# ID 049: The Great Licensure Assumption- Erosion of Closure in the Canadian Engineering Profession

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*Abstract*

Engineering has been a regulated profession in Canada for nearly 100 years. In recent decades, pressures of globalization and economic competition, combined with increased student enrollments in university engineering programs have caused changes to the profession. This paper argues that engineering in Canada is undergoing processes of both deprofessionalization (Haug 1975, Scanlon 2011) and hybridization (Noordegraaf 2007, 2015), demonstrated by the small and declining proportion of engineering graduates who obtain their license to practice. Using secondary data from government surveys of university enrolment and labour market outcomes and qualitative studies of individual engineers' learning at school and work, I show how neo-Weberian perspectives combine with Noordegraaf's concepts of situated and hybrid professionalism to explain the complex changes taking place in engineering in Canada. The paper highlights a growing rift between licensed and non-licensed engineers manifested in conflicting membership criteria for professional bodies. This raises questions about the relevance of regulation and the future implications for professional education.

## *Introduction*

All professions can be understood as the intersections of simultaneous battlegrounds. In the "real" world, the forces of globalization, corporate influence, and pressure from citizens and governments are challenging the power base of the historic professions (Haug, 1975; Scanlon, 2011), at the same time as new occupations are pursuing their own professionalization projects (Larson & Larson, 1979; Paton, Hodgson, & Muzio, 2013). This battle for power and status is mirrored in the academic realm, as scholars of work and learning have questioned the privileged position of the sociology of professions (Gorman & Sandefur, 2011). Representatives of the Anglo-American incumbents of the discipline have fired back (Saks 2010, Adams 2015) while new voices have emerged to make sense of changes in the 'worlds' of professionals and the 'words' of scholars who study them (Muzio, Kirkpatrick, & Noordegraaf, 2011; Noordegraaf, 2007; Schinkel & Noordegraaf, 2011).

This paper investigates the following questions about ongoing changes to the engineering profession in Canada, with particular emphasis on the country's most populous province, Ontario: Why are so few graduates of engineering programs obtaining professional licenses? How can this be explained from a neo-Weberian perspective of closure, and from Noordegraaf's perspective of situated and hybrid professionalism? Using existing studies, this paper argues that the engineering profession in Canada is simultaneously undergoing processes of deprofessionalization and hybridization, signaled by the decreasing fraction of engineering graduates who obtain their professional licenses. Neo-Weberian explanations highlight the decline of new engineer training and development programs within companies; a vicious cycle of fewer licensed engineers leading to less viable applicants for the future; and deregulation policies which allow non-licensed workers to undertake engineering work in the manufacturing sector. Noordegraaf would explain these changes based on the primacy of organizational context and more complex notions of control beyond autonomy afforded by professional status.

The paper is structured as follows. First, we explore the core idea of professions as a means to achieving different types of closure, using the work of Mike Saks (2010, 2012) to clarify the neo-Weberian approach to studying professions. Second, we look at how the engineering profession in Canada obtained closure through a regulative bargain with the state (Adams, 2010), aided by universities which created additional barriers to entry. Third, we present growing evidence of challenges facing the engineering profession and changes to the career structure and labour market outcomes for engineers (Adams, 2017; Prism Economics and Analysis, 2016). Fourth, we explain these changes from two different perspectives, showing how deprofessionalization and hybridization are distinct but complementary processes. Finally, we investigate the implications for the knowledge base, legitimacy and authority of the profession.

### *Professions and closure: The neo-Weberian approach*

The term 'profession' is highly contested and has been the subject of a vibrant scholarly debate over the past century. The search for a conclusive definition has frustrated and exhausted numerous researchers, as professions have been analyzed from functionalist (Parsons, 1939), interactionist (Becker, 1962), Marxist (Braverman 1998), Foucauldian (Nettleton 1992) and neo-Weberian (Halliday, 1985) perspectives. Because of the emphasis on licensure and closure, in this paper we start with the neo-Weberian approach as our analytic entry point.

