InFocus | The Internal Goods of Engineering

By Jon A. Schmidt, P.E., SECB

In my last column, I proposed that the proper purpose of the practice of engineering is the material well-being of all people. This month, I would like to elaborate a bit on what this means and explore in more detail how engineers uniquely pursue it.

Philosophers Allison Ross and Nafsika Athanassoulis addressed this subject in a 2010 paper ("The Social Nature of Engineering and Its Implications for Risk Taking", *Science and Engineering Ethics*, Vol. 16, No. 1, pp. 147-168). In their words, "Engineering projects provide us with the technological means of overcoming some of the physical limitations that are a consequence of being human." Engineering is thus "a profession that seeks to harness technological advancements to provide solutions to a wide range of social problems." Note that material well-being, here characterized as technological advancement, is not strictly separate from physical and social well-being; instead, it facilitates both in a particular way.

Ross and Athanassoulis zero in on the aspect of engineering that I believe is crucial to understanding the peculiar ethical burden that engineers bear:

> Engineering projects are often innovative, long-term and involve the co-ordination of so many different variables that it is impossible to predict absolutely accurately what their consequences will be. In addition, because of the scale and infra-structural nature of these projects there is often significant potential to do harm should something go wrong.

As a result, the engineer assumes a responsibility to determine which hazards are pertinent to each undertaking, decide how best to deal with them in spite of the uncertainty surrounding them, and inform everyone who needs to become aware of them. In other words, the basic societal role of engineering is the assessment, management, and communication of *risk*.

Ross and Athanassoulis point out that people participate in any instance of risk-taking in three ways: as the decision-maker, as the potential harm-bearer, or as the intended beneficiary. It is not morally problematic when the same person occupies all three positions, but for engineering risks, multiple parties are always implicated – the engineer makes the decision, the public is often in harm's way, and the engineer's employer or client presumably stands to gain something. This is what makes engineering an "ethically complex" profession ("The Social Captivity of Engineering," May 2010).

Significantly, the precise identity of the potential harm-bearer is usually unknown to the engineer; a population is put "at risk," not a designated individual or group. It may even encompass members of a future generation when something like environmental impact is at stake. Under such circumstances, what factors influence whether the risks associated with a given engineering decision are reasonable, and therefore justifiable?

Ross and Athanassoulis reject the widespread assumption that this is purely a matter of "objective" probabilistic calculation. Instead, a number of "subjective" considerations must also come into play, including the desires and priorities of the engineer, different perspectives on how to characterize various outcomes should they come about, and the range of available options. Therefore, "the assignment of moral responsibility for risk-taking and for the results of risk-taking needs to be done on a case by case basis."

This is not to say that engineering ethics is consigned to a form of relativism. On the contrary, "engineers, like other professionals, have distinctive reasons to take or refuse to take risks that they acquire by being members of their particular profession." They share a common consensus – although they rarely articulate it – about what they do and how it fits into the bigger picture, which Ross and Athanassoulis describe as follows:

> It is our contention that the chief good internal to the practice of engineering is safe efficient innovation in the service of human wellbeing and that this good can only be achieved where highly accurate, rational decisions are made about how to balance the values of safety, efficiency and ambition in particular cases… engineers don't just strive to find technological solutions to human problems, they strive to do so in a manner fitting for the conduct of an engineer which involves consciously foregrounding the values of safety and sustainability.

This passage invokes the notion of an internal good and connects it directly with engineering's proper purpose. However, the references to "values" seem out of place, and the attempt to pinpoint a single internal good strikes me as needlessly restrictive. Instead, I advocate rearranging the terminology to recognize three such goods:

- Safety – protecting people and preserving property.
- Sustainability – improving environments and conserving resources.
- Efficiency – performing functions while minimizing costs.

These three types of risk mitigation are goals inherent in nearly every engineering endeavor today. Engineers can – and regularly do, even if only subconsciously – treat them as ends in themselves, rather than as means to some other end, and successfully achieving them legitimately contributes to the material well-being of all people. They qualify as goods that are internal to the practice of engineering because they are specific to it, can only be *fully* understood by those who participate in it, and generally benefit the entire practicing community.

Even so, it is important to acknowledge that safety, sustainability, and efficiency may be – and in fact, frequently are – in tension with each other to some extent. Most notably, Ross and Athanassoulis observe that "decisions about risk made by engineers require them to weigh their concerns about risk against economic considerations … the demands of efficiency and safety/minimisation of risk tend to conflict." The question then arises: What personal attributes would enable someone to make the necessary trade-offs among them without inappropriately compromising any of them? That will be the subject of my next two columns.▪

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