

The Changing Nature of Professional Work and Professional Knowledge: A Case study of Canadian Nurses and Engineers

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Professionals' ways of working appear to be changing. There is an extensive body of sociological literature documenting changes to professional regulation, including requirements for continuing education and recertification, and changing scopes of practice (Adams 2016; Saks 2015; Chamberlain 2013). The literature on professions and organizations documents how the structure of professional workplaces is transforming (Brock 2006; Ackroyd 1996; Cooper et al., 1996; Noordegraaf 2007). While employment in larger and global firms brings its own set of challenges (Brock 2006; Flood 2011), even professionals working in smaller, more local firms, appear to face greater bureaucratic control than before (Ackroyd 1996; Cooper et al. 1996; Leicht and Fennell 1997). New management techniques and business practices have been adopted, altering traditional, more collegial, workplace environments. These trends are accompanied by an expansion of professionals' participation in managerial roles (Livingstone 2014, 2017; Noordegraaf 2015; Waring and Currie 2009). Combined, these changes may reduce individual professionals' autonomy – certainly, professionals in many fields appear to be subject to more supervision, and face greater accountability (Evetts 2011). Notions of professionalism that formerly emphasized autonomy, are being coopted by employers to exert greater control over professional workers (Evetts 2011).

These trends appear to place higher demands on professional workers. Growing requirements for recertification, technological developments, changing regulations,

rationalization, and managerial practices which increase reporting and accountability may combine to exacerbate professionals' already heavy workloads. But what are the implications of workload change for professionals' skills and knowledge? On the one hand, professional skills may be increasing, as technological change and recertification require professionals to learn continuously. As professionals take on more managerial roles, they may acquire more managerial knowledge and expertise (Waring and Currie 2009; Noordegraaf 20015). On the other hand, professions' scholars have long contended that one likely outcome of the rationalization and bureaucratization of professional employment is deskilling. Professionals may lose autonomy, and the ability to exercise professional judgement, becoming gradually indistinguishable from the more general mass of workers in capitalist economies (Ritzer and Walczak 1988; Haug 1975; Larson 1980; Coburn 1994). Rationalization may reduce the scope of professional activity, routinizing the work of rank-and-file professionals, and leaving only professional elites to enjoy the autonomy and influence associated with professions in the past (Freidson 1994; Muzio and Ackroyd 2006).

In this paper, we explore the implications of workplace change for professional skills, knowledge, and judgement. We argue that because many professional skills are learned on the job, changes to professional workplaces have significant implications for professional knowledge and skill. However, the nature of these skill and knowledge shifts appears to be complex. If some traditional skill development is compromised, new skills may be taking their place. The implications for professions are potentially profound.

Professional Work and Knowledge

Virtually by definition, professionals are expert workers. For some scholars the terms 'professionals' and 'experts' are synonymous (Brint 1994; Evetts 2006). Amongst some US

scholars, the term 'profession' has fallen out of favour; the label 'expert' is viewed as more encompassing (Eyal 2013; Gorman and Sandefur 2011). Historically, Brint (1994) contends, professions were based on status as much as – if not more than – expertise, but this changed by the mid-twentieth century. The term profession has largely lost any meaning it had separate from 'expertise'. Other scholars disagree. For them, such claims do not acknowledge the multi-faceted nature of professions (Collins 1990; Freidson 1986; Saks 2012). For Collins (1990), it is not technical knowledge or expertise per se that distinguishes a profession but the social organization of knowledge and the link between knowledge and status. In a similar vein, for Freidson (1986) professionals can be distinguished from other experts by their formal knowledge, and the manner in which that knowledge is institutionalized. Moreover, unlike some other experts, professionals have tended to “control technological innovation” in their fields as they “produce and legitimize new knowledge” (Freidson 1986: 211). This control over knowledge generation and education has been a key source of professional power (Larson 1990). Professionals can be distinguished from some other experts, therefore, by the nature of their knowledge, its organization and institutionalization, and the status attached to it.

