Our society has come to take for granted the soundness of our infrastructures. The relatively infrequent disasters tend to focus public attention on details of engineering flaws: joints, weight-bearing beams, sensors, water filtration, runway lighting, and the like. I confess, as a non-engineer, to an awe of—and sometime worry about—those very features of infrastructure, but in general, people go about their daily activities with great confidence in the environment, the structures, and the transportation systems in which they surround themselves.

Recognizing the shortage of trained engineers in much of the world, and having studied and evaluated the pipeline of potential engineering students and professionals from elementary grades of school through college, I look for wider attention to engineering education. Notwithstanding the numerous efforts of the many and various national engineering accrediting and licensing bodies, at the professional and academic levels, an ever-deepening concentration on engineering education quality and how to assess quality consistently seems warranted. As a result, there are so many reasons to be grateful for the arrival of this book.

Gray, Patil, and Codner provide an introductory background to the issue of quality assurance with a review of accrediting history of higher education generally in the 1800s and engineering education specifically during the early 20th century. Most important, they frame the current discussion within the broader trends toward the internationalization of higher education, heavily influenced by the Bologna process in the European Union and by the extraordinary migration of engineers and students around the world (though they do not address migration as a growing factor). The introduction traces quality assessment through the history of the scientific education movement at intervals over the past century, as well as the relationship of scientific education to the emergent accountability movement in the 1980s and later. Best of all, the authors advocate for recognition of the two divergent goals of quality assessment: external review and internal continuous improvement.
The early chapters are largely descriptive and historical in nature. Several authors have elected to provide a history or chronology of the development of engineering education standards within their particular country or region of expertise. Alternatively, or within the historical context, they describe the current state of standards and approaches to quality assurance. In most of the country cases, the authors lend their own level of analysis of the system. As an example, Chuchalin, Boev, and Kriushova describe a post-Soviet era development of engineering education accreditation and certification, and they draw the new system within the context of market forces and the connection to the EUR-ACE standards. Another regional example is provided in a chapter by John Cowan outlining the multiple challenges in European engineering education assessment. Hu Hanrahan gets at a critical issue: the development of consensus global standards in engineering program QA. Ultimately, we live in an interdependent world where translation of engineering standards—and the standards of education—must be intertwined as well.

A remarkable feature of the book is the inclusion of authors and perspectives from all over the world representing institutions in all (settled) continents. Historically and developmentally, it is interesting to observe in these descriptions the evolution from deeply en-grained ABET (USA) based standards through EUR-ACE and toward a standards model that can be adopted more readily by rapidly developing countries. In fact, most of the national and regional descriptions of accreditation and standards reveal very brief histories, seldom preceding the 1990s. That might be for the better. While Vietnam, for example, borrows heavily from ABET guidelines, its very young program has become emblematic of the need for an expanded system of quality assessment. Ultimately, the book might be most effective in this regard: the international dissemination and implementation of worldwide expectations of broadly acceptable standards in engineering education.

“A global perspective” is the subtitle of the book, and the editors have ensured such a world view. Braskamp goes well beyond the usually-measured domains of learning in describing a Global Perspective Inventory (GPI), a “measure of student holistic development.” Whether it is the proper and required role of engineering education to provide such a perspective could be the reader’s query. No doubt we want our engineers—students and professionals—to have the world view, but the responsibility to impart that outlook falls to the university in general, not just to the engineering education program. Indeed, Braskamp’s GPI could be recommended to most higher learning institutions assessing student outcomes.

The global perspective contains not only chapters descriptive of assessment and accreditation systems, but also of variants in approaches to assessment. Siu, writing about an “all-round perspective” in quality assurance, offers the prescriptive: revise engineering curricula to support critical thinking and in-depth investigation along with knowledge and skills.

