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Knowledge ‘transfer’ as sociocultural and sociomaterial practice: Immigrants expanding engineering practices in Canada

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Abstract

Research on migration and knowledge transfer predominantly focuses on expatriate and return migrants, who are acclaimed for transferring knowledge from the west to the rest of the world. Not only does the literature reinforce the west as the epistemic centre, but it conjures a realist image of knowledge as an objective thing. To interrupt these images, this paper examines the knowledge transfer experiences of 22 immigrant engineers in Canada. Theoretically, it posits knowledge transfer as an effect of immigrants’ enrolment in sociocultural and sociomaterial practices within professions. Empirically, it pinpoints three ways in which immigrants help expand engineering practices, i.e., assembling knowledge, mobilizing the capacity of learning to learn, and negotiating being and becoming. The process of transfer, as accounted by research respondents, is enabled through access to epistemic and boundary objects, reception of peer professionals, and the rise of (niche) needs. The paper draws on a narrative case study.

Keywords: Immigrant studies; knowledge ‘transfer’; practice turn; sociocultural theories; sociomaterial theories

Introduction

Migrants, by virtue of their corporeal mobility, have been celebrated as boundary spanners (Williams & Baláž, 2008), and knowledge spillover agents (Tripl & Maier, 2010). Managerial and organisational studies, for instance, have documented how expatriate elites – often deployed by transnational corporations – help forge social, cultural, and knowledge networks through intra-company movements (e.g., Beaverstock, 2002; Haas, 2006). Migrant and development studies have also highlighted the crucial roles that return migrants play in knowledge transfer, technological innovation, and economic development in their home countries (e.g., Newland & Plaza, 2013; Zhou & Hsu, 2011). Some also point to the strategic position that they occupy in the diffusion of



social and cultural capital, i.e., non-monetary forms of social remittance from developed to developing countries (Conway, Potter & St. Bernard, 2012).

In contrast, there is relatively little research on the roles that immigrants play in knowledge transfer in the west. Research on immigrants is largely drawn to the systematic marginalisation immigrants experience in the host societies. Related work is instrumental in highlighting issues such as a lack of qualification recognition, cultural distinction, racism, sexism, xenophobia, as well as how immigrants learn to negotiate the identity politics in the labour market (e.g., Maitra & Guo, 2019; Morrice, Shan & Sprung, 2018). Yet, the lack of attention to immigrants as knowledge transfer agents is problematic. In particular, it serves to entrench the image of the west as the epistemic centre of the world, where universal and authoritative knowledge emanates.

In view of these issues, this paper examines the experiences of knowledge transfer narrated by 22 immigrant engineers in Canada. In what follows, I review the existing literature of knowledge transfer as it intersects the context of migration. The review points to the prevalence of realism, which treats knowledge as an objective thing. Departing from this dominant trend, I propose a practice-based and process-oriented view of knowledge transfer. Following the conceptual section, I introduce the study, including the research methods and research respondents before I focus on the research findings. I conclude with a discussion of the theoretical and practical implications of this paper.

Knowledge transfer and migration

Research on knowledge transfer largely evokes a sense of realism, conjuring the image of unidirectional movements of a real ‘substance that can be ‘sent’, ‘received’, ‘circulated’, ‘transferred’, ‘accumulated’, ‘converted’, and ‘stored’ (Gherardi & Nicolini, 2000, p. 329-330)’. In migrant and development studies, knowledge transfer – along with its variants such as human capital transfer, and technology transfer – is taken as an effect of migratory movement from the west to the rest of the world (e.g., Newland & Plaza, 2013; Trippl & Maier, 2010). In organisational studies, models of transfer have been built at multiple levels, e.g., the individual, the intra-organisational, the inter-organisational, and the transnational, to identify the factors, processes, resources, media, and conditions involved in the diffusion of knowledge from one place to another (e.g., Duan, Xu & Feng, 2011). In adult education, questions of transfer focus on *what* is being transferred in relation to both the context of origin and the context of application (Ottoson, 2009), as well as ‘the learning process involved when a person learns to use previously acquired knowledge ...in a new situation (Eraut, 2019, p.13)’.