One thing that scholars on both sides of the debate agree on is the fact that professional knowledge and expertise has seldom been the focus of sociological analysis (Abbott 1988; Eyal 2013; Young and Muller 2014). We know little about the nature of professional knowledge, and its exercise in the workplace. Young and Muller (2014: 5) argue that when sociologists do study professional expertise, there has been a tendency to focus on skills and competencies, rather than knowledge per se. This is problematic, since professional knowledge has traditionally had a dual character. Professionals “have, and need, both specialised knowledge and practical experience” (Young and Muller 2014:6). Professionals draw on their extensive knowledge to solve problems

in complex situations (Champy 2016). Their work requires the exercise of judgement, and the ability to think flexibly and quickly to apply scientific knowledge in often unique circumstances (Champy 2016; Freidson 1986). In this manner, professional expertise blends esoteric, theoretical knowledge, with practical and pragmatic applications (Schon 1983; Gidney 2005). To understand professional knowledge, therefore, we need to consider both practical and esoteric dimensions.

Because professional knowledge and expertise are complex, professional education has traditionally been broad, taking place in multiple settings. For at least a century, professional training has combined university or college-level education with ongoing, on-the-job training, learning and development (Gidney 2005). Not only do most professional schools provide opportunities for practical hands-on learning, but many professions require a period of field experience before candidates can obtain their final registration or license to practice independently. Thus, professionals receive only some of their knowledge and skills in formal educational settings. Much of what they know they learn by doing – on the job.

It is in this context that workplace change has potentially significant implications for professional skills and learning. In today's global capitalist market place, knowledge is increasingly commodified (Grace 2014: 23). As a result “what were complex, interpersonal processes of teaching, learning, and research” are being transformed into a “set of standardized measurable products” (Ibid). In Canada and the United States generally, firms once willing to train workers, to invest in them and provide them with learning opportunities, now prefer to hire workers who already have measurable skills in place (Hall 2014). Opportunities for professionals-in-training, and other workers, to acquire skills on the job may be dwindling (Ibid).

As the pace of work intensifies with rationalization, workers may have less time to invest in deep knowledge acquisition. Or workers may acquire the skills they need to get the job done, but not fully understand the background or implications of their decisions. The ability of professionals, in this context, to fulfill traditional fiduciary roles may be compromised (Grace 2014). Moreover, professionals' ability to exercise good judgement may be impaired. Winch (2014: 56) argues that successful professional practice requires "underpinning systematic knowledge." The latter is

"best conceptualised as a combination of 'know that' and 'know how', as well as acknowledging that reflection on elements underpinning knowledge can be a prelude to judgement and action. In addition, however, occupational capacity in a fully developed form entails a civic awareness and know-how that encompass an understanding of the impact of the occupation practised, not just on related occupations, but also the wider society"

In today's economy professionals may not have the time to develop 'underpinning systematic knowledge' to its full extent; they may not have time to reflect on their practice, and consider its impact on others. This, potentially, leads to poor professional judgement that can have negative societal impacts.

Previous research has explored the impact of rationalization and bureaucratization on professional skills (Freidson 1994; Coburn 1994; Murphy 1990). Murphy (1990) argued that bureaucratization was challenging traditional professional powers, reducing practitioners' autonomy and control. Coburn (1994) documented rationalization and routinization affecting medical doctors and nurses, but also highlighted their efforts to resist these changes. Freidson (1986, 1994) was somewhat optimistic, arguing that organizational change need not undermine professional autonomy, as professionals in bureaucratic organizations often take orders from other professionals. Thus, while individual professionals might experience a loss of autonomy

with rationalization, this “does not represent a reduction in the control of professional work by the *profession* itself” (Freidson 1994: 139). Professionals are often still in a position to direct the work of others, and professionals are also in a position to generate new professional knowledge through research (Ibid). Taken together, this research suggests that organizational change may lead to routinization, but this in and of itself, need not undermine professional knowledge, control, or authority. Moreover, routinization and deskilling, may be accompanied by the emergence of new knowledge, and skill upgrading (see also Sawchuk 2013).

Today, there is considerable evidence of workplace change. Technological change, work intensification, and professional reaccreditation and recertification requirements encourage professionals to upgrade their skills continuously. At the same time, however, workplace change may be subjecting professionals to greater organizational control, reducing their autonomy, and potentially routinizing professionals’ skills. To understand this duality better, in this paper we explore the impact of workplace change on the knowledge and skills of engineers and nurses, drawing on their own accounts.

Methodology

Our data come from both in-depth interviews and practitioner surveys. First, we conducted “oral history” interviews with 23 experienced registered nurses and professional engineers. All participants had over ten years’ experience working in Ontario, Canada. Professionals were asked about both their own career histories, and the key changes and challenges currently facing workers in their professions. Although there were few questions directly asking about professional knowledge and skill, our participants raised these issues often. Interviews lasted between 30 and 90 minutes, and all but one were recorded and transcribed.

