modification and self-transformation for being a full person, negotiates and adjusts the relationships between human beings, society, and technology (Wong, 2012, pp. 80–82).

Finally, Western critics may be concerned about whether the Confucian technocratic stance on proactively politicizing and moralizing technologies would lead to a kind of worrisome *technological paternalism* especially in the age of emerging technologies. In the field of the ethics of technology, Wong argues that the paternalism engendered by technology "is not something that people *can* and *should* avoid" (Wong, 2013b, p. 36). Wong further argues that paternalism is unfortunately

unavoidable in most engineering design projects given the power dynamic between the designer and the user:

> In most technological design and production processes, users are often conceived as passive receivers of technology, who are not and often cannot be involved in the processes. The passivity of users has an important implication… values are built into technology; and, the values are built into the technology by its designers and engineers, who claim special technical knowledge that are unavailable to the users. Designers and engineers are also the small group of people who oversee the design and production processes. In other words, users are 'instructed' how to live by designers, engineers and the others in the chain of production who determine – either consciously or unconsciously – the values to be embedded in the technology and, relatedly, decide what is good and bad for the users. In this respect, designers and engineers cannot but impose a view of the good life on the users (Wong, 2013b, pp. 34-35).

The quote above from Wong (2013a, b) may seem to be too "technological deterministic." Research in the historical and social studies of technology has shown that there are cases in which societal factors such as the user preference and cultures did shape the developmental trajectories of technologies. One classical example is the development of bicycles in the social construction of technology (SCOT) theory (Bijker, 1995). However, to some extent, scholars may agree that there is some degree of imbalanced power dynamic between designers and users in a technological society. Perhaps, such imbalanced power dynamic and technological paternalism are more significant or daunting in the age of emerging technologies when technologies such as big data and artificial intelligence bring both opportunities and challenges to social governance. Technocrats may have more chance and technical capability to understand the risks associated with these technologies. It is noteworthy that there is a dilemma in the Western democratic approaches to governance: On the one hand, critics argue that technocracy is threatening democracy and dehumanizing society. On the other hand, it seems that most advanced democratic societies including the United States and Europe do have seen the great potential of big data for promoting more efficient policymaking (Giest, 2017; Joseph & Johnson, 2013). If it seems unrealistic to fully rule out emerging technologies in social governance, then scholars should think carefully about whether there is any possibility that the cultivation of the moral and intellectual virtues of technocrats can complement traditional democratic approaches to technological governance that may include overwhelmingly complicated political processes (e.g., how the public can effectively participate in policymaking and rationally present their views in a democratic system). In fact, these processes are often too technical if not "technocratic," whereas not every member of the public can understand.

This paper argues that the society mediated by emerging technologies require technical experts to assume more responsibilities. In fact, the ethical concerns arising from the use of large datasets such as the re-identification of individuals and the identification of types of individuals (Floridi & Taddeo, 2016) call for more morally

competent technical experts, as they are more intellectually capable of identifying potential and untraditional risks associated with these emerging technologies (if they have developed sensitivities to these risks). By using philosopher Peter-Paul Verbeek's words, if emerging technologies are too powerful that humans cannot or do not want to depart from them, humans have the obligation to learn how to better *accompany* these technologies in moral ways (Verbeek, 2010).

Nevertheless, it is also worth noting that emerging technologies sometimes can also influence the ways that technocratic leaders exert influence over sociotechnical systems. For instance, the ubiquitous and decentralized nature of social media has partially made possible misinformation and fake news. For technocrats who are governing or participating in the design of social media platforms, a critical question for them to think about is how they can create a reliable environment in which diverse values and voices are heard.

So far, a methodological recommendation this paper has for the Western critics of technocracy is that technocracy is not a "static" concept and scholars need to adopt a pragmatist view of understanding technocracy. As an idea, technocracy changes its meaning as its use context changes. It might be counterproductive if scholars fully abandon such a concept. Instead, scholars need to be creative and explore if there are any opportunities to make technocracy a more *practically efficient* and *morally plausible* system. In doing so, this paper suggests that scholars learn from other non-Western philosophical traditions such as Confucianism which might bring new insights into the interpretation and practice of technocracy.

Technocratic Practices in Organizational and Social Management

The technocratic approach to social governance or the employment of experts and expertise in shaping social order is nothing new. In this section, this paper will introduce some examples that demonstrate how technical experts and expertise contribute to organizational and social management. These cases show that virtues and the rule of virtue do play a crucial role: virtues either determine the selection of technocrats and the legitimization of their political power or are embedded in engineering design and affect human behavior in the use context.