It is evident that the books’ editors and authors broadly have adopted CDIO: conceive, design, implement, operate. In fact, “CDIO” has become the moniker for an entire process, which includes standards for the development and evaluation of engineering programs. If the proof is in the pudding, then evaluation is the cook stirring the pot, and Brodeur and Crawley, in their chapter on CDIO and quality assurance, lay out a model of evaluation that goes well beyond the ABET model of assessment. They are careful, however, not to dismiss out of hand the standards of an earlier day, which have emerged from various geographical regions, but, to expand on those standards. The authors understand that the effectiveness of a system of assessment relies on a fundamental appreciation of and engagement in evaluation and the support of all participants, especially faculty, in the mission of assessment.

Even the process of effecting change toward the adoption of CDIO standards is ad-
dressed, in a chapter by Eijkman, Kayali, and Yeomans. That’s a good strategic inclusion by the editors. The “hard systems” of engineering education requirements must be balanced with “soft systems” thinking, say the authors. Participant action research underlies the strategic change—and the buy-in for change. Although action research has serious limitations, the idea of broader, systematic, strategic thinking must be included in program and curriculum development. I would hardly call them “soft systems.” They, too, require very disciplined thought, and they deserve a place among the outcomes of engineering programs.

Another chapter, by Nair and Patil, defines the role of student experience and feedback in the development and continuous improvement of engineering programs, particularly as practiced at Monash University. This is good, since today’s students are the target and primary beneficiaries of all the efforts in quality assessment, and they will become tomorrow’s professionals. To complement the student role in quality, it would have been interesting if one of the authors had addressed a parallel issue: the professionals’ role in rapid feedback continuous improvement. A close look at the market oriented needs of the engineering business and industry sectors, the secondary beneficiaries of quality assessment, seems to be missing from the book. If the authors seek ways to include faculty, students, administrators, accrediting bodies (and presumably the professionals who advise their efforts), then a chapter specifically about ways to evaluate the fulfillment of engineering business needs would be highly appropriate and desired.

Throughout the book, its various authors address a subtext—the healthy tensions between externally regulated (e.g., by the government) and self-regulated (e.g., by self-constituted accrediting bodies) quality assurance. All of the many authors’ various perspectives and views on quality assurance are neatly tied with a prescriptive bow in a final, summative chapter by the editors. Gray and Patil illustrate the tensions—and harmonies possible—in the relationships on two dimensions or continua: (1) locus of control (or perhaps input): internal vs. external; and (2) purpose of assessment: toward accountability vs. improvement. The balance and harmonization of those polarizations is possible through more comprehensive assessment processes that balance the needs of many stakeholders.

One important facet of engineering education quality assessment remains to be treated: distance and online education. One could make the argument that the authors in Patil and Gray’s book have indirectly addressed the quality of programs delivered at a distance. In fact, the delivery mode selected--on campus or online--should not call out a differentiation in assessment rigor or process. Yet in too many academic communities, more than a generation after engineering courses were first delivered via telecommunications, a question of rigor in online courses continues to percolate, as in “How can we be assured of the quality in distance learning programs? Are the online programs as good as face-to-face programs?” These are questions that persistently nag the online education community in general, and I wish the book had addressed this topic. (In truth, I was invited to submit a chapter on the topic but could not.) After all, in the long run, online learning is contributing to the mobility of programs and learners throughout the world and, along with the mobility of engineers across national borders, is pressing the demand for consensus in outcome standards, programmatic standards, and assessment standards.

Given what appears to be a shortening of the half-life of engineering education (the point at which half of the knowledge learned in higher education programs becomes obsolete), even professional engineers, their employers, education institutions, and the public have a stake in ensuring engineers’ engagement in quality continuing education.

I, for one, entrust my stakeholder role—that of the public, the tertiary beneficiaries of quality assessment—to the many engineering academics, assessment experts, engineering
professionals, and students who participate in the field daily. Patil and Gray’s book suggests that my trust is well placed, and the book itself is a testament to the growing concern and attention academics and others are giving to the quality of engineering education programs.

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