Interviews were conducted over the phone, in person, and over skype, depending on the location and preference of the participant. Respondents had between 15 and 45 years of work experience. They were employed in different capacities in various workplace settings and sectors. Of the engineers (n=15), 7 of the participants were men, while 8 were women. Most were Canadian trained, and only 3 were members of visible minorities. Of the nurses (n=8), 6 were women, 2 were men, while only one received initial professional training outside of Canada and none were members of a visible minority. All names used in excerpts below are pseudonyms.

Second, we conducted on-line surveys of practising nurses and engineers between October 2016 and February 2017. The Ontario Nursing Survey was carried out in partnership with the Registered Nurses Association of Ontario (RNAO), while the engineering survey was conducted with the Ontario Society of Professional Engineers (OSPE). Both professional organizations assisted with recruitment, sending out repeated invitations to participate over the study period. These surveys were designed to parallel the Changing Workplaces in the Knowledge Economy (CWKE) national survey conducted in 2016. As such, the surveys included both general questions about working, workplace change, and learning, and profession-specific questions addressing professional issues and concerns. There were 1,300? respondents to the nursing survey: 88% of respondents were Registered Nurses (RN's), and 88% were female. Only 20% of nursing respondents indicated they belonged to a visible minority. There were roughly 700 respondents to the Engineering survey. Of the engineer respondents, 81% were male, and 21% indicated they were members of a visible minority.

This paper presents preliminary survey data (frequency distributions) on responses to questions about workplace change and workplace learning, as well as excerpts from interviews elaborating on the importance of on-the-job training for professional knowledge acquisition, and

the impact of workplace change on professionals' skills. Our overarching research question is this: *What is the impact of workplace change on professionals' knowledge and skills?* To answer this question we first consider the implications of workplace change for on-the-job training and mentorship. Next we explore professionals' learning and skill acquisition strategies. Last, we explore how workplace change is shaping the skills professional engineers and nurses say they exercise on the job.

On-the-job training, and workplace change

Surveys asked nurses and engineers what source of learning they valued most: formal learning in educational institutions or on-the-job? As Table 1 shows, almost half of all engineering respondents said they valued on-the-job learning most, while most of the rest valued a combination of on-the-job learning and formal education. (Nurses?)

Table 1. What source of learning do you value most as an engineer / nurse?

	Engineers % (N)	Nurses % (N)
On-the-job learning	46.8 (275)	
Organized education	9.2 (54)	
Neither	0.9 (5)	
Both	43.1 (253)	
Total (N)	100 (587)	

Our interviews confirmed the importance of on-the-job training for skill acquisition. This was particularly the case amongst engineers:

I think the most learning occurring will be on the job. Like ... universities are very academic. They give you the fundamentals, I will say. ... But in terms of practical, I think you learn that doing the work. (Katherine, engineer).

The skills you use on the job are acquired on the job. Real work gives you the core training you need. (Hans, engineer).

You cannot just graduate from university and start practising engineering. It's a learned profession. There is a graduation in your understanding and your experience level. You have to layer it. You have to be mentored. You have to have knowledge transfer from experienced engineers.... Getting those opportunities to have [on-the-job] training is essential for the profession. (Julie, engineer)

Nurses also emphasized practical learning in combination with formal education:

Eventually they may become an expert in what they do but that takes a while. They are not experts the first day they graduate from nursing school or university. (Charlotte, Registered Nurse)

It's my belief that university teaches you how to think about learning to do these things on the job. You can't possibly learn all these things you need to know. You need to learn the tools to be able to do it once you get out there. (Cathy, Registered Nurse)

In our surveys, we asked nurses and engineers about how much on-the-job training was necessary for their current jobs. Not surprisingly, many said the training required was extensive. About 45% of engineers and xxx % of nurses said that 3 or more years of on-the-job training was required. Another 20% and xxx % respectively said their jobs required between 1 and 3 years of on-the-job training. Evidently, most registered nurses and engineers believe that substantial on-the-job training is necessary for successful job performance.