Efforts to identify *what* is being transferred have led to the construction of various typologies of knowledge. In organisational studies, for instance, Blackler (1995) identified five images of knowledge commonly used in the literature: embrained, embodied, embedded, encultured, and encoded knowledge. Embrained knowledge is used to designate conceptual skills and cognitive abilities. Embodied knowledge refers to knowledge acquired through embodied experience. Embedded knowledge refers to knowledge embedded within social, systematic, and institutional arrangements. Encultured knowledge has to do with shared meanings within cultural systems that are perpetuated through socialisation, and acculturation. Encoded knowledge is understood as information encoded in signs and symbols. This typology has become the basis for Williams to address systematically the relationship between migration and knowledge transfer (Williams, 2006, 2007a, 2007b; Williams & Baláž, 2008).

According to Williams (2006), encoded knowledge is the most mobile form of knowledge. Embodied and embodied knowledge, encapsulated within individuals, is also transferrable through corporeal migratory movement. Encultured knowledge and embedded knowledge however are transferrable only in 'truncated' forms as they are socially situated. With this approach to knowledge, Williams (2007b; Williams & Baláž, 2008) further developed a multi-level (national, regional and firm-level) perspective on migration and knowledge transfer to identify the conditions of transfer. He argued that barriers to knowledge transfer exist at all structural levels. At the firm level, for instance, there may or may not be systematic strategies to leverage the distinct knowledge that migrants bring. Workplace barriers faced by migrants may also include how they are perceived by other workers, whether their knowledge is compatible with the local context, as well as their level of language competency, which affects whether their knowledge would be recognised and valued (Williams, 2007a).

The links that Williams made between migration and types of knowledge are corroborated by Burgers and Touburg's (2013) study of Indian IT professionals working in the Netherlands through intra-company transfers. This study distinguishes between codified and tacit knowledge. According to the authors, the former seems to be moving relatively easily across place, and the latter needs to be developed through immersion within different cultural contexts. However, Williams' conceptualisation can also be challenged. For instance, in a study of Mexican construction workers in the US, Iskander and Lowe (2011) referred to Polanyi's original work where tacit knowledge is considered a relational construct. They argued that knowledge, specifically tacit knowledge, is not acquired through accretion. Rather, each time the Mexican workers invoke their tacit knowledge in new workplaces, they also make new cognitive connections and hence transform, rather than merely transfer that knowledge. Iskander and Lowe's work reminds us of Blackler's original criticism of the realist approach to knowledge, namely, knowledge could not be 'sensibly conceived as separate' things (Blackler, 1995, p. 1032).

Knowledge transfer as sociocultural and sociomaterial practice: Conceptual heuristic

To Blackler (1995), focusing on distinct types of knowledge works to fragment knowing. He proposed instead that knowledge should be studied as a process that is mediated, situated, provisional, pragmatic and contested. This process-oriented perspective is echoed by Gherardi's knowing in practice (Gherardi, 2008; Gherardi & Nicolini, 2000), which frames knowledge as something that people *do together*. This paper aligns with the process-oriented and practice-based perspectives. It proposes that knowledge transfer is much more than about individuals moving knowledge across context. Informed by what Schatzki (2001) calls the practice turn, it sees knowledge transfer as an accomplished effect within practices. When considering immigrants as knowledge transfer agents, it is not sufficient to understand what they introduce to their new workplaces. It is rather imperative to focus on how they become enrolled in and become contributing members within expansive work practices.

Of note, within this practice turn, there are diverse constructs of practice, ranging from the sociocultural to the sociomaterial (Fenwick, Edwards & Sawchuk, 2011). What these constructs have in common though is a trend to challenge the traditional social approaches that dichotomise the social world into the individual versus the structural, the subjective versus the objective, and in some cases, the human versus the non-human beings (Schatzki, 2002). Instead, they project the world in the image of 'organized

bundles of human activities (ibid. p. 59)', and it is in the *relational* constitution of these bundles that we appreciate the saying, knowing, doing and being of the constituents of practices (ibid.).