This approach builds on the work of Max Weber who argued that "social groups engage in social closure in the course of furthering their social interests and they both attempt to exclude others from their group and to usurp the privileges of other groups" (Macdonald, 1995, p. 27). In professions, this takes the form of "exclusionary social closure in the marketplace sanctioned by the state" (Saks 2012, p.4). It is important to note that closure is broader than just the market, as Macdonald (1995) spells out clearly:

> The occupation and its organization attempts to close access to the occupation, to its knowledge, to its education, training and credentials and to its markets in services and jobs; only 'eligibles' will be admitted. In so doing it may well exclude those of a particular race, gender or religion and thus play a part in the structured inequality of society (p. 29).

These critiques mount a sociological and critical argument for why professions are sites of substantial inequity and marginalization. In this way, the neo-Weberian perspective focuses our attention at the meso and macro levels of analysis, away from the micro level of individual professionals:

> Professionalization is a socio-political process, involving power and interests in the market at a macro level… Explanations of professionalization therefore are sought less in concrete knowledge and expertise and more in a profession's tactics of competition and the prevailing socio-economic conditions (Saks 2012 p. 6).

Saks helps us reframe the role of knowledge and expertise as a means to achieving political ends in the drive to secure legitimate standing for professions. The ultimate sign of legitimacy is exclusionary closure, where governments legislate that individuals must obtain a professional license to practice specific professional work. The members of that profession are thus sheltered from competition in the labour market, with "entry to the profession usually gained through obtaining relevant higher education credentials" (Saks 2012 p.4).

### *How the engineering profession in Canada achieved closure*

Tracey Adams (2010) studied the actual historical legislation for a wide range of professions across five provinces in Canada. Engineering was first regulated in Quebec in 1898, followed by other provinces in the

1910s and 1920s, including Ontario in 1922 (Adams 2010), and was typical of a number of the early professions:

> Most are closed, self-regulating professions with regulatory boards, composed of elected practitioners, that can pass by-laws to regulate entry to practice, as well as their own functioning and at times, aspects of practice and training more generally. These professions have tended to have high entry requirements, necessitating extensive training and education (p. 59).

In a short internal article professional engineers, Peter DeVita (2012) quotes at length from a "visionary speech" from F.H. Peters, who rallied Ontario engineers in 1918 behind the idea of legislation with the following argument:

> If we could get a law to define our status and bring us together so we could speak with one voice, then, if we were active, reasonable in our demands and consistent in our efforts, it seemed that we should certainly be able to gain the recognition and remuneration that was desired… The closely united organizations possessed by the lawyers and doctors, wherein they receive special privileges, are justified on one basis only, and that is the protection of the public. (DeVita 2012, p. 27, quoting Peters).

Clearly engineers were motivated to organize and push for legislation to increase their "income and image" (DeVita, 2012). They demonstrated political savvy predicted by the neo-Weberian perspective, emphasizing the 'protection of the public' as the only legitimate argument that could justify exclusionary closure.

Engineering leveraged higher education as a mechanism for increasing entry requirements to the profession. Engineering education in Canada predates the regulation of the profession (Morris, 1986), but enrolment didn't really take off until participation in higher education grew rapidly in the 1960s and 1970s. As a popular *undergraduate* field of study, engineering rode the wave of growth as higher education transitioned from an elite to a mass system (Trow, 1973). In a longitudinal study of the labour market outcomes of engineering bachelor degree holders in the 1980s and 1990s, Lavoie and Finnie (1998) show the high employment rates of engineering graduates, hovering around 90% across engineering disciplines over this time period. The pace of growth of engineering in Ontario has continued in the past decade with a growth rate between 2009 and 2012 of 6.2% in Ontario, compared to law (4.4%) and medicine (3.6%) (Prism Economics and Analysis, 2016).

While functionalists argue that professional engineers study at a university to access theoretical knowledge underpinning professional practice, others take a different perspective: "Academic knowledge… functions more symbolically than practically…the maintenance of professional jurisdiction lies in part in the power and prestige of its academic, abstract knowledge" (Scanlon 2011, p. 23, citing Abbott 1988). We can see how universities can inadvertently support the achievement of closure by limiting access to the profession of engineering through high entrance standards and a grueling technical education. This process may have more to do with prestige and status than the "expert" knowledge base upon which closure is premised.