It is, therefore, troubling that many of our interviewees felt that recent workplace change was compromising on-the-job training and practical skill acquisition. This theme resonated with engineers in particular. Consider, John's description of his early career training in the 1970s:

There was a progression of assignments during your first two to five years on the job, so that you could do some pretty heavy duty work at the end of the five-year

period. There was two years of rotations, and another two to five years handholding with senior people. So, let's say between five and seven years of mentoring and support, and then after that they pretty much knew they could let you go and you would be working on your own with normal supervision rather than a little closer oversight by a senior engineer. (John, engineer)

Julie's experience in the 1980s was similar:

I had a phenomenal engineering-in-training program It was a two-year program, I would almost call it a boot camp, almost like a military overtone. I don't mean that in a necessarily bad way, but it was character building. What they did is every six months they moved us around to various core components of the organization.... We might have got a bit of choice as to which ones we wanted to rotate through For a young engineer, this was excellent training about the real world and how engineering gets done.

Engineers report, however, that now most of these engineer-in-training programs are gone.

Opportunities for new engineers to 'apprentice' have disappeared.

Not too many companies are willing to train people anymore. They want employees who are fully ready to go, and they don't want to invest in training. (Lisa, engineer, manager)

On-the-job training is not happening. The industry is cutting costs, and one of the things they don't see the return on is on-the-job training. (Howard, engineer)

It's basically... just-in-time delivery, so they grab a person stick him in a desk and say 'go to it'. (John, engineer)

Engineering interviewees also reported a decline in mentorship. Senior engineers have no time to mentor, and formal mentoring programs have been dissolved:

The mentoring is pretty much gone too now. They tend to overload the supervisors with a lot of administrative work, and managers with meetings, and senior engineers are struggling to keep up with schedules because typically the schedules and the budgets now are so tight They don't want to be responsible for training people from scratch. There's very little money there to have somebody spend time training someone else. (John, engineer)

"Mentorship is a joke in the engineering world. Yeah, I have officially had mentors; they've never mentored me" (Julian, engineer).

Registered nurses too reported a decline in mentoring:

I know I got it and it really made a difference in my nursing career. I'm just not seeing a lot of nurses wanting to mentor or even be a preceptor [i.e. the formal assignment of an experienced nurse to mentor a new nurse] anymore. It used to be quite common.
(Constance, Registered Nurse)

Number one, there seems to be less senior nurses that [act as a] kind of mentor or preceptor to students in an informal type of way. So they are learning bad habits from maybe not the best people. (Charles, Registered Nurse)

These people are new, they need to be supported and they need to be coached because they are starting like you were twenty or fifteen years ago and they need to be supported. Because if not they quit, they leave nursing and that's bad for the profession. (Peter, Registered Nurse)

Some of the nurse participants suggest that there are fewer professionals “willing” to mentor, but there is evidence from both nurses and engineers that the problem may be more a matter of time than desire. In the survey, we asked nurses and engineers about workload change. As Table 2 shows, both groups of professionals have experienced workload increases in the last 5 years, but the trend is particularly marked amongst nurses.

Table 2 Has the workload in your job changed over the past 5 years?

	Engineers % (N)	Nurses % (N)
Increased Greatly	24.6 (130)	58.0
Increased somewhat	41.0 (217)	32.0
Stayed the Same	26.0 (138)	7.8
Decreased Somewhat	6.8 (36)	1.5
Decreased Greatly	1.5 (8)	6.4

Among survey respondents, 90% of nurses had experienced a workload increase in the last 5 years. If informal mentorship is indeed declining, it may be because nurses are far too busy coping with new workload demands. Although a smaller percentage of engineers say they have

experienced an increased workload, it is still the case that roughly two-thirds say the demands on them have risen over time.

In interviews, both nurses and engineers described this workload pressure:

The workload is increased, heavier, more difficult cases to deal with. The early discharge of patients is throwing patients in a repeating loop of returning for care, and it's throwing the nurses into the loop too in the sense that staff realize in the morning that the doctor discharged the patient and they are not fully prepared to go home because the health teaching has not been done and they need the bed. This is not good because as RNs one of the things is that we need to do the teaching before they go. (S02, nurse)

You are always going. There is no break. The work is constant. (Hans, engineer).

So what I see is the pace and expectations of ... work. There's sometimes a real need to slow things down and take the effort to get things right. That's what I feel in engineering is a real fundamental requirement. And there is *a lot of pressure to get it done fast. And that's problematic.* (Adam, engineer; emphasis added).