A sociocultural and sociomaterial heuristic for practice

Community of practice (CofP) and cultural historical activity theory (CHAT) are two major theoretical constructs used to account for the social and the cultural relations that organise our experiences of learning and knowing. CofP refers to a group of people who share ideas, look for solutions, and perhaps experiment with innovation as they engage in a common domain of knowledge (Wenger, McDermott & Snyder, 2002). From the perspective of CofP, learning takes place as a dual process of participation and identification, as people move through legitimate periphery to become old-timers (Wenger, 1998). While CofP addresses people's learning experiences in relation to their membership within CofP, it does not attend to the power differences that may impact individuals' access to CofP (Hodkinson & Hodkinson, 2004). Further, with its sole emphasis on the cultural conditioning of learning, it may have occluded the political and economic relations that shape CofPs. In these respects, Engeström's (2001) CHAT well extends the illustrative power of CofP.

CHAT focuses on the interrelations and interactions among individual subjects, objects, and mediators of learning, in relation to the rules, community, and division of labour (Engeström, 2001). Its attention to division of labour also necessarily embeds activity within the political economy of production, consumption, and distribution. The object around which an activity pivots is more than a personal objective or motive. It is rather related to the social concern that focuses our attention, engages our efforts, and generates individual and collective actions and interactions (Engeström, 2001; Fenwick, Edwards & Sawchuk, 2011). An object of an activity is not fixed and may shift as the activity expands. In fact, when an 'objective or motive is reconceptualised to embrace a radically wider horizon of possibilities', Engeström (2001, p. 137) would consider that the activity experiences an expansive transformation. When considering immigrants' roles in knowledge transfer, expansive practices are used broadly to refer to any changes and transformation of existing routine practices.

Both CofP and CHAT approach practices as activities that are purposeful, ordered and regularised (Fenwick & Nerland, 2014). If we zoom in to practice as it is produced from moment to moment, sociomaterial approaches help us see more of the provisional and emergent nature of practices. Deleuze and Guattari's (1987) assemblage, for instance, sees the social systems as 'wholes whose properties emerge from the interactions between the (heterogeneous) parts (DeLanda in Tamboukou, 2010, p. 685)'. In this view, there is no pre-determined or inherent hierarchy to the constituents of an assemblage, nor is there a unifying principle of organisation that can be taken as a superior ontological given (Deleuze & Guattari, 1987). All constituents are in a continuous process of becoming; as they are enrolled into different assemblages, they may exhibit different properties (Müller, 2015). This continuous process of becoming and assembling can be captured using the image of a rhizome. Unlike the traditional arborescent way of thinking that insists on hierarchy and prior rationalism, a rhizome is about continuous reticulation among multiple nodes of connectivity and it flattens the ontological status of all entities constituting the world (Deleuze & Guattari, 1987). Of note, neither assemblage nor rhizome implies that the world is indeed flat. There is no denying that social hierarchies and strata exist. However, they highlight hierarchies are 'not the result of the (constitutive) substances and their nature and value, but of the modes of organisation of

disparate substances (Grosz, 1994, p. 167)'. Looking into the formation of assemblage as a rhizomatic process can help unveil these modes of organisation without reducing organisational issues to individual failings.

Knowledge transfer: Unfolding with non-human objects

Whether constructed through sociocultural or sociomaterial perspectives, social practices are interspersed with cultural artifacts and other non-human things. In CofP and activity theories, it is believed that cultural artifacts, i.e., language, texts, tools, and technologies, congeal a collective consciousness, and mediate the process of learning and knowing. In sociomaterial research, some researchers have gone a step further; they see non-human things as more than cultural mediators. Instead, they conceive them as actors agentic in shaping how the world hangs together (Fenwick, Edwards, & Sawchuk, 2011). Star's boundary objects (2010) and Knorr Cetina's conception of epistemic objects (2001) are two illustrating examples. Star (2010) used the notion of boundary objects when she tried to uncover how cooperation is achieved despite the absence of consensus at work. A boundary object is 'something people (or, in computer science, other objects and programs) act toward and with. Its materiality derives from action, not from a sense of prefabricated stuff or 'thing'-ness. (ibid., p. 603)'. Boundary objects are known for their interpretive flexibility which arises organically in response to the requirement for information and work (ibid.).

