From Professional Ethics to Technological Citizenship

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Abstract—**This paper argues for an expanded conception of professional ethics that acknowledges the engineer's special responsibility to help reform organizations and institutions as society undergoes large-scale technological transformations.**

Keywords-ethics, citizenship, structuration, institutions, organizations

I. INTRODUCTION

Engineers working on the cusp of large-scale transformations may experience painful ethical dilemmas that stem in part from the magnitude of impending changes. For example, who is responsible for solving the problem of global climate change? Is it the oilfield engineer, the corporate executive, the political leader, or the consumer? Of course, individuals, organizations, governments, and society as a whole each affect the trajectory of technological change. Yet the direction of influence in this hierarchy is unclear: does social behavior emerge from the interactions of individuals, or do social structures constrain individuals?

This paper explores the countervailing influences of individuals, organizations, and institutions on one another and it maps an ethical way forward for engineers working on elements of large-scale, transformative systems. It applies the new institutionalist perspective from sociology to a topic that has hitherto been in the domain of professional ethics.

New institutionalists distinguish among formal or regulative constraints, informal or normative constraints; and unwritten framing assumptions and cognitive biases that may constrain human behavior [1]. Institutions and organizations can impose regulative and normative constraints on individuals, but framing assumptions are deeply embedded in culture, and cognitive biases are more or less hard-wired in human brains.

II. PERSONAL ETHICS

Discussions of ethics often revolve around the importance of "doing the right thing." As individual human beings, each of us would like to be treated fairly and with dignity. Following a personal ethics based on, say, the Golden Rule, we try to treat others as we would have them treat us. This ethical stance has utility because it is reciprocal—if everyone behaves this way then everyone enjoys fair treatment and dignity.

A utilitarian ethical stance could also lead individuals in other directions, however. For example, if I believe that you are not my equal or that I will never see you again, then my interest in reciprocity might wane, and I may decide to mistreat you. My personal cost-benefit calculus would tell me that there is no need to do the right thing in this case. This is a consequentialist approach to individual ethics [2].

An ethical stance based instead on recognition of the other person's essential humanity would force a person to keep doing the right thing out of a sense of mutual obligation. This would be a deontological approach to individual ethics [2].

At its heart, moral reasoning is a process of balancing desires, duties, and consequences. Most discussions of individual ethics seem to boil down to an obligation-based, utility-informed argument to follow the Golden Rule. This standard of ethical behavior applies nicely to many situations one faces in personal and professional life.

III. PROFESSIONAL ETHICS

Sometimes this simple type of moral reasoning does not offer enough guidance. For example, at work is it better to obey a boss who directs you to overlook shoddy work and thereby keep food on your family's table, or let the world know about the shoddy work and thereby avoid potential harm to a stranger?

Professional norms have developed to help resolve such ethical dilemmas. Typical norms embodied in the codes of conduct of professional societies direct members to be obedient to their boss only as long as public health and safety are not endangered. Professional norms remind us of our obligation to our fellow humans even as we make personally fraught utilitarian calculations.

The IEEE code of ethics, for example, explicitly states that membership implies "accepting a personal obligation to our profession, its members and the communities we serve…" [3]. ASME members are expected to be "using their knowledge and skill for the enhancement of human welfare..." [4]. ASCE extends the professional obligation to Earth's biota: "Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties" [5]. This is repeated almost verbatim at

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AIChE, where members are expected to: "Hold paramount the safety, health and welfare of the public and protect the environment in performance of their professional duties" [6].

The ethical codes of the various engineering societies go into some detail, typically including ten or more guiding principles or canons. Other professions go into even more elaborate detail. For example, although the AICP code of ethics succinctly derives principles from "the special responsibility of our profession to serve the public interest with compassion for the welfare of all people…," its members are also expected to abide by some twenty-five rules of conduct elaborated over many pages of text [7]. Codes of professional ethics substantially circumscribe the range of acceptable behaviors, although they certainly do not scrub out all ambiguity.

IV. Organizational Codes of Conduct

Organizations also often have codes of conduct to guide employee behavior. In healthy organizations, these norms will reinforce the individual's inclination to do the right thing. Other organizations exhibit pathology and have corporate cultures that encourage Enron-like behavior. Professional norms can provide a check on problematic organizational behavior by giving employees the confidence to be disobedient.

Organizations do not rely only on norms or corporate culture to guide individual behavior. They also put in place very specific policies and procedures that constrain employee choices.

The professional engineering license certifies competence in specific technical domains, as well as imposing professional norms of behavior on individuals. But in many work places, quality and competence are as much an institutional matter, determined by the processes that are used to organize work activities and to make decisions. Examples include quality assurance programs.

There are financial controls and corporate certification schemes (like ISO 9000) that allow companies to demonstrate that they are following laws and competent procedures.