As these excerpts show, professionals feel a great deal of stress about their workloads, and these intense working environments can have a negative impact on getting the work done right, which in turn has implications for professionals, and their patients/clients. It also clearly limits time for mentorship:

I tried to spend time when I had a young engineer working with me. I tried to ... [my company] was a consulting company. It was all billable hours, so you didn't really have the time to teach any person anything more, because it was so many hours to get a job done. And um... it's an issue. (Ruth, engineer).

Overall, survey and interview findings suggest that nurses and engineers learn a lot of their skills on the job, but that in the last several years, they have experienced significant workload increases that result in a decline in mentoring opportunities. For engineers the situation has been exacerbated by a decline in on-the-job training programs. These changes would appear to have significant implications for skill development and knowledge acquisition.

Professional Skills Acquisition

If fewer professional engineers and registered nurses have time to acquire skills through mentorship and on-the-job training, where do they – especially young professionals – acquire job-related skills? Do they take steps to make up for the lack of on-the-job training and mentorship? Consider this quote from Sarah, a professional engineer,

So the challenge for the students now is where do you get that training? Do you have to go back to college? Do you, you know, do your Masters? Like it seems a lot more common that the kids stay in and do their Masters to just get that extra level. Whereas I think ...um ... I think there was more of a partnership [in the past] between the students and the employers that's not there now, from my observation. (Sarah, engineer).

Sarah suggests that lack of training (combined with a poor labour market for young engineers) is driving credential inflation in the field. The pressure to get more formal schooling is also evident in nursing:

I do believe it could be difficult moving forward in the future. There's starting to be a lot of pressure for Master's level entry. In fact I'm not sure I'd get my job now, whereas I got it based on the experience of a number of projects and leadership roles I'd already played here. (Cathy, Registered Nurse)

However, formal education is only one way of obtaining skills, and as we have seen, professional engineers and nurses traditionally learned a lot by doing, and by taking advantage of more informal learning opportunities. In professions, increasingly, continuing professional education, whether formal or informal, is a must:

Well I always kept myself updated with new in-service programs, [and] I went back to school as well. It was the practice on all floors on the hospitals, and every time I went to a new unit, a new department, a new area of practice, I was updating myself with the co-workers over there and then the in-services. That's how I kept learning. (Peter, Registered Nurse)

There isn't one spot or one place where you learn everything and then you stop.... I had to read all the time and go to conferences and keep up with new things right? ... Every day it's something new. I have been reading, or attending conferences, or listening to lectures, and having conversations with others. (Rebecca, engineer).

You always need to be doing professional development. You need to learn through work, and on your own to be informed. Engineering is a demanding career, and technology instead of making the work easier makes it more intense. Employers don't exactly force you to keep in touch, and to use technology to keep on top of things, but other people will do it, if you don't. You are afraid of the others, so you keep up. It makes it hard to balance your life. (Hans, engineer)

Our survey data provide additional context and support. We asked nurses and engineers about their learning activity. On the whole, not surprisingly, practitioners were already highly educated. Amongst engineer respondents, 66% had completed a university bachelor's or professional degree, and an additional 33% held a graduate degree. Nursing respondents reported ... Despite this high level of training, both types of professionals were heavily engaged in continuing education. Over half of engineers (54%) and xxx of nurses reported taking formal education or training in their field in the past year. Members of each profession were also regularly involved in informal learning to develop their skills, as Table 3 shows.

Table 3. Informal Learning Activities in the Past year by Skill Type: Percentage of respondents saying they undertook training in specified areas.

	Engineers	Nurses
Technical Skills	75.9 (442)	
Organizational or Managerial	56.4 (329)	
Financial or Business	45.9 (266)	
Soft Skills, Communication	53.8 (312)	
Employment Conditions	34.8 (202)	
Health & Safety	55.7 (323)	

Three-quarters of engineers report informal learning to upgrade their technical skills, while over half undertook informal learning to enhance their managerial, health & safety, and soft skills.

Nurses also engaged in a great deal of informal learning ... Moreover, professionals reported developing their skills by seeking advice from knowledgeable colleagues: 46.6% of engineers, and xxx of nurses say they have done this in the last month alone.