Knorr Cetina (2001) was interested in what, other than norms and routine procedures, makes creative work an exciting engagement for scientists. She turned to the relations between subjects and objects, highlighting the role and identity of what she called 'epistemic objects', that is, objects scientists try to study and understand, in the accomplishment of knowledge work. Epistemic objects are, according to Knorr Cetina (2001), 'processes and projections rather than definitive things (p. 190)'. They exist in their incompleteness and acquire their identities as they appear in relation to interpretive human beings. Boundary and epistemic objects are not necessarily distinct entities. Indeed, they could be used to refer to the same thing, depending on where it is positioned within the organisation of work. Both notions though require us to focus on how objects enter, relationally, organised activities.

In sum, knowledge transfer, I submit, is a continuous process of accomplishment through which knowing, doing, saying, and being continuously unfold within practice. This approach is informed by sociocultural images such as CofP and CHAT, as much as it is sensitive to the coming together of the social and the material in the in-situ production of practices. To explore immigrant engineers' knowledge transfer experiences, attention is hence directed to how individuals enroll themselves and/or get enrolled into work practices, as well as the sociocultural and sociomaterial relations, established and emergent, that are conducive to the expansion of practices.

Research methods and respondents

This paper is based on a narrative case study (Wells, 2011) that examines immigrant engineers' knowledge transfer practices in Canada. It addresses two research questions: 1) *how do immigrant engineers contribute to the transfer and transformation of knowledge and practices in the engineering profession?* and 2) *what social practices facilitate immigrants' professional learning and knowledge transfer processes?* For the study, narrative interviews were conducted with 22 respondents, each treated as an

independent case for comparative purpose. Narrative is suited for the study as it involves the collection of stories or narration of events (Grbich, 2012). Narrative is powerful not because it offers accurate account of life events, but because it entails (re)construction of these events, with a point of view of the now, and with an eye for the future (Bamberg, 2012). In this process of reconstruction, individuals necessarily take up agentic positions, accessing, and assessing life events, and formulating meaning and identities, which may move them beyond normalised and stereotypical social locations (Hallqvist, 2014). More importantly, narrative research is not only about how individuals make sense of past events, but it is also revealing of the social, cultural and material contexts shaping individuals' experiences (Grbich, 2012).

For the interviews, respondents were asked to recount their educational, professional and migratory trajectories, and describe in-depth small stories and/or large events where they made a difference in engineering practices in Canada. During the interviews, they were prompted to think about the technologies, texts, communities, and other resources involved in the production of their opportunities and professional spaces. The interviews lasted on average 1.5 hours, with the shortest one being one hour, and the longest one four hours (over two interviews). All interviews were transcribed verbatim, and sent back to the respondents for member check. Data analysis focused on the knowledge transfer stories and events narrated, each treated as a case, in relation to respondents' professional and migratory trajectories. Attention is paid in particular to the process and conditions of knowledge transfer. Themes emerging from each case were compared along two major lines of differences: 1) gender, and 2) whether immigrants came from the developed west or the developing world.

