2016 ASEE Mid-Atlantic Section Conference

Moral Foundations of the Engineering Profession

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Abstract

Moral Foundations Theory (MFT) proposes that moral judgements are based on six universal elements of morality: Care, Fairness, Liberty, Loyalty, Authority, and Sanctity. In this paper, we explore the importance of these different elements of morality in the engineering profession. Examining a number of engineering texts demonstrates an emphasis on concerns for Fairness, Authority, Care, and Loyalty, with comparatively less emphasis on Sanctity and Liberty. While sustainable development appears in Canon 1 of the ASCE code of ethics, it is framed as an issue of Fair allocation of resources to future generations. There are also a number of important professional ethical issues in engineering related to Liberty, including issues of national security, privacy and surveillance, and diversity/access to the engineering profession. Application of MFT provides insight into the moral foundations underpinning the engineering profession, insight useful in evaluating the position of engineering on a variety of professional and societal issues.

Keywords

Engineering ethics; moral foundations theory; values; profession.

Introduction

Engineers are challenged on a daily basis with ethical dilemmas, from recognizing conflicts of interest, to fulfilling duties to clients and the public, to protecting the environment. The ethical challenges faced by engineers, and more importantly our ethical failures, are often front page news as recently illustrated by the Flint Water Crisis.

The importance of engineering ethics in engineering education has been highlighted in a number of reports and policy statements by the National Academy of Engineering (NAE),[1] National Society of Professional Engineers (NSPE), American Society of Civil Engineers,[2] and others. Professional societies in engineering have developed Codes of Ethics that address many of the issues faced by practicing engineers.

As part of the accreditation process, ABET has established engineering ethics as a student outcome in both current and proposed criteria. As a result, engineering programs have incorporated formal instruction in ethics into the engineering curriculum. ABET student outcome *f* requires students develop "an understanding of professional and ethical responsibility." Many state licensing boards also include some type of formal instruction in engineering ethics as part

Traditional approaches to the formal instruction of engineering ethics utilize a Rationalist model based essentially on Kohlberg's theory of moral development.[3] In the Rationalist model, ethical decisions are based on determining facts, clarifying concepts, identifying relevant ethical

Moral Foundations Theory

As introduced above, Moral Foundations Theory proposes that our moral intuitions are based on six universal elements: Care, Fairness, Loyalty, Authority, and Sanctity, and Liberty. The origins of the universal elements are related to both evolution and social structures.[5] A brief description of each foundational element is given below[5]:

duty of the engineer to contribute positively to human welfare, and therefore, illustrates an emphasis on the moral element of *Care* and the prevention of harm.

The pledge provides specific actions or behaviors the engineer should undertake in order to improve human welfare. “To give the utmost of performance” demonstrates commitment, and therefore in a sense, *Loyalty* to the public, employers and clients. “To participate in none but honest enterprise” and “to live and work according to the laws of man and the highest standards of professional conduct” emphasize honesty and reciprocity and so invoke the moral element of *Fairness*. “To place service before profit, the honor and standing of the profession before personal advantage, and the public welfare above all other considerations,” illustrates the expected *Loyalty* of the engineer to the public and profession over personal self-interest.

Thus, in the Engineers’ Creed, the moral element of *Care* is emphasized over all others. Elements of *Loyalty* and *Fairness* are invoked to support caring and efforts to advance human welfare.

Engineering Codes of Ethics

Engineering societies have developed “Codes of Ethics” to provide guidance on proper professional conduct. Most engineering codes of ethics include a number of fundamental “canons” that address public welfare and the environment, issues of competence, honesty and integrity, and issues related to serving clients. In addition to overarching canons,

documents, reviewed or prepared by them, which are determined to be safe for public health and welfare in conformity with accepted engineering standards." Thus, the competent and honest practice of engineering is an act of *Care* in that it ensures the safety, health and welfare of the public. The emphasis on honest practice also invokes the moral element of *Fairness*.

One Rule of Practice in the NSPE Code of Ethics under this canon is that "if engineer's judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate." This rule of practice highlights that while an engineer's highest obligation is to the public, the engineer still has a duty to act within the hierarchical structure of the firm. This introduces an emphasis on *Authority*, i.e., an engineer must hold paramount the welfare of the public, but should do so while respecting the contractual *Authority* of public and/or private institutions.