The picture that emerges from the survey and interview data then is of busy professionals who nonetheless invest a considerable amount of time engaging in formal and informal learning opportunities. Since employers are providing less training, it is increasingly left up to workers “to go and learn what they can on their own time” (Ruth, engineer). This can lead to “bad habits” as nurse Charles suggests above, and can prevent professionals from achieving work-life balance, as engineer Hans reports. Formal and informal skill acquisition activities would also appear to exacerbate the workload increase professionals report. Nevertheless, it is not clear what this means for professional skill and knowledge more broadly. Do these learning activities contribute to skill upgrading that counteracts any deskilling from declining mentorship and job-training opportunities? Survey data provide us with some tentative answers.

Professional Skills and Knowledge Utilization on the Job

In our surveys we asked several questions to determine if the skills professionals possessed were being utilized in their jobs. For instance, we asked if practitioners had more or less skills than were required, and whether they believed they were overqualified or under-qualified for their current jobs. Findings are shown in Tables 4, 5 and 6.

Table 4. To what extent can you use your professional knowledge and skill in your current job?

	Engineers % (N)	Nurses % (N)
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Not at all	4.5 (31)	0.2
Very little	8.1 (56)	1.9
A moderate amount	28.6 (198)	10.9
Quite a lot	35.6 (247)	30.7
Fully	23.2 (161)	56.3

Table 5. Do you have more, about the same, or less knowledge than your job actually requires?

	Engineers % (N)	Nurses % (N)
Much more	17.7 (100)	
More	33.5 (189)	
About the same	35.8 (202)	
Less	11.5 (65)	
Much Less	1.4 (8)	

Nurses were more positive than engineers about their skill use, with over half of all nurses reporting they had opportunities to use their skills ‘fully’, compared with just 23% of engineers. Over one-third of engineers (35.6%) reported they could use their skills “quite a lot,” and 30.7% of nurses reported the same. It is clear from Table 4 that approximately 40% of engineers felt their skills were being strongly under-used. In a similar vein, 51% of engineers report that they have more knowledge than their job requires (Table 5). Among nurses ... Thus, there is evidence of under-employment: [most/many/?] professionals appear to have more knowledge and skill than are required in their jobs.

The news is slightly more positive for engineers in Table 6, which shows that 62% report that, in terms of their education, they are adequately qualified for their jobs. Still roughly 30% report being over-qualified. **NURSES.**

Table 6. In terms of your schooling, do you feel you are qualified for your current job?

	Engineers % (N)	Nurses % (N)
Very over-qualified	7.7 (44)	
Somewhat over-qualified	22.9 (131)	
Adequately qualified	62.0 (355)	
Somewhat under-qualified	7.0 (40)	
Very Underqualified	0.5 (3)	

In combination, these survey findings suggest that many engineers and nurses are under-employed. While the majority may be adequately qualified for their jobs, many (especially engineers?) do not have the ability to use their skills and knowledge on the job. Credential inflation, constant skill-upgrading and continuing education may exacerbate this trend.

While the surveys reveal under-utilization of professionals' knowledge and skills, our oral history interviews suggest that there may be a shift in the kinds of knowledge, or depth of knowledge, professional workers exercise on the job. The decline of mentorship and on-the-job training may be significant. Professionals scrambling to learn on their own, may acquire knowledge on an ad-hoc basis, learning only what they need to know to do a particular task, resulting in a more superficial, less reflective, mode of knowledge acquisition. These sentiments emerged in the engineering interviews:

People are basically expected to jump into the deep end of the pool, and swim. If they don't swim they're told to leave. If they swim, they can stay. And as a result they tend to struggle around water paddling instead of swimming, right? And um... the quality of the work that you get suffers until the person gets a deeper knowledge of the operation and work that's required, and how to do that particular work. (John, engineer)

Older engineers understand more of the 'why' behind things....Older engineers will sometimes ask what is going on behind the scenes? What formula or calculation is used to arrive at that solution? How does that work? The new guys have no idea what is behind. They are less interested in the background, or how things are working (Hans, engineer).

John and Hans suggest that while workers may be acquiring new skills, they lack “deeper knowledge” that earlier professional engineers had the opportunity to acquire.

To touch on this dimension of skill complexity and depth, we asked our survey respondents whether they considered the body of knowledge they brought to their jobs to be complex.

Table 7 Do you consider the body of knowledge you bring to your job to be complex?

