

**Daniel W. Mead Prize for Younger Members**

**What ethical problems might the engineer of 2025 encounter with  
advancements in technology and communication?**

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## You Can't Spell "Engineering" without "Engineer"

"Technology" is a capability given by the practical application of knowledge<sup>1</sup>. "Communication" is a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior<sup>2</sup>. The plural "communications" is the technology of the transmission of information<sup>2</sup>. This implies that communications are, by definition, dependent upon technology, and that advancements in technology will almost certainly result in advancements in communications. The rapid development of technology over the past fifteen years has revolutionized the methods and means of communications between humans. Internet, email, instant messages, and wireless communication devices have altered the speed at which we communicate and are crucial in performing business to today's society. Social networks, blogging, and similar technologies have transformed the style and formality in how we exchange ideas and information. In 1995, these technologies either were in their infancy or were not developed, yet they are a part of everyday life now. Today, an engineer can review an entire plan set on his or her cell phone, email revisions or comments to multiple individuals instantly, and blog about it at the end of the day. This situation was hardly imaginable in 1995; in fact, the word blog did not appear in Merriam-Webster's dictionary until 1999.<sup>3</sup>

One can only speculate upon the technologies that may be available to the engineer of 2025, but one can be sure that that engineer will confront ethical problems in their work. The question is; will these ethical problems differ fundamentally from those that are encountered in 2010, or were encountered in 1995? The methods by which these problems present themselves and the speed at which these problems arise will certainly increase with advancements in technology and communications. In the end, however, the root of engineering ethics is that it is ultimately the engineer's responsibility to uphold and advance the integrity, honor and dignity of the engineering profession, and to hold paramount the safety, health and welfare of the public.<sup>4</sup> Engineering is and always will be a people serving profession, and it is this ethical service to people...the public...humankind...that will directly link the engineers of the past with the engineers of today and the future. Technology will simplify the technical tasks that engineers employ, but engineers will always perform and be responsible for engineering work including all of its technical and ethical aspects.

The following paragraphs contain brief descriptions of technological advancements and societal factors that may require the engineer of 2025 to solve ethical problems not seen in the past. The fundamental basis of these ethical problems will not be new to engineering, but the manner in which they manifest themselves will.

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<sup>1</sup> "technology." *Merriam-Webster Online Dictionary*. 2009. Merriam-Webster Online. 7 December 2009. <<http://www.merriam-webster.com/dictionary/technology>>

<sup>2</sup> "communication." *Merriam-Webster Online Dictionary*. 2009. Merriam-Webster Online. 7 December 2009. <<http://www.merriam-webster.com/dictionary/communication>>

<sup>3</sup> "blog." *Merriam-Webster Online Dictionary*. 2009. Merriam-Webster Online. 7 December 2009. <<http://www.merriam-webster.com/dictionary/blog>>

<sup>4</sup> American Society of Civil Engineers. *Code of Ethics*. 5 December 2009. <<http://www.asce.org/inside/codeofethics.cfm>>

## Sustainable Design

The sustainable design movement is rapidly gaining momentum in today's engineering society. It has become apparent that population growth, rapid economic development and finite natural resources have made the need for a sustainability component within infrastructure development plans inevitable.<sup>5</sup> How will the move towards sustainable design affect future engineers with regard to ethical problems?

The engineer of 2025 must be able to cut across disciplines to collaborate closely with planners, lawyers and investors<sup>5</sup> in order to create sustainable engineering solutions to the problems they will face. This crossing of discipline lines will open new arenas of communication that are not commonplace today. Disciplines driven primarily by financial or other gain and not by service to the public at large may not adhere to the same ethical guidelines and principles as engineers.

For example, the ethical standard of law practice in the United States focuses mainly on the responsibility of a lawyer to his or her client, with no mention of the safety, health or welfare of the public. Direct and open communication may not be given when client interest is the main impetus for the profession. The *ABA Model Code of Professional Responsibility* specifically states in Canon 4 "a lawyer should preserve the confidence and secrets of a client."<sup>6</sup> This statement implies that open communication and information sharing among all parties involved in a process is not necessarily common practice in law as it is in the development of successful engineering solutions. In this way, the procurement of sustainable design solutions across disciplines may present uncommon or new ethical challenges to the engineer of 2025 that are not widespread today.

## Global Economics

Emerging economies in developing nations will have an impact on the way the engineer will do business in 2025. Nations such as Brazil, Russia, India, and China will increasingly become the world's major economic players with respect to both production and consumption.<sup>7</sup> These nations as well as others will continue to develop skilled labor forces that will include engineers as well as engineering support staff. These labor pools will be available at rates significantly less than those of countries with well-established economies such as the United States, Japan, Germany and the United Kingdom. As engineers in the established countries compete for work, the ability to outsource work at a lesser rate from developing nations will make them more competitive in the marketplace. Advancements in technology and communication will make working across political and physical boundaries as simple as working with a fellow employee in the office.

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<sup>5</sup> "What is sustainability?." *ASCE Committee on Sustainability*. American Society of Civil Engineers, Web. 8 Dec 2009. <<http://content.asce.org/Sustainability.html>>.

<sup>6</sup> Association, American. *Model Code of Professional Responsibility and Code of Judicial Conduct*. Chicago: American Bar Association, 1986.

<sup>7</sup> "Global Strategy Institute - Revolution 5 - Economic Integration." *Global Strategy Institute*. Web. 8 Dec 2009. <[http://gsi.csis.org/index.php?option=com\\_content&task=view&id=28&Itemid=57](http://gsi.csis.org/index.php?option=com_content&task=view&id=28&Itemid=57)>.

The engineer of 2025 will be challenged with the desire to remain competitive while simultaneously delivering quality products that keep the safety and welfare of the public as top priority. Differing cultural values and economic stimuli may result in dealing with ethical principles in other nations that are not of the same standard.

### **Information Pollution**

Advancements in technology and communication have, and will continue to, enable a great wealth of information to be freely interchanged worldwide. In 2010, information available on the internet is a great asset, but the security of this information is not absolute and the validity of this information must always be questioned and verified. Individuals with malicious intent continue to develop new ways to compromise otherwise legitimate information that is readily accessible. The engineer of 2025 must consider this fact in his or her information exchange via new technologies.

An instance when information pollution can create an ethical problem can be illustrated in the use of design standards. Imagine you are an engineer who must use certain design standards that are issued by your client exclusively online. You obtain the standards, perform your design to the standards, and submit the final product. Only after the project is completed do you discover that the standards were hacked and modified, and now you realize your design could be compromised. The standards have since been replaced by the client with the correct versions, and when you inform them of the issue, they respond that they believe you are at fault for modifying the standards. Although technology caused the problem, as the engineer of record it is your ethical duty to elevate the issue until the problem is corrected. Ultimately, the technologies used were only a tool to assist the engineer, and do not replace the engineer's sound judgment and ethical responsibility.

### **Conclusion**

The world of 2025 will include technological advancements that will improve the speed and the delivery methods of communication. As the world of 2010 was difficult to accurately envision in 1995, so is the world of 2025 in 2010. What is very simple to predict in the profession of engineering, because it has been omnipresent since the beginning of the profession, is the role of humans in engineering. Engineering is performed by humans, for humans, to better the lives of all humankind. Engineers will continue to use increasingly advanced technologies to assist them in their work to produce more, faster, and better, but as is, was, and always will be the case, the engineer is the most advanced technology in engineering, and will always provide the final decision when an ethical problem is encountered. As long as engineers hold paramount the safety, health and welfare of the public, technological advancements will have no effect on their ability to solve ethical problems. You can't spell "engineering" without "engineer."