Sustainable Development

The first canon of the ASCE Code of Ethics also includes a statement related to sustainable development, namely, "Engineers … shall strive to comply with the principles of sustainable development in the performance of their professional duties." The ASCE Code of Ethics adopts the following definition of sustainable development: "Sustainable development is the process of applying natural, human, and economic resources to enhance the safety, welfare, and quality of life for all of the society while maintaining the availability of the remaining natural resources." The NSPE Code of Ethics adopted a similar definition ("'Sustainable development' is the challenge of meeting human needs for natural resources, industrial products, energy, food, transportation, shelter, and effective waste management while conserving and protecting environmental quality and the natural resource base essential for future development"). As written, the engineers' obligation to comply with the principles of sustainable development is primarily an act of *Care* for current and future generations. However, inherent in the NSPE definition is the *Fair* allocation of resources to future generations.

Interestingly, preserving the *Sanctity* of the environment is not part of the ASCE definition and is mentioned weakly in the NSPE version. The first canon of the AIChE Code of Ethics, however, highlights the engineers' responsibility to "protect the environment." Presumably, the duty to protect the environment is based on not only the fair allocation of resources to future generations but also the inherent value of the nature and the environment.

Perform services only in their area of competence

The second fundamental canon of the NSPE Code of Ethics is the engineer's duty to "perform services only in their area of competence." This duty also serves as the second canon of the ASCE Code of Ethics. More specific Rules of Practice in the NSPE and ASCE Code of Ethics related to this canon deal largely with issues of education, exper7.408 0 Td o32(i)0.4417115( )-6.99806(l)0.441715(a)-8.31. T3(o)-3.71631(p)-3.71631(m)-.71693(41( )-6.

documents dealing with subject matter in which they lack competence, nor to any plan or document not prepared under their direction and control." In Case 94-8[8] the NSPE Board of Ethical Review (BER) concluded that it was unethical for a Chemical Engineer, with no obvious training or experience, to design a structural foundation because the engineer "does not possess the competence to perform the required task." As mentioned above, this duty is grounded in the foundational element of *Care* in that competency ensures the safety, health and welfare of the public.

Engineers shall issue public statements only in an objective and truthful manner

The obligation to "issue public statements only in an objective and truthful manner" appears in both the NSPE and ASCE Code of Ethics, and similar statements appear in other codes. Further, "engineers shall issue no statements, criticisms, or arguments on technical matters that are inspired or paid for by interested parties, unless they have prefaced their comments by explicitly identifying the interested parties … and by revealing the existence of any interest the engineers may have."

A relevant case study is BER 88-7[9] which examines whether an engineer's public criticism regarding the safety of a bridge was ethical. In this case,

> *Engineer A, a renowned structural engineer, is hired for a nominal sum by a large city newspaper to visit the site of a state bridge construction project, which has had a troubled history of construction delays, cost increases, and litigation primarily as a result of several well-publicized, on-site accidents. Her report identifies, in very general terms, potential problems and proposes additional testing and other possible engineering solutions. Thereafter, in a series of feature articlesctgeisi(1969(g)16.84291568(e- ra363441715( )250]TJ*
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creates an un-level playing field, and therefore, disadvantages honest firms that truthfully state their qualifications. This Rule of Practice also touches on the obligation not to offer gifts in order to “influence the award of a contract.” Again, giving of gifts to sway a decision is not fair to other firms when the decision should be based solely on qualifications. In the ASCE Code of Ethics, a similar canon also includes that “engineers … shall not compete unfairly with others” through giving of gifts, political contributions, etc.

Corruption and the Engineering Profession

Corruption in the construction industry is a particularly important ethical issue in the practice of engineering. According to Transparency International, it is estimated that nearly 10% of all funding for infrastructure globally is lost to corruption.[11] Forms of corruption include bribery, extortion, “grease payments,” etc.

protecting privacy is protecting *Liberty* and freedom. On the other hand, threats to national security have led to programs such as the National Security Administration's collection of phone records without a warrant. The collection of phone records therefore

[4] Harris, Charles E., Pritchard, Michael S., Rabins, Michael J. Engineering Ethics: Concepts & Cases, 4th Edition, Wadsworth **CENGAGE**