	Engineers % (N)	Nurses % (N)
Very complex	26.8 (149)	
Somewhat complex	59.5 (331)	
Not very complex	11.0 (61)	
Not at all complex	2.7 (15)	

As Table 7 shows, only a little over a quarter of professional engineers indicate the knowledge they apply in their job is “very complex” – which is less than one might expect for a learned profession. Still, 59.5 % of engineer respondents said their knowledge was somewhat complex.

Nurses. Moreover, there is evidence that many professional engineers possess decision-making authority: 48% of engineers believe they meaningfully participate in decision-making. In contrast only about **xx%** of nurses claim the same (full results not shown here). It may be the case that professionals have less opportunity to acquire ‘deep knowledge’ and exercise complex skills than they did in the past; certainly many professional engineers and nurses report they lack the ability to make decisions, and use their professional knowledge fully in their current jobs.

Nonetheless, the survey does not provide evidence of skill decline. Quite the contrary. We asked respondents if the skill required to do their job had become greater or lesser over the past five years.

Table 8. In the past 5 years, has the skill required to do your job become greater or lesser?

	Engineers % (N)	Nurses % (N)
Much greater	12.0 (65)	32.3
Somewhat greater	50.7 (274)	46.2
Stayed about the same	33.5 (181)	17.9
Somewhat less	2.6 (14)	3.0
Much less	1.1 (6)	0.3

Over three-quarters (78.5%) of nursing survey respondents indicate that the skill required to do their jobs has increased over the last five years. Skill increases are evident, but slightly less common in engineering, with 62.7% reporting that skill requirements have grown.

On the surface these findings are contradictory. Professionals report that the skills they have are under-utilized, yet they report skill requirements are increasing. We have also seen that

the majority of practising professionals in engineering and nursing undertake regular skill upgrading. How do we reconcile these findings? The qualitative interview data suggest that – especially amongst nurses – skill demands are changing.

We moved from hundred per cent patient care to a lot of work around administration, regulation, documentation as opposed to a lot of that hands-on care. So that is the latest change that I've seen happen. Nurses are pulled away to do a lot of other work and as a result, they are not spending enough time with the patients and their families. (S01)

It's become definitely more of people management than illness management. Or you are not so much dealing with, I mean when you are dealing with patients who are really sick you are obviously dealing with that, but there is more what they call "red tape" now. You can't just now give care, you have to sometimes jump through a lot of hoops just to be able to give the care that the patient needs. So I think there is a lot of frustration. (S06)

These registered nurses report less time spent at the bed-side exercising traditional nursing skills, and more engagement in management activities, and dealing with bureaucracy. This requires new skills from nurses. Registered nurses are somewhat ambivalent about these changes. While new skills are gained, some express a sense of loss at having to spend less time at the bed-side engaging in what were traditionally regarded as core nursing duties. Some also question whether the changes actually reduce nurses' ability to exercise judgement and their core skills fully.

I feel like there has been a shift to have less hands-on and more organizational roles. [...] I worry in some ways that people are trying to be too prescriptive and not actually letting people think and make decisions based on their assessment, which is a hugely important role for nurses, our ability to assess a situation and make the right choice for that time and that situation. And that you can't, there's more protocols and rules and trying to put everything in a box and I don't believe you can. I think some of that individual assessment is really important. And believing that the skill is there, I think the risk averseness here, now applied to nurses, is making that change in some ways. (S04)

People are doing way more things. People have more responsibilities than they should. It's not only about, you know, giving medication and doing your assessments and providing high quality care anymore. It's about, you know, [things like] did you identify them for their discharge status. So now you're taking on the role of almost like a utilization co-ordinator. You are not just asking people about their best possible medication history. Now you are taking on roles that might be more specific for like a pharmacist. A lot of things are getting dumped on nursing, and they may be not the right people to do it or they don't have maybe enough time dedicated to do those things the

way they should be done.[...] And, it's changed with technology, so there's way more technology which people have to be responsible for knowing. And they have to be really tech-savvy, and if you're not, you're kind of thrown onto the curb, kind of lost in your work. (S03)

The breadth of nurses' roles have clearly expanded, even though the time they devote to traditional or core nursing tasks may have declined.

Although these themes are less strong in our interviews with engineers, there is still evidence of new skills being gained. Our respondents talk about the need for more soft skills and managerial skills. Consider these comments from Julian:

[Engineers] wind up getting jobs that require different skills. Uh. I am having to stretch my skills in interpersonal relations and communications and database work which ... was not part of ... of my core training.