V. Government Policies

Sometimes both individuals and organizations need help from society's institutions to do the right thing. Government can step in and impose laws—regulations and incentives—to protect the public health and safety, encourage economic progress, improve fairness, and enforce widely shared norms. This is a huge help for working professionals who are trying to do the right thing. It provides clear guidance regarding acceptable behavior by individuals and organizations, and it protects employees from pathological organizations.

VI. Interdependencies

The account so far has described various levels of constraint on individual behavior that strive to make ethical choices routine. Embedded within these strictures is a belief that "progress consists mostly of developing standard practices that free up human attention to focus on new problems" [8].

This story line does not explain how we develop norms and pass laws. In fact, there are many interdependencies among individual, professional, organizational, and institutional levels of decision making.

Norms of behavior first emerge from the repeated interactions of individuals, along the lines of the Golden Rule discussion above. Some norms become widely accepted within particular social or professional contexts. Organizations then codify certain norms to guide the behavior of their employees. Social, professional, and organizational norms thus both emerge from and also constrain individual behavior. Giddens calls this interdependence "structuration" to indicate that agency and structure are inextricably linked [9]. It is an optimistic view because it implies that we can change our own behavior and that of our society, profession, and organization.

Laws likewise emerge from individual participation in political processes and the institutions created by political action. Thus, a political majority has slowly built over time favoring, for example, the protection of human health and safety even at an economic cost. Enforcing this law in turn constrains the behavior of individuals and the organizations they work for. Thus laws also both emerge from and constrain individual behavior. The view of government policy as emergent is a cause for optimism because it implies that individuals can change bad policies.

At the purely technological level, this view supports the engineer's design prerogatives: if you don't like what a technology is doing to society, feel free to hack it or design a better one [10].

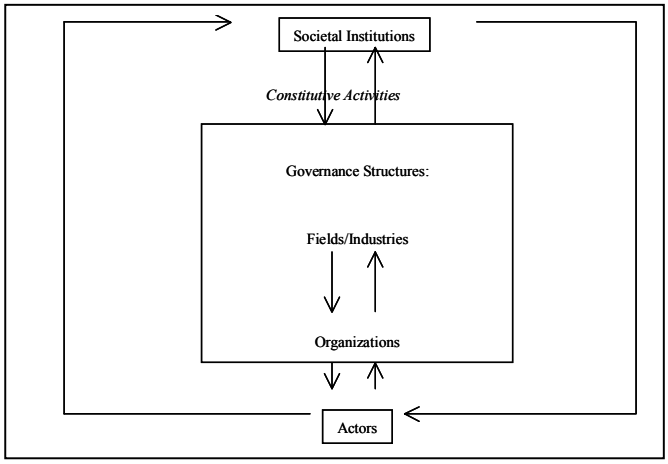

Figure 1. Structuration based on [1]

VII. Technological Citizenship

This brings the argument to the point suggested by the title of this paper: engineers should embrace the idea of technological citizenship. It is not enough merely to follow norms and laws established by others. Engineers should also exercise professional responsibility as technically informed

citizens by weighing in on issues that the general public may ignore, misunderstand, or miss entirely.

If "the recurring failure to consider the impact of technologies on basic social and political structure is as astonishing as it is ominous" [11], then perhaps we should behave as if "technological innovations are similar to legislative acts" [12].

Citizenship carries both rights and obligations. Usually we focus just on our rights, such as the right to own property or pursue happiness. More important for the current discussion are our obligations as citizens to become informed, engaged, and mindful of the general welfare.

Should our rights and obligations as citizens change as technology advances? According to the inventor of the phrase, good technological citizenship implies rights of access to knowledge, participation in public decisions, informed consent, and reasonable levels of risk exposure; while carrying duties of achieving technological literacy, engaging with the problems of the day, and protecting the civic good [13]. This list is not very different from that shown in the paragraph above, except that being informed requires more technical understanding, and being engaged implies critical thinking about more technical topics.

Arguably, those with a greater degree of technological literacy have a greater degree of responsibility to become engaged. At least it is easier for such people to do so knowledgeably. Active technological citizens certainly will hold preferences as diverse as the rest of the citizenry.

VIII. Conclusions

Engineers have vital roles to play as society undergoes its large-scale transformations. They are helping society wean itself from fossil fuels and enhance humanity's cognitive abilities, among others. Ethical behavior during such transformations extends beyond the standard scope of individual moral reasoning and codes of professional conduct. It brings a responsibility to help our organizations and institutions evolve in ways that address the emerging scientific and technological circumstances.

Encouraging change in society's great institutions requires engagement with them. At the political level, this implies the active practice of technological citizenship. Further, engineers can express their preferences in that other great collective decision-making mechanism, the marketplace. The satisfactory evolution of fundamental technological systems depends on responsible individual actions by professionals acting in distinct roles as employees, consumers, investors, and citizens.

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