This section extensively draws on cases and experience from the Chinese context. However, it is not the intent of this paper to mean that either (1) technocracy only existed or is working in the Chinese context; or (2) technocracy as a form of governance works best in the Chinese context and cannot be implemented in other contexts. Historically, technocracy has appeared in both Eastern and Western contexts including not only China and Singapore but also Germany, Russia, and the United States. There are at least two reasons why this section places a strong emphasis on China. One reason is that China is a country that builds its globally competitive economy based on the national ideology of technocracy. There are more research materials available on the role of technocracy in the development of China's economy and society. Scholars globally have become very interested in the "China model" of development in which technocracy plays a critical role (Bell, 2015). The other reason for employing relatively more materials on China is due to our own academic

background and interests. A much longer goal of our research team is to theorize the Confucian (or Chinese) approach to technocracy and use it as an analytic framework to critique technological development and policy issues in China and other countries. However, it is not our intent in this paper to draw a sharp distinction between China and other countries: China advocates technocracy and has a better political system whereas other countries are against technocracy and thus have inferior political systems. We hope that a more nuanced, deeper, and creative examination of technocracy especially its role in China's economic development and social governance will benefit Western scholars and help them reconsider the challenges faced by liberal democracies. For instance, most politicians in the United States were trained as lawyers and can be insensitive to the critical role of science and engineering in advancing the society (e.g., overlooking scientific evidence and advice can be detrimental to effective social governance especially in a pandemic).

Before diving into the discussion of technocracy in contemporary China, it might be helpful to have a quick glimpse of technocracy in other countries. Reflecting on the rise of what he terms the "info-state", in which he sees the United States as a historical but falling-behind leader, Parag Khanna (2017a), using Singapore as his prime example, makes a strong case for what he calls "direct technocracy". Direct technocracy is a middle way between excessive, self-defeating democratic populism and insensitive authoritative technocracy. "It uses robust and real-time public consultation, elections, workshops and data analysis to capture the specific desires of the people, while expert committees balance short-term needs and long-term objectives" (Khanna, 2017b). Dolores Augustine (2018) has studied the historical background of nuclear energy policy in Germany since 1940s. Augustine (2018) points out that there was a technocratic culture of nuclear energy management in which pro-nuclear scientists and other experts dominated public and political discourses about nuclear energy. However, later in the 1970s, there existed an "anti-nuclear movement" initiated by some anti-nuclear counterexperts who challenged the status of the pro-nuclear experts (Augustine, 2018). Finally, the power of nuclear technocrats in Germany was challenged and defeated by the mobilization of anti-nuclear activists. Eugene Huskey (2010) examines the patterns of elite recruitment in Russia and illustrates that current Russia continues to be ruled by technocrats rather than politicians. Huskey (2010) also compares technocracy in Russia and that in other countries and discovers that the backgrounds and orientations of technocrats in Russia different from those of technocrats from other countries. Unlike Germany, France, and some other Western countries, Russia has lacked sustained periods of competitive elections so that it has never been able to develop a group of politicians who could challenge the powerful role of technocrats (Huskey, 2010). Arguably, in terms of the role of technocracy in organizational and social management, China is closest to Singapore given that the two countries have been heavily influenced by Confucianism that provides a social and cultural justification for the value of merit and expertise.

The idea of technocracy is prevalent in Chinese politics. Most core members of the central government were either trained as engineers or had extensive experience working in state-owned technical companies. For instance, as the most powerful group in the whole country, eight out of nine members of the 17th Standing

Committee of the Chinese Communist Party's Politburo were all technocrats. It is unsurprising to see that technocracy is embedded in Chinese politics in at least two senses. On the one hand, engineers were selected to assume powerful positions in the government and their training in engineering affected the policies and reforms they led. For instance, former President Hu Jintao was trained as a hydraulic engineer. Later, he integrated pragmatic and managerial-technocratic thinking into his main ideology or guiding principle for national policymaking "*kexue fazhanguan* (科学发展观, scientific development concept)" which treated the whole country as a techno-economic system and employed systematic methods to bridge socio-economic divides (Scott, 2010).

In addition to the members of the standing committee of the Politburo, many other members in China's central government were trained as engineers. For instance, the central government consists of ministries that oversee highly technical fields and these ministries are often led by technical experts (Zhu et al., 2015). Most of these ministers are often technical experts and received graduate degrees in engineering. For instance, the current State Council consists of 26 ministries and many of them are technically focused such as Ministries of Natural Resources, Ecological Environment, Science and Technology, Hydrology, and Industry and Information Technology. For instance, the current Minister of Industry and Information Technology was trained as a mechanical engineer, started his career at a state-owned auto company (Dongfeng Motor Corporation), and then was promoted to senior engineer, head of the auto company, and later governor of the province in which the auto company was located.