### *Signs of change to engineering professionalism in Canada*

Enrolment in undergraduate engineering programs in Canada has skyrocketed in recent decades, growing from roughly 38,000 in 1990 to more than 80,000 in 2015 (Engineers Canada, 2015). Two main drivers are (1) more students who want to pursue engineering as a career that leverages their skills in math and science and can lead to high salaries (Stevens, O'Connor, Garrison, Jocuns, & Amos, 2008); and (2) an increase in available spaces offered by universities, implicitly sanctioned by the government through public subsidy of higher education. Thus, we can see that professional regulatory bodies have no direct control over enrolments via a quota system,

nor do the companies that hire graduates. Higher education scholars have shown how financial pressures cause universities to increase enrolment across the board (Clark, Moran, Skolnik, & Trick, 2009). Fallis (2013) argues that the current enrolment-based funding model in Ontario has led universities to increase undergraduate enrolments as a means to hiring more faculty to do research and thus increase international rankings.

The net effect has been a declining proportion of engineering graduates who obtain their license to practice professional engineering as it is defined in the Professional Engineers Act[1]. In a recent comparative study of regulated professions in Ontario, it was shown that only 18-38% of engineering graduates had obtained their professional license three years after graduation compared to 63-67% for medicine, 88-90% for education, 92-95% for nursing, and 96-100% for law. The report concludes that "the evidence from the labour market is that an engineering degree is a valued qualification that can open doors to many different professional careers that are not covered by the Professional Engineers Act" (Prism Economics and Analysis 2016, p. 112). This indicates a declining relevance of the exclusive professional domain that engineers back in the 1920s had wanted to protect.

Another challenge to professional licensure in Ontario is the "industrial exemption". This is an amendment to the Professional Engineers Act, which allows non-engineers to undertake "an act that is within the practice of professional engineering in relation to machinery or equipment, other than equipment of a structural nature, for use in the facilities of the person's employer in the production of products" (Government of Ontario 1990). The amendment was part of a wider set of deregulation reforms led by the provincial government in a bid to make it easier for Ontario companies to compete in international markets. The deregulation targeted the manufacturing sector in Ontario, which was struggling following the 2008 financial crisis. This sector is the second largest sector of employment for engineering graduates[2], so the legislation sent a strong signal to engineers that their monopoly on practice was under threat. Professional Engineers Ontario (PEO), the regulatory body in Ontario, has continuously lobbied to remove the amendment since its introduction, without success (Professional Engineers Ontario, 2016).

In response to these challenges, PEO has strengthened its outreach programs to encourage engineering graduates to enroll in its Engineer in Training (EIT) program. While PEO has moderately increased initial enrolment in the program, very little has changed in terms of follow-through and EITs actually obtaining their professional license, with still only about a quarter of graduates are on track to get their license (Prism Economics and Analysis, 2016). While the program is "administered" by the PEO from a regulatory perspective, it is directly influenced by the learning opportunities available in companies, and the support and mentorship from experienced professional engineers in the workplace. In a recent study of changes to professional work in Ontario, Adams, Livingstone and Sawchuk (2016) interviewed experienced engineers and noticed the decline of EIT programs on the employer side:

> Today, companies have abandoned formal training programs…A related trend [is the] decline in mentorship. Senior engineers have no time to mentor, and formal mentoring programs have been dissolved… [this] has been particularly hard on new engineers. Companies want to hire experienced

[1] The Professional Engineers Act defines engineering as "Any act of planning, designing, composing, evaluating, advising, reporting, directing or supervising that requires the application of engineering principles and concerns the safeguarding of life, health, property, economic interests, the public welfare or the environment, or the managing of any such act."

[2] 31% of engineers were employed in the manufacturing sector in 2011 (Prism Economics and Analysis 2016)

> workers, and are less willing to invest in someone fresh out of school, leaving fewer employment opportunities in engineering for new graduates. (Adams, Livingstone, & Sawchuk 2016, pp. 12-14)

This shows how competitive pressures are translated into the daily work of engineers. Manufacturing companies take advantage of the industrial exemption by hiring unlicensed engineers, starting a vicious cycle where fewer licensed engineers can supervise the work of EITs, making it harder for them to obtain their own license.

