V

Engineering in 2020

by R. Anthony Warner, P.Eng.

The demographic of engineering practitioners is changing. Engineering disciplines are changing. What are the challenges that PEO will face and how can PEO reach out and get all engineering graduates to opt in to licensure, and to participate in governing members of the profession and regulating its practice?

A little over a year ago, I had the opportunity to participate in the 2020 Engineering Forum hosted by PEO and supported by the Council of Ontario Deans of Engineering and the Engineering Institute of Canada. Although I was a Regional Councillor at the time and had been a long-standing member of PEO and of the York Chapter, it was only then that I realized how important PEO is to the future of our profession and to the public.

Without going into the proceedings (available on PEO's website at www. peo.on.ca/publications/Reports/Proceedings _2020.pdf), this forum dealt with engineering in the year 2020 and the future fields of practice. It attempted to answer the question of and plan for what the 2020 engineer will look like, based on where science and technology will have taken us. It focused on what the critical skills required by engineers will be, how those skills can be imparted and other related issues. I attended a similar forum on computing 20 years earlier (which touted a paperless economy by the year 2000) and since then have watched the world of computing technology unfold before my eyes and many engineers switch professions from traditional engineering to computer and software engineering.

During the forum, we discussed such emerging disciplines as nanotechnology, proteomics (protein engineering), genomics (genetic engineering) and financial engineering, to name a few. We also discussed how engineering ethics and design will change in response to a higher percentage of women in the profession and increased cultural diversity among engineers and the public. For me all of these factors raise the question of how a regulatory body should evolve to meet the new demands of these changes, as well as the challenge of the "traditional" engineer who will be displaced by them.

The role of PEO is to bestow qualified individuals with a licence to practise engineering in the province of Ontario. In fulfilling this role, PEO administers licensing criteria that will deem some members of the engineering community ineligible for licensing, just as they confirm the eligibility of others. It may seem to some that PEO allows only the best and the brightest to practise professional engineering, but in my experience some of our most talented engineering graduates are not licensed–simply because they have chosen not to be. Although PEO may prosecute those who are practising professional engineering without a licence, the fact that some practitioners choose not to become members of that profession through licensing presents a challenge.

The big picture

Business-to-business, e-commerce, or e-business, has become an entrenched term in our lexicon. There is an army out there converting everything that is not fixed in place to e-enabled market exchanges, which are electronic marketplaces allowing multiple buyers and sellers to carry out procurement and sales activities over the Internet. This presents a management challenge for regulatory bodies, because it is difficult to control the location of exchanges (PEO's current governance model is geographically fixed), let alone to validate the credentials and qualifications of the parties involved in those exchanges. Today, a professional's identity can be stolen for use in marketing over the Web, or even to execute projects, without the bona fide professional being aware of it.

Consequently, the infrastructure of PEO must change, including its governance structure, to facilitate technological change and human interactions over the Web. We have to be able to embrace practitioners of emerging disciplines who are not confined by time and space, while helping practitioners of displaced disciplines use their knowledge and experience in a new context. If those practitioners in emerging areas choose not to be licensed, PEO will be governing the members of and regulating practice in a diminishing profession.

To date, PEO's website has served the engineering community as a discussion forum and information source, with information flow being primarily one-way and aimed at educating visitors about PEO. Our first challenge is therefore to enable meaningful visitor interaction with the information on the website and collection of funds. A later challenge will be to enable payment to those providing services to PEO and online expense accounts. I am even looking forward to being able to file a com-

plaint online and have the Complaints Committee discuss and assess it the same way. Meanwhile, the Discipline Committee and discipline hearing panels would hold videoconference hearings, allowing defendant and prosecutor to assemble and make decisions in an e-environment.

The early stages of this transformation should see licence applicants filling out applications online and the applications being screened in a software environment before being referred to the Academic Requirements Committee; the Experience Requirements Committee would also conduct its interviews with applicants online. Once all the requirements were met, licences would then be awarded via email and an electronic stamp and electronic ID would be sent to the newly licensed engineer. Because applications processing software is readily available and can be easily customized to meet our needs, I can foresee the admissions process being one of the first PEO functions to be totally e-

enabled. I can foresee a paperless economy, when an engineering seal on a design will not be a rubber stamp.

So, can we educate the people behind these functions to meet these changes, or must we prepare to replace them? Do we educate the knowledgeable with high-tech skills, or take high-tech people and educate them with PEO skills? And where do we find volunteers to admit, regulate and discipline those from the emerging disciplines? And how do we train our staff and volunteers to understand the changing diversity?

The main benefit of e-enablement will be removal of geographic constraints on the volume of work that we can because travelling time will disappear. Of course, this assumes that everyone will be Web-enabled, which I believe will happen as surely as we all have telephones. It is ease of use, not technology, that is the deterrent to Web enablement, and enhanced ease of use will make all the difference.

PEO's current governance model works well because of partnering of volunteer committees, management and a volunteer Council. Re-engineering processes within our management structure and staff functions to facilitate governance of an e-enabled future profession will be relatively easy; however, it will be much less easy to re-orient our volunteer committee members. Most of our volunteers bring skills they have learned elsewhere to PEO's benefit, so we cannot simply change them to meet our future needs. Consequently, we need to put a system in place that will gradually e-enable our committee members. One option would be to train our volunteers, but this investment in volunteers would be cut short when the volunteer moves on. Similarly, I realize that all the training I received by serving on Council would be lost if I did not continue to contribute.

So we need both those with PEO experience and those who are e-enabled with-

V

in our volunteer ranks. And we certainly have to recruit our best and brightest to help us through this transition stage. Yet corporate North America has given most of these individuals more work than they can manage, leaving them very little free time for volunteering.

But I think there are ways that we can recruit our best and brightest to be part of our changing profession. These are: formulate a process to award licences to all our best and brightest who are not currently licensed by choice and design strong benefits to licensing our members (these are not advocacy functions); endeavour to find out what would make one of our best and brightest apply for a licence when he/she is successful and is able legally to do his/her work without a licence.

How do we manage rapid innovation in such emerging areas as IT, nanotechnology, microelectronics/systems and biotechnology? I think this is easier to do than managing the old technologies, since we now must promote lifelong learning

in engineering. Within a few years, engineering graduates will find that soon after graduation their jobs require more skills than they have received. How do we regulate their practice in this environment, and how much are we budgeting for this?

I believe the gap between the skilled and the unskilled will drive changes. This should promote movement of some practitioners from the engineering profession to other professions (old technology engineers will move into teaching and other technical fields that require old technology as a base for the new technology).

In the future, could a professional engineer in Ontario get charged when he crosses the border into the United States for practising without a licence if he did work while in Canada for a US-based client? Does a US engineer soliciting business in Ontario over the Internet require a Certificate of Authorization? How do we manage this need for mobility? Currently, this situation is managed by transferring liabilities: You get an engi-

neer licensed in the other jurisdiction to stamp for you. But this method only assures accountability if the engineering work is stamped, and much engineering output that is not submitted to meet a regulatory requirement is not stamped, even though under the Ontario *Professional Engineers Act*, at least, it should be. This situation illustrates a fundamental change to the way we need to regulate the profession in the new economy.

The Internet introduces a new set of questions about how to apply our jurisdiction across borders. The Web changes the dynamics.

My only solution is to recruit the best and brightest engineering graduates into the profession and into PEO's volunteer ranks and have them look at doing it better. ❧

R. Anthony Warner, P.Eng., is a former PEO Councillor and has given presentations on virtual engineering and engineering on the Internet.