Nevertheless, the extant literature has not provided an empirically informed explanation on how these technocrats were promoted in the state-owned technical companies to more powerful positions in the companies and later at different levels of the government. One of the authors (QZ) of this paper did his dissertation on the everyday cultures of Chinese engineers and discovered that the idea of technocracy affected the selection of technocrats on the factory floor. On the factory floor, sometimes, engineers who become managers are not motivated by their interest in management but are promoted based on the assumption that *competent technical experts should be placed in management positions* (Zhu, 2017b). Conversely, if later a manager is found to be not technically competent, the political legitimacy of this manager will be challenged by the subordinates. In a professional setting, challenging a manager's technical competency is to challenge this manager's political legitimacy of being a leader. One of the interviewees explained how the selection of engineers to leadership roles looked like in his company:

> Our management often start from the very bottom technicians and learn from every project and discipline. If you start from the lowest level and then move up step by step, you can encounter different people and projects and expand your knowledge scope. As the higher position you move up to, the more you will be responsible for. You need to know a little bit about everything. Otherwise, how can you arrange production and organization?... We have an assumption, a person who is doing well in one position will be likely to do well and adapt easily in a different position (Zhu, 2017b, p. 116).

In fact, it is worth noting that moral excellence often carries more weight than technical excellence in promoting an engineer. As noted by some interviewees, their companies will often conduct a *qunzhong diaocha* (群众调查, mass survey) that includes informal conversations with the supervisors, co-workers, and subordinates of the engineer considered for promotion. A major goal of these conversations is to make sure that the engineer is morally qualified before their technical excellence is even considered. Such approach to prioritizing and assessing the moral excellence of technocrats in their promotions has also been found prevalent in the promotion of leaders in fields such as military and politics in China (Wang & Wang, 2018).

Furthermore, on the factory floor, a Chinese engineer who has demonstrated technical excellence is often expected by the company to exert moral power on other members, especially when the leader is assigned to formulate and lead a new team. As described by another interviewee, a lead engineer at a private computer engineering company:

> Suppose you are excellent in technological development… However, the company might expect you to assume more responsibility. You are expected to extend your (moral) power or influence. The way you extend your influence is to lead a new team. You transfer your influence to others. Or, by leading a team, through your project, by using your own deep and broad understanding of technology, you teach your team members' competency (Zhu, 2017b, p. 79).

Such selection of technocrats in the factory allows them to leverage and further develop their technical expertise and moral influence in shaping the cultures of engineering practice in their companies. Their political negotiation skills and leadership developed in the companies will prepare them for future political roles in the government. Nevertheless, this paper notes that there might be potential limitations with this meritocratic approach to selecting technocrats. For instance, when a supervisor wants to promote a subordinate to a leadership role, it is possible that this candidate's peers may provide non-objective or biased assessment of the candidate with the purpose of pleasing the supervisor. Also, it is worth noting that such meritocratic selection of technocrats often works well at lower levels of organization. When technocrats are promoted to much higher leadership positions such as those in the central government, political interests and powers may jeopardize the efficiency of the promotion system. Finally, current engineering education systems in most countries often lack an explicit focus on cultivating virtuous technocrats. The cultivation of virtues necessary for good technocrats would need to rely on their experiences in the workplace such as following role model engineers in their everyday practice.

Furthermore, the value of technical expertise can also be found in the design of sociotechnical systems that aim to address social issues. Thaler and Sunstein (2009) bestselling book *Nudge: Improving Decisions about Health, Wealth, and Happiness* discusses many examples of social technologies that aim to reinforce moral values, shape human relationships, and change moral behavior. Verbeek (2011) has famously developed an engineering approach to morality and argued that engineers have an "ethicist's role" in inscribing moral values into the design of technological products. These embedded moral values will later actively shape the moral

perceptions and behaviors of users. Other similar examples that are inspired by the engineering approach to morality can be found in emerging design initiatives such as persuasive technology (PT) and value sensitive design (VSD). Examples that demonstrate how engineering design shapes human moral perceptions and behaviors include: a speed bump that *forces* the driver to slow down and be aware of people living in nearby neighborhoods, a car specially designed to *enforce* the safety requirement that the driver cannot start the engine without securely fastening the seat belt, and a fitness tracker that *persuades* the user to make exercise a habit. All these technological impacts on users are *not democratic* but *technocratic* as these technologies have limited (if any) interests in having democratic, equal "conversations" with users. In fact, researchers have felt concerned about the potential ethical issues with these technocratic approaches especially persuasive technology:

> Users are expected to accept the basic premise of the "correctness" of the designers' chosen end behavior; and the designer is not expected to have to rigorously debated the preferability of this end behavior. This is largely a byproduct of persuasive technology researchers' avoidance of controversial framings of problems; but as a result, the issue of whether the techniques of so-called "persuasion" are indeed manipulative has escaped serious scrutiny within the computing community (Knowles et al., 2014).

