

# REGULATING EMERGING ENGINEERING DISCIPLINES



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**A DISTINGUISHING** feature of engineering is its rapid growth in new scopes of professional practice—what we often refer to as emerging disciplines. Perhaps because of the exponential pace of development of new technology, engineering seems to evolve faster than other senior professions. One of PEO's important tasks as a regulator is to ensure that new engineering disciplines and areas of specialization are incorporated into our regulatory regime in a timely manner so that the public is protected by those who are practising on “the leading edge.”

I wish I could say that our profession's record of proactivity in embracing emerging engineering disciplines is good. Traditional scopes of practice within the fields of civil, electrical and mechanical engineering, for example, are generally well understood and recognized as the exclusive purview of licensed professional engineers. More often than not, however, we have missed the boat on their newer derivatives, such as computer, environmental and software engineering.

Software engineering is a good case in point: I remember in 2001 trying to convince the directors of the Canadian Council of Professional Engineers (now Engineers Canada) that software engineering was, indeed, the practice of professional engineering. Many of them were unconvinced on the grounds that the work product of software engineering was, in their minds, intangible (i.e. not manifested in concrete, metal or other traditional engineering materials, and instantly replicable). I can imagine their similar reaction to the field of nanomolecular engineering, where the artifacts are invisible to the naked eye. In any event, the net result of our tardiness in embracing software engineering as a regulated engineering discipline allowed non-engineers to dominate the field, and to this day it remains essentially unregulated. I believe it can be argued

that the public has suffered from the consequences of lack of discipline and accountability in the development and management of software systems. But to this day, we Canadian engineering regulators have yet to enforce against anyone practising safety-critical software engineering without a licence, although such unlicensed practice continues. (A convincing argument for software engineering as the practice of professional engineering may be found in Steve McConnell's book *After the Gold Rush: Creating a True Profession of Software Engineering*, whose 1999 publication date seems ironic in retrospect.)

### A PROACTIVE APPROACH

In an effort to avoid a repeat of our experience with software engineering, PEO's Emerging Disciplines Task Force has tried to take a more proactive approach with our two latest emerging engineering disciplines: communications infrastructure engineering (CIE) and nanomolecular engineering (NME). Unlike software engineering (which, one could argue, emerged more than 20 years ago), these new fields of engineering are truly still emerging—a fact that manifests itself in a few important ways:

- There are few, if any, established university engineering programs that prepare individuals to practise in them;
- Most of those currently practising in them have non-engineering backgrounds, and even those who are engineering graduates acquired their knowledge of the field on the job, not through formal education; and
- They lack a “critical mass” of licensed engineering practitioners to establish them from the outset as the practice of professional engineering.

These characteristics of emerging disciplines pose several challenges that do not apply to more established disciplines, and that require the regulator to adopt special strategies in order to integrate them successfully.

### STEPS FOR SUCCESSFUL INTEGRATION

First of all, it is critical to identify at least an initial set of scopes of practice for the emerging discipline that fit clearly within the definition of the practice of

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professional engineering in the *Professional Engineers Act* and for which a licence to practise is therefore required in the public interest. This step (defining restricted scopes of practice) should precede and should drive the definition of the core body of knowledge for the discipline, not the other way around. The temptation to consider emerging disciplines first from an academic point of view, especially if academic programs in the discipline have already been established or are in the process of being established, should be resisted.

Then comes the definition of the core body of knowledge for the agreed upon scopes of practice, which will be used for the following purposes:

- To evaluate the knowledge and experience of limited licence applicants to ensure they possess the depth of knowledge and skill required for their proposed limited scopes of practice;
- To establish syllabi against which the academic credentials of P.Eng. licence applicants can be evaluated;
- To create any new technical examinations that may be required for the emerging discipline before they are requested by applicants; and
- To assist academic institutions to design curriculum for programs and options that will prepare graduates to work in the emerging discipline and that will meet accreditation criteria.

Next, it is necessary to identify and recruit a core body of already-licensed practitioners who are practising in the emerging discipline and who are able and willing to serve as supervisors and referees for applicants for licensure, and as reviewers of applicants' academic credentials and experience on behalf of our Academic Requirements (ARC) and Experience Requirements (ERC) committees. These volunteers must be in place before applications for licensure in the emerging discipline can be processed fairly and expeditiously.

On the subject of licensure, it may be necessary with an emerging discipline to adopt greater latitude in the assessment of academic credentials than is customary for established disciplines. This is especially true in the early stages of accepting applications, when the goal is to build up a critical mass of licensed practitioners as quickly as possible in order to establish a "beachhead" in the new field. It may also be useful to test out our licensing processes in advance of the receipt of applications

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to ensure they are ready to handle what will inevitably be atypical applicants. Recently, staff and volunteers in PEO's licensing and registration function conducted a triage of potential applicants practising in the field of communications infrastructure engineering with a national telecommunications carrier to identify how they would be treated in our application process for both types of licence (P.Eng. and limited licence). This exercise has yielded useful information for both PEO and the applicants.

### INDUSTRY OUTREACH

Finally, success at integrating an emerging discipline into PEO's regulatory fabric requires extensive outreach into industry and government, and extensive communication to existing licensees and potential applicants who are already working in the field—what I usually think of as marketing, a term I hesitate to use given that PEO's core mandate is to license qualified applicants in a fair and consistent manner whenever they choose to apply. But if we simply wait for organizations and individual practitioners to recognize our jurisdiction and apply, we will have spent our effort to define the emerging discipline and to prepare to regulate it in vain. They need to be made aware that the practice of the emerging discipline is subject to regulation by PEO, that PEO stands ready to assist them in complying with the act, and that everyone will ultimately benefit from having licensed professional engineers take responsibility for their work. We need to identify champions in key target industries, and to engage them in supporting our efforts to build professionalism among their staff, clients and suppliers in the field. These necessary activities represent a significant departure from normal practice for PEO.

Another key aspect of outreach for an emerging discipline is to identify opportunities to create practice guidelines and standards and demand-side legislation that will accelerate demand for licensed professionals to work in the field. Such demand must, of course, be predicated on a need to protect the public interest through licensure, not on the self-interest of the profession or its members. Fortunately, in the case of communications infrastructure engineering and nanomolecular engineering, the potential for public harm from unregulated practice is so severe that the case for restricted scopes of practice can be made easily.

I believe our future as a self-regulating profession will depend on our success at integrating new fields of engineering practice as—not after—they emerge. As time goes on, more and more of PEO's licensees will be working in these emerging disciplines, especially as traditional scopes of engineering practice continue to be commoditized. We need to become proficient at this! Σ