

# PRACTITIONERS SUPPORT active regulation of SOFTWARE ENGINEERING

By Michael Mastromatteo

**W**ith PEO's recognition of software engineering more than a decade old and 13 software engineering programs in Canada now accredited as meeting the academic requirements for the P.Eng. licence, how is software engineering practised today? *Engineering Dimensions* talked to several software engineering graduates to find out.

## CANADIAN STANDARDS SUPPORTED

Rupinder Mann, P.Eng., was one of the first graduates of the University of Western Ontario's software engineering program in 2002. Soon after, she was hired as a research assistant, software developer and image analyst (imaging and nuclear medicine) for the Lawson Health Research Institute, the research arm of London, Ontario's St. Joseph's Health Care and London Health Sciences Centre.

Since then, Mann has worked with scientists in software development, data management and data analysis, and in 2007 became project manager for knowledge translation in "health informatics."

With a long-time interest in math, computer languages and electronics, Mann was drawn to software engineering because of its wide applicability and pervasiveness. "I was captivated by software," she says, "because it was, and is, impacting all the domains of society, be it education, health care, space, economic, political, social, cultural, technological, anything."

Mann clearly sees software development as engineering practice, especially in areas of public health, safety and protection.

"Software development is not simply some lines of code that allow the user to perform certain functions, rather, it becomes critical engineering," she says. "In the requirements phase, developers need to do requirements engineering as business and software analysts; in the designing phase, developers need to execute as architects;



Rupinder Mann, P.Eng., is a software engineer and developer, Lawson Health Research Institute.

in the implementation phase, developers need to become software experts who know the superior applications of efficient and secure code; in the testing phase, developers need to become quality assurance representatives; and in the production phase, developers need to stand behind their developed product and provide support through the maintenance phase.”

She says practitioners often take on multiple roles, especially to satisfy some of the best practices expectations supported by industry. She believes a combination of computer science and engineering discipline is the best formula to ensure safety, security and reliability of software-related projects.

“Software engineering employment is essentially imperative for critical systems as they are ubiquitous and the complexity and consequences that arise when they fail most often require the highest level of engineering,” Mann says.

She says she supports PEO’s development of new guidelines for her area of practice and the development by PEO of a possible designation or specialty in software engineering.

“In such a heterogeneous environment, some sorts of standards are always welcome,” she says. “Most organizations develop their own standards, but again, consistencies among these different organizations would be a good idea.”

She cites as examples the Institute of Electrical and Electronics Engineers’ Software & Systems Engineering Standards Committee, which promotes timely development and management of a comprehensive and integrated set of software and systems engineering standards of proven utility, and software engineering standards established by capability maturing modeling integration, a systematic improvement approach providing organizations with the steps needed for process enhancement.

“I am sure it would be advantageous to software practitioners if PEO helps develop such standards, especially applicable to Canadian rules, law and regulations,” she says.

#### LICENSURE ENFORCEMENT A CHALLENGE

Also a graduate of Western’s software engineering program, Darcy Bachert, P.Eng., is vice president, operations, Prolucid Technologies Inc., a Mississauga-based systems integration company that develops software and control systems for energy, life sciences, manufacturing and other industries. Typical projects for him include turnkey test and automation, real-time data logging and control systems, and software product development for clients.

Bachert was originally enrolled in Western’s computer engineering option, but found the then newly introduced software engineering option was a better fit with his interests and career expectations.

He says an engineering mindset is especially useful to software professionals if their work touches on different industries, or if it involves safety critical applications, noting that such software is often “acquiring data, performing engineering calculations and then using the results to feed back into control of some process in real time. To ensure we are successful, we take the same approach to developing software as we would to designing a bridge. This starts with clearly defined requirements and detailed design, through development, testing and deployment of the system. This systematic approach to software development turns a previously ad-hoc process and puts the structure around it required to create robust, reliable and documented software.”

Like Mann, Bachert notes that assorted industry- or sector-specific guidelines currently inform software development work. In the medical sector, for example, Prolucid relies on IEC 62304 and its standard operating procedures that help define an approach to software development in this critical area. And while there are generic processes to ensure all phases of software development are executed, documented and open to review, Bachert says there’s a place for PEO and its guidelines writing volunteers to bring consistency to the field.

“As software is a relatively new discipline compared to civil engineering, [perhaps] PEO does need to update or develop standards that are more applicable to software practitioners,” he says. “Many of the current references or guidelines are vague when it comes to software engineering, and so need to be updated to be more relevant.”



Darcy Bachert, P.Eng., is vice president, operations, Prolucid Technologies Inc., Mississauga.



As to the question of PEO enforcing requirements for licensure in the software area, Bachert notes some of the complexities inherent in regulating emerging disciplines.

“Where software development is completed on a safety critical application,” he suggests, “it should be similar to electrical design, where P.Eng. supervision, review and sign-off on drawings are required—safety critical software should require this same process to be followed. The challenge is how to determine where the exclusive rights would apply and how to actually enforce this. Unfortunately, because of this challenge, I have many colleagues who have opted not to actually complete the P.Eng. process, as they do not see a direct benefit or requirement for them to do so within their field.”

#### TRANSFERABLE EDUCATION

In the early days of PEO’s recognition of software engineering as the practice of professional engineering, the challenge in licensing software practitioners was that they had graduated in a more traditional engineering discipline and migrated to the emerging area

of software engineering. Today, some of them are migrating in the opposition direction.

Sarah McDonald, P.Eng., graduated in software engineering from the University of Ottawa and is now working as a transportation engineer at AECOM. Licensed by both PEO and the Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA), she is primarily involved with strategic planning, design and installation of intelligent transportation systems (ITS). She has been with AECOM since 2006.

Although her transportation work today does not involve software development or software engineering, McDonald believes her software engineering education supports her present work pursuits.

“The underlying principles behind the courses were taken from the systems engineering process,” she told *Engineering Dimensions*. “Although we applied the process to software in school, I have been able to apply the same principles to the ITS work I do with AECOM. The engineering courses, both software and common, I took provided me with a transferable skill set that, with some additional courses, I have been able to apply in the transportation field.”

Although no longer an active software practitioner, McDonald says she fully supports efforts to provide guidelines for software engineering practitioners and to enforce against misuse of the engineer title.

“It is important for PEO to continue its regulating and licensing work to ensure that the public interest is served and protected,” McDonald says. “If software development involved in public safety and health can benefit from professional standards similar to those in place now, it would be worthwhile for PEO to look at this question further...As a professional engineer, I understand the important value of standards to my work. PEO’s strong expertise in establishing, maintaining and developing professional standards could support advancing the area of software programming, where there is an opportunity to do so.”  $\Sigma$



Sarah McDonald, P.Eng., of AECOM.