Who We Are As Engineers

Every individual is unique, raised in a family, culture, community, school system, religious environment, and political context that inform their perspective. This is well documented by Bobbie Harro in her Cycle of Socialization. (https://depts.washington.edu/fammed/wp-content/uploads/2018/06/Cycle_ofSocializationHandout.pdf)

Potential Issues Based On Our Development

This fact presents opportunities for problems with the creation and use of technology. A simple example arises in the creation of forms (online or paper) that ask for an individual’s name. An easy approach is to ask for “First Name” and “Last Name”, and perhaps “Middle Name”. For many people in the U.S. this works. In some Asian cultures, the first name is the family name and the last name is the given name. So often you will see “Family Name” and “Given Name(s)” as a more inclusive model. Notice the plural on “Given Names” since there are cultures where an individual may have a number of names in the middle. There are cultures where women have the first name “Mary” and a second name that distinguishes each individual. In Iceland, there are no family names – John Robertson is the son of Robert, and his son would be Harry Johnson and so forth.

Assumptions: Good or Bad

Until you encounter the variety of naming conventions, it is easy to assume that the fields “First” and “Last” are sufficient. Individuals with different cultural backgrounds find ways to shoe-horn their real names into these fields – but realize their culture is not recognized. Names may also be quite long, overflowing entry, display or print fields, which can create problems comparing a full presentation in an official document (passport, etc.) with a truncated version. Even character sets and printing fonts affect this. The UNIX “pipe” symbol (a vertical line) uses the same ASCII encoding as an apparent variation of the letter “e” in Denmark. Other countries have di-critical marks, umlauts, and other unique characters as well. The 32-bit ISO character set standard, and the subset Unicode try to address this. However, since the ISO standard is based on the “appearance in print” there are multiple ways to express umlaut “ö” : umlaut precedes the “ö”, umlaut comes after the “ö” and a
single character form. Needless to say these sort and compare differently. Since some symbols are the same between Japanese and Chinese, ISO decided to use just one representation – even though the symbols have quite different meanings. The print image looks just fine, but the actual cultural differences between the symbols is lost.

Who is In The Room?
This example lays out some of the challenges that each individual brings into the design of technology products. The broader the diversity and experience of those “in the room” the more likely a product or service will serve a truly global community. (This notion is covered in detail in the recent book The Diversity Factor: Igniting Superior Organizational Performance. The book’s key tenant is that it is more likely that features and functions of a product that meets the needs of diverse people will be identified and implemented well if there is a diverse set of people in the room of the organization provisioning the product or service.)

The individuals who use the technology are key to its success. And when they feel recognized and included by the way that features and functions are instantiated it improves their satisfaction. Take, for example, accessibility for persons with disabilities. Small font sizes make it difficult for those with poor eyesight to see the words on a screen; as does selection of text/background colors that can reduce legibility.

Perspective Makes All The Difference
The perspective that each individual brings to the table includes awareness of their experiences to date. These include any bias factors as well. Failure to recognize an individual’s “name” is an easy example. Assumptions that we bring to the table about gender, race, national origin, etc. are all also part of the package. There is a tendency in the U.S. when given the fact that China is graduating more engineers every year than the U.S. is graduating college students to dismiss the implications of this with the biased assumption that they are not “real engineers” or that the Chinese system suppresses innovation so they cannot match U.S. engineers. There is a case to be made that political restrictions on education, whether it is China denying Tiananmen Square, or states denying slavery or structural racism, will place limits on both the understanding of their professionals, and also cast a cloud over both the educational environment and the workplace.

Emerging Challenges
An emerging challenge is the “black box” incorporation of bias that emerges from deep learning datasets. Amazon built a resume scanning system that compared candidates to their existing employee base and discovered the results were not gender neutral. (https://www.reuters.com/article/us-amazon-com-jobs-automation-insight-idUSKCN1MK08G) MIT researchers discovered a similar bias based on gender and skin color that was being “learned” by facial recognition systems. (https://news.mit.edu/2018/study-finds-gender-skin-
In short, our next generation of technology is at risk of incorporating the limited perspectives and biases of their designers and/or their ‘culture of origin’.

Obviously it is most difficult when everyone at the table has similar perspectives, lacking diversity of experience and viewpoints. It is even more difficult when the problems arise indirectly as a result of dataset selection and deep learning algorithms.

**IEEE Efforts and Initiatives**

IEEE is actively involved in efforts to address some of these issues for its members and its own internal operations. For members, IEEE has developed its Ethical Aligned Design projects ([https://ethicsinaction.ieee.org/p7000/](https://ethicsinaction.ieee.org/p7000/)) including “Algorithmic Bias Considerations”. IEEE members are expected to adhere to the IEEE Code of Ethics in their professional activities, which calls for members to “To treat all persons fairly and with respect” (expanded below). This is not just an expectation for individual activities, but also management, requirements and design roles.

For its own internal operations, 2021 IEEE president and CEO Susan K. Land in her President’s Column titled “IEEE’s Commitment to Diversity, Equity, and Inclusion” ([https://spectrum.ieee.org/ieee-presidents-note-december-2021](https://spectrum.ieee.org/ieee-presidents-note-december-2021)) in the December 2021 “IEEE Spectrum” stated that “IEEE’s mission “to foster technological innovation and excellence to benefit humanity .requires the talents and perspectives of people with different personal, cultural, and technical backgrounds.” The article describes several actions that have been taken to create a more equitable and inclusive association.

**Your Call To Action**

The challenge to you - take some time to re-read the [IEEE Code of Ethics](https://www.ieee.org/about/corporate/governance/p7-8.html). Read the Ethical Aligned Design project descriptions. Consider how to apply these to your work. Also see: The Diversity Factor: Igniting Superior Organizational Performance (Discovering Superior Performance); James McKim; March 1, 2022