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PROFESSIONAL PRACTICE IN SOFTWARE ENGINEERING

THE ENGINEERING PROFESSION'S POSITION

- Self-regulation of the engineering profession protects and enhances public health, safety, welfare, and the environment for all Canadians.
- Engineering regulators set high professional and ethical standards, establish codes of conduct, and administer regulatory processes and standards of practice to assure protection of the public.
- In the case of software engineering, a piece of software (or a software intensive system) can be considered an engineering work if it meets certain conditions outlined below.
- To protect the public and to prevent software developers who are not professional engineers from assuming responsibilities that should be taken on by a professional engineer, the public, engineers, governments, other decision-makers, and engineering regulators require an understanding of the scope of the regulated practice of software engineering and why it is regulated.
- Professional engineers working in the traditional engineering disciplines are grounded in Canadian Engineering Accreditation Board-accredited programs and the scope, practices, and standards for these disciplines are well-defined.

The challenge(s)

Since 1999, the engineering profession in Canada has been registering professional software engineers through an established discipline of software engineering. For many years prior to this, professional engineers in Canada were instrumental in developing the international body of knowledge and practice of software engineering. Professional engineers in Canada design, implement, and manage software-intensive systems across all industries – from Aerospace to Manufacturing, Mining to Transportation and Telecommunication, Finance to Government and Education. The regulation and enforcement of software engineering practice has proven to be a challenging task for the engineering profession, because activities such as software development may often overlap with software engineering.

The "practice of engineering" means any act of planning, designing, composing, evaluating, advising, reporting, directing or supervising, or managing any of the foregoing, that requires the application of engineering principles, and that concerns the safeguarding of life, health, property, economic interests, the public welfare, or the environment.

In the case of software engineering, a piece of software (or a software-intensive system) can therefore be considered an engineering work if both of the following conditions are true:

- The development of the software required "the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software."
- There is a reasonable expectation that failure or inappropriate functioning of the system would result in harm to life, health, property, economic interests, the public welfare, or the natural environment.

The scope, practices, and standards for traditional engineering are well defined. Accredited and established engineering degree programs are available for all engineering disciplines, including software engineering. Those who develop and implement software or software-intensive systems and who seek licensure are often less likely to be graduates from an accredited or recognized engineering program in software engineering. Through licensure tools developed by the engineering profession, the provincial and territorial regulatory bodies are able to assess the qualifications of all applicants to determine whether they are eligible for licensure and to determine requirements that need to be satisfied to achieve professional engineer status. Some jurisdictions also offer a limited-scope license, which grants the holder the right to practice software engineering.

To protect the public and to prevent those who are not professional engineers from assuming responsibilities that should be taken on by a professional engineer, the public, engineers, governments, other decision-makers, and engineering regulators require an understanding of the scope of the regulated practice of software engineering and why it is regulated. The regulation of software engineering will hold individuals accountable for the work they do via the existing enforcement, investigation, and discipline process. Without the regulation of software engineering, there is little or no

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accountability, other than resorting to the justice system which is ill-equipped to deal with an issue that should fall within the engineering regulators' purview.

How Engineers Canada has contributed

The Canadian Engineering Qualifications Board, in consultation with the provincial and territorial engineering regulators, has prepared a national document that provides guidance to regulators regarding the scope and depth of the software engineering discipline.

This *White paper on professional practice in software engineering*[1] is publicly available and provides an introductory rationale that addresses the nature of practice in software engineering, in comparison with software development. The document is a tool that provides guidance to help regulators and others to recognize the practice of software engineering. The White Paper includes:

- An application of the definition of the practice of engineering to the software field, as well as indicators that an activity may involve the practice of software engineering that is only to be practised by those so licensed as software engineers.
- An exploration of aspects that may be practised by others in addition to software engineers.

The Qualifications Board has also developed the *Software Engineering Syllabus* to further define the requirements for software engineering.

In addition, regulatory bodies in Canada in several jurisdictions have developed software engineering experience and competency requirements for those who wish to pursue registration as a professional engineer. Professional engineers across Canada have also contributed to the Institute of Electrical and Electronics Engineers (IEEE) Computer Society's *Guide to the Software Engineering Body of Knowledge*, which describes generally accepted knowledge about software engineering; and the IEEE's software engineering competency model (SWECOM), which describes competencies for software engineers who participate in the development of and modifications to software-intensive systems.

Recommendations to the federal government

The federal government must continue to recognize that the Canadian public is best served when the jurisdiction of the provincial and territorial engineering regulators is recognized and respected, and when it is acknowledged that provincial and territorial governments have delegated the authority to regulate the engineering profession to these 12 regulators.

Provincial and territorial regulators consistently strive to ensure that their admissions and licensing practices are timely, transparent, objective, impartial, and fair. Provincial and territorial regulators also set high professional and ethical standards, establish codes of conduct, and support and oversee the practice of professional engineering to ensure protection of the Canadian public.

The federal government must also:

- Ensure that any legislation or regulations that refer to software engineering work require the involvement of a professional engineer in accordance with provincial and territorial engineering acts.
- Use demand-side legislation to drive the requirement that software engineering work is to be performed by individuals who are licensed to do so, thereby encouraging compliance with professional regulatory legislation.

How Engineers Canada will contribute

Engineers Canada will continue to;

- monitor developments in the professional practice of software engineering and will update its guidelines if/when necessary. In addition, Engineers Canada will continue to support the work of provincial and territorial regulators to enforce the engineering acts as they pertain to the practice of software engineering.
- engage in advocacy activities with relevant federal government officials and other stakeholder groups to educate and inform of the benefits of understanding and complying with the contents of the White paper on professional practice in software engineering.
- promote its White paper on professional practice in software engineering to provide engineering regulators, the public, engineers, employers, and governments with guidance as it pertains to the discipline of software engineering.

[1] Engineers Canada (2016). "White paper on professional practice in software engineering" Retrieved from: https://engineerscanada.ca/publications/white-paper-on-professional-practice-in-software-engineering