Similarly, Lisa argues that soft skills are expanding:

But it's the soft skills that they don't really teach you in engineering education, because that's not really core, um, but I think it's really key to success. Right? So, great you can design a great solution, and um you can fix the problem, but if you don't know how to present it? And get approval to proceed ... it's not good, right?

There is evidence that engineers are increasingly being employed to do non-engineering work in Ontario (OSPE 2015), and this trend may be driving skill change for professional engineers.

Thus, many report they cannot use their skills fully, and yet they must constantly learn new skills, ones that appear less core (at least to them) to engineering as a discipline and profession.

Discussion

Professionals are experts who possess considerable knowledge and skill, which they apply at work to solve complex problems. Recently, professional engineers and registered nurses in Ontario report experiencing workplace change affecting their skills and knowledge.

Increasing workloads affect their skill acquisition activities, and appear to have an impact on the

kinds of skills utilized as well. There is evidence that organizational rationalization may be leading to a routinization of professional skills. Engineers in particular report in interviews that new engineers are not having the opportunity to acquire deep knowledge and fully exercise their skills on the job. Mentorship appears to be declining in both professions. Moreover, in surveys and interviews, many engineers and nurses report that they do not have opportunities to fully exercise their knowledge and skills on the job. A majority do not have opportunities demonstrate their complex knowledge, and many do not have the opportunity to make key decisions. At the same time, the vast majority of nurses and two-thirds of engineers say the skills required to do their jobs have increased. Moreover, our survey data show professionals are constantly upgrading their skills through formal and informal professional development activities. Most professional engineers and registered nurses report utilizing considerable skill and knowledge on the job.

How do we reconcile these findings, which suggest simultaneous skill-upgrading and possible knowledge degradation? One might simply conclude that professional skills are changing, and as some old skills are lost, they are replaced by new skills. Indeed, there is evidence to support this conclusion in the data: if there is less use for some core technical skills, especially in engineering, the demand for managerial and soft skills appears to be increasing in both professions. These findings are consistent with the literature on hybrid professionalism, which suggests a blurring of professional and managerial knowledge and roles (Noordegraaf 2007, 2015; Waring and Currie 2009). Managerial concerns and roles are increasingly combined with professional roles to create new hybrid forms (Noordegraaf 2007; Waring and Currie; McGivern et al. 2015). Most recently, this is resulting in an incorporation of managerial goals and logics into professionals' own work (Noordegraaf 2015; Waring and Currie 2009).

However, these developments have potentially profound implications for professions. Traditionally, professional power has been linked with professions' control over access to a body of knowledge and skills (Abbott 1988), and the generation of new knowledge and innovation – even if professions could never control how that knowledge was applied in the workplace (Freidson 1986). However, recent workplace change appears to be altering professionals' knowledge acquisition, encouraging knowledge of immediate use to employing organizations (knowledge acquired when and as needed), and the acquisition of managerial and organizational skills. As a result, professions' control over new knowledge acquisition may be weakening, while organizations' influence is increasing. This has implications for professional autonomy: if professional practice becomes less reliant on professional knowledge “then claims to professional jurisdiction and autonomy may be undermined” (Waring and Currie 2009: 758). Previous research has shown that professionals do not accept these changes without challenge. Rather they resist encroachments on their knowledge and autonomy in the workplace (Waring and Currie 2009); hybrid professionalism is contested (Sawchuk 2017). Nevertheless, to the extent that managerial knowledge and expertise “is drawn downwards into professional practice” (Waring and Currie 2009: 774), professional knowledge and skills are altered.

Our respondents hint that these alterations may reduce professionals' ability to think, to exercise judgement, to acquire deep knowledge, and to reflect on what they learn. Winch (2014: 56) argues that a distinguishing feature of professional knowledge is the development of “a civic awareness and know-how that encompass an understanding of the impact of the occupation” on others and society more generally. It may be precisely this big-picture thinking – the ability to look beyond the organization to think about the societal implications of one's actions -- that may be endangered by these changes. Thus, professionals' ability to fulfill fiduciary roles may also

be undermined with workplace change. Future research should continue to investigate workplace change and its impact on professional skills and knowledge, as well as professionals' efforts to resist these changes, which would appear to strike at the very heart of professions and their work. Organizational encroachments into professional knowledge and skills acquisition may undermine professions' ability to shape their own work in the future.

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