### *Possible interpretations and explanations*

There is a mismatch in supply and demand for licensed engineers that has led to a declining proportion of graduates obtaining their licenses. Ontario has also eroded the closure of the profession by passing the industrial exemption which opened up previously exclusive domains of engineering work. This regulatory change plays a symbolic role in disregarding the work of engineers, as the current president of the PEO lays out in the 2016 annual report: "The industrial exception is widely misinterpreted to include all engineering activity in industry and commerce, and therefore contributes greatly to the problem of lack of exclusive rights to practice for professional engineers" (Professional Engineers Ontario 2016, p. 3).

These challenges to closure suggest a classic example of deprofessionalization whereby professionals lose "control over their knowledge domain as a result of inroads from computerization, new occupations in the division of labour, and increasing public and client sophistication" (Haug 1975, p. 211). In our case, Scanlon (2011)'s wider definition of deprofessionalization is even more potent: The provision of historically professional services by non-professionals, the loss or distillation of skills, an attack on core values or professional identity, and changes to the professional workplace in ways that narrow or commodify roles of professionals (Scanlon, 2011).

The limits to this neo-Weberian view are that it implies that most of the power in the political struggle for closure lies with the professional regulatory body and the government itself. This misses out on two other important actors: organizations employing engineers, and universities.

To understand the role of universities, we draw on the work of scholars who have used person-centered ethnography to understand the process of becoming an engineer in the context of the United States (Stevens et al., 2008). Their work highlights the powerful socializing role that university education plays in shaping young engineers. University is the only time engineers are in such close and ongoing proximity to the full range of engineering disciplines. Students have intense shared experiences, and through various symbolic rituals they start to 'become' engineers (Scanlon, 2011). Following forms of pre-university filtering and self-identification, students develop their identities at the same time as they grapple with demonstrating "accountable disciplinary knowledge" – what 'counts' as engineering. This can cause cognitive dissonance for students as they journey from school to the workplace for work placements and they encounter fundamental differences between the mathematically-intense theoretical knowledge learned in school and the practical, social and tacit knowledge they gain and use at work. These dynamics will only intensify as increasing numbers of people start the socialization process of becoming an engineer in the face of diverging occupational pathways and trajectories. This situation challenges the logic of an assumed linear path from education to work to licensure that underpins the design of the professional system of engineering.

To deepen our analysis, we draw on Mirko Noordegraaf's work to look beyond the notion of "pure" professionalism, which is "about applying general, scientific knowledge to specific cases in rigorous and therefore routine or institutionalized ways" (Noordegraaf, 2007, p. 765). Noordegraaf critiques this "pure" perspective for conflating occupational content (control of content) and institutional control (content of control) in the quest for closure. Echoing from the continental European tradition of studies of occupations that in Anglo-American perspectives are unproblematically "professional", he repeatedly draws the links between modern professions and medieval guilds, as both rely on power and occupational control for performing well in their work: "As professional work is not only theory driven and inferential but also experiential, it is important to shield off occupational practices so that knowledge and skills can be developed and transferred" (p. 767). Noordegraaf also distances himself from the internal arguments within the sociology of professions, focusing on the research task at hand: "Frameworks for understanding professionalism, such as the one presented earlier, solve conceptual puzzles" (p. 768).

Noordegraaf's situated professionalism can help us with the "conceptual puzzle" of the engineering profession in Canada. Situated professionalism views professionals as embedded within organizational systems, and thus illuminates how professional autonomy is challenged in the face of organizational and financial considerations. This perspective gives meaning to the contexts described by Adams et al. (2016), whereby senior engineers are so burdened with administrative and managerial work they don't have time to mentor young engineers through the experiential learning central to developing engineering skill and knowledge. Organizations thus hinder the process of becoming an engineer by virtue of such things as task structures, divisions of labour and possibly the reformation of career evaluation and advancement.

Noordegraaf describes hybrid professionalism as taking on "distinctive cultural and symbolic meanings… as a new way to establish institutional legitimacy." (Noordegraaf 2007, p. 775). Hybridized professionalism helps explain why professional engineers take on positions of management to increase their power and control over organizational matters in a situated context. It also explains why project managers in those same organizations will seek to professionalize themselves to increase their legitimacy and authority in that specific technical domain. In this sense, "measurement and control methods... are not merely about being or becoming 'really' professional – they are about showing professionalism or putting on a professional performance to enact meaningful and legitimate work practices" (Noordegraaf 2007, p. 778).