Here it is crucial to revisit the Confucian thesis of technocracy, that is, it is inappropriate to assume that all technocrats and technologies are apolitical. Rather, *good* technocrats are both morally and intellectually excellent. Compared to engineers in democratic societies, it is thus more crucial for technocrats to demonstrate a morally and intellectually reliable record in their previous positions before assigning them tasks to design "value-generating" technologies. To a large extent, all these examples embrace a kind of weak program of technocracy: engineers do believe and realize their proactive and powerful role in employing technical expertise to rebuild and reshape the society including its moral system. Such philosophy would certainly be supported by Confucian technocrats who also believe that technologies are not value neutral and there are opportunities to shape social values, relationships, and structures. It is therefore probably easier to understand why China has the highest number of smart city pilot projects, according to a report released by the consulting company Deloitte (2018). Projects such as smart cities are technocratic by nature as these projects focus on information and communication technologies including big data and artificial intelligence and their uses in managing and regulating cities (Kitchin, 2014). The unbalanced power dynamic between the design engineer and the user has somehow assigned the engineer a special kind of professional "technocratic" responsibility, or what Confucians call the rule of virtue.

Conclusion

In summary, this paper has synthesized the major criticisms of technocracy in Western literature. It proposes that Western scholars reexamine their oppositions to technocracy. To do so, this paper suggests that these scholars need to start by reexamining the liberal democratic ideologies underlying their arguments but *invisible* to themselves, as these ideologies are too familiar and "natural" to them. That is a main reason why this paper has conducted an "experiment" that employs a non-Western perspective Confucian ethics to fundamentally reexamine the Western criticisms of technocracy. The integration of Confucian ethics into technocracy is thus expected to expand and "revamp" the traditional, narrow, dated (if not outdated) approaches to technocracy. Finally, with the increasing popularity of emerging technologies, this paper makes a plea for the reconsideration and rediscovery of the meaning of technocracy. Policymakers and policy scholars are invited to reassess the opportunities of technocracy, diversify the approaches to technological governance, and formulate policies that are more responsive to societal changes in the age of emerging technologies.

To envision a more comprehensive account of Confucian technocracy, there are some more specific research questions that need to be examined in future research. For instance, future research needs to address to what extent and in what ways the virtue-based Confucian technocracy could be adopted and implemented in Western socities. One possibility might be to institutionalize a system that selects and promotes leaders with superior qualities including both superior technical expertise and moral competence. It might be helpful to encourage engineering educators to challenge the value-neutral ideology in the engineering curriculum and teach students about political implications of technologies and the role of engineers in regulating social issues. Therefore, students do not simply limit their future career possibilities to corporations or similar organizations. Similarly, educational reformers need to explore how to integrate Confucian technocratic principles into the engineering curriculum including the design curriculum. More specifically, they need to teach students to be sensitive toward potential opportunities that their designs can generate positive social changes including flourishing relationships.

In addition to these practical issues regarding the application of Confucian technocracy, there are some more fundamental or theoretical issues that need to be addressed in future research. For instance, arguably, Confucian technocracy advocates some kind of hierarchical structure in the society that selects and promotes technically and morally superior people. Then a major challenge is how to interpret and integrate such a hierarchical model in liberal democracies which are often suspicious and critical of hierarchical structures. A related question would be: how to reconcile the centralized power structure (e.g., technocrats have more power than the public) and the opportunities provided by liberal democracies for public participation in technological development? But then a more challenging and fundamental question is how to justify the power of technocratic leaders. In other words, how to understand and justify the political legitimacy of technocratic

leaders especially in liberal democracies? Does the power of technocrats come from people? Or does it come from the value of technical efficiency for social governance? Regardless of how these questions will be answered, technocracy is not something that only exists or works in the Chinese context. It has been and still will be the nature of the technological society. This is even more so in the society we are currently situated in which is fundamentally mediated by artificial intelligence, robots, and big data.

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