This hybrid perspective explains how non-licensed "engineers" may be respected for their knowledge gained throughout their engineering degree, despite not having obtained their professional license. This threatens professional regulatory bodies, as it weakens their members' exclusive right to practice, and demonstrates how people can achieve some of the benefits of professionalism without being paying their dues, quite literally. This impacts the professional identity of both licensed and unlicensed engineers: "The search for present-day professionalism is a search for communal or social identity and for appropriate work identities that can be used for coping with trade-offs between individual demands, professional claims, and organized action" (Noordegraaf 2007, p. 780).

The engineering advocacy organization, the Ontario Society for Professional Engineers (OSPE), recently exacerbated engineering identity conflicts by creating a new "Associate Membership" category which explicitly target non-licensed engineers who have graduated from an accredited engineering program. This highlights the quest for "communal and social identity" among non-licensed engineers and the fractures between two

professional bodies, with each approaching their constituency in a different way.

### *Implications for the profession of engineering in Canada*

Exclusionary closure has been weakened by changes to regulation, increasing organizational control, and a growing supply of places in engineering degree programs. What does this mean for different stakeholders? For licensed engineers, it dilutes the value of their license and potentially undermines their professional authority. From the perspective of situated professionalism, licensed engineers working in large engineering consulting firms are losing professional control to pressures for efficiency, productivity and being "billable" to clients. This is likely to cause a greater identity crisis for older members of the profession, like those interviewed by Adams et al. (2016) who want to hang onto their autonomy. Much like teachers in the UK (Beck & Young, 2005), young engineers seeking to learn "the rules of the game" today are more likely to adopt the organizational logics underpinning the commodification of engineering than they the professional logics of autonomy and authority.

For unlicensed engineers, the implications are more ambiguous. These "engineers" operate outside of their primary institutional sphere (Halliday 1985) to work in domains of contested legitimacy that intersect the primary spheres of other professions. While Abbott (1988) and other neo-Weberians might predict inter-jurisdictional conflict in this situation, another possibility is that these engineers adopt identities that are more organizational rather than professional. A clear example is engineers who come to identify themselves as project managers (Paton et al., 2013), or engineers who work in software companies where professional licensure is irrelevant and their distinction from computer scientists is blurred (Adams, 2007).

Has it become the norm, rather than the exception for engineering graduates to work without a license? The labour market projections of Prism Economics and Analysis (2016) and Engineers Canada (2015) indicate this to be the case. OSPE's broadened membership criteria that includes graduates of accredited programs without licenses, compared with PEO's strict focus on "expanding exclusive rights to practice" (Professional Engineers Ontario 2016) presents another form of this dilemma. A looming final question is how changing occupational pathways should be reflected in the engineering accreditation system, the main link between professional bodies and universities. Curriculum reformists in engineering have long complained about the rigidity of accreditation requirements, often at the expense of a broader general education and emphasis on professional practice. Perhaps the changing external landscape will give them the leverage they seek to implement their preferred reforms.

### *Conclusion*

Engineers in Canada explicitly modeled their professionalization project after doctors and lawyers, and yet clearly the nature of their work and the organizational contexts in which they operate are drastically different. This paper highlighted signs of 'cracks' in the professional system that seem likely to spread. In this context, the symbolic and cultural dimensions of professionalism have proved more significant than the structural functionalist ones. Future research can build on this framing of engineering professionalism in Canada, and should inquire into how the macro changes documented here impact the micro details of the lives of working engineers, licensed or not. Studies of organizations that include licensed and unlicensed engineers could shed light onto the hybrid dynamics of professionalized management and managed professionalism, not to mention the layered identities and inter-professional authority structures that might exist among these groups. The other important line of inquiry is the 'politics of accreditation' hinted at in this paper: How do the changes in the profession ripple through the accreditation system into universities? Studies of quality assurance and

curriculum reform in engineering education can benefit significantly from a wider frame set in the sociology of professions, as presented here.

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