Respondents were recruited through posting in an engineering association, and approaching engineering companies and communities in British Columbia (BC). At the time of the study, majority of the respondents were based in Alberta, and BC in West Canada, three in Yukon in North Canada, and one in Ontario in East Canada. Among the 22 respondents, nine were female and 13 male. Eight came from Europe (four from West Europe and four East Europe), six from Asia, four from Central and South America, two from Africa, and two from the Oceania (Australia and Fiji respectively). All respondents held a bachelor's degree or above in an engineering field prior to immigration. Ten came to Canada as skilled immigrants. The rest came as temporary visitors (four on work holiday visa, and one regular visitor visa), sponsored family members (three), temporary immigrant with company sponsored work permit (two), students (one), and refugees (one). The majority landed in Canada after 2000, with the exception of one who came in 1983, and another one in 1997. All immigrants worked in the engineering field prior to moving to Canada with the exception of two who were under/graduate students. All had worked in Canada as an engineer for a minimum of six months at the time of the interviews. Appendix 1 shows the specific demographic information of each respondent.

Knowledge transfer as sociocultural and sociomaterial practice: Research findings

Each respondent shared at least one story or event where s/he helped bring changes to their work in Canada. The analysis below focuses on these events of transfer as they were narrated by the respondents. It starts by looking at how, in these accounts, research respondents have contributed to the expansion of engineering practices in Canada. It moves on to explore the sociocultural and sociomaterial relations that are constitutive of the knowledge transfer practices.

Knowledge transfer as continuous knowing, doing, and being

Respondents' accounts of their knowledge transfer experiences point to three interconnected ways through which they have brought about changes to their respective workplaces in Canada: assembling knowledge, mobilizing capacity of learning to learn, and negotiating being and becoming.

Assembling Knowledge

A number of respondents reported that they introduced standardised, research-based, and codified knowledge, or what Williams (2006) called encoded knowledge, to their work in Canada. For instance, Tabor from Czech Republic learned European codes at school, and worked in countries such as Germany, the UK, Australia, and New Zealand before he moved to Canada to join his partner's family. He shared:

In many occasions... we use in our designs... codes from somewhere else... Say you're doing some...specific design ... which is not covered in your Canadian codes or...standard... so you search, and someone has done some research somewhere ...and ... it might be [seismic design] in New Zealand. So I just grab that from New Zealand and use that in Canada because that's the best that you have... I see a lot of timber design ... knowledge ... coming from Europe... Canada is what, 100 years old? Europe is tens of centuries of structures. And the science and the research is way advanced beyond Canada (Tabor).

Tabor's experiences of 'grapping' research and codes from other places, and plugging them into work in Canada typifies a major narrative of knowledge transfer shared by those who have had educational and work experiences in western countries. What he shared is also a sentiment that engineering sciences and practices in other western countries such as Australia, New Zealand, and the US are more advanced than in Canada. That said, not everyone would agree that the west is the only place where people could find useful design knowledge. Lestari from Indonesia shared '[D]esign innovation in Asia is much more advanced than... [in Canada]... What we learned in Indonesia, ... there was a lot of design that is more advanced'.

Of note, in addition to scientific and codified knowledge particular to a field, some respondents also shared that their empirical work experiences proved to be of value. Jagan from Nepal for instance shared:

Geotechnical work, survey work, in Canada, ...is done by different sections...[W]hen you work ...[in] a developing country, you do [everything – across sections]. [Now], when I [am]... leading a multi-disciplinary team, I [am] able to understand not only my area of service, i.e., civil engineer transportation, but I also [bring with me] an environmental perspective, [sensitive to] the challenges related to cost, or foundation or some of other [nuanced], technical [issues] (Jagan).

In the study, a few respondents, like Jagan, worked in countries where division of labour is not detailed due to limited resources. While working in Canada, they shared, they introduced not only a comparative lens, (see also Williams & Baláž, 2008) but environmental perspectives as they make conscious and cognitive connections with the new context of work (see also Iskander & Lowe, 2011).

Mobilizing the capacity of learning to learn

When using languages such as ‘assembling’ or ‘plugging in’, by no means do I suggest that knowledge transfer is a technical process that is friction free. Instead, if any of the cases of transfer that the respondents shared appears to be uneventful, it is because they have always mobilised their capacity of learning. All respondents, with no exception, prided themselves on their capacity of learning, which many attributed to their educational experiences from their home countries. Indeed, it is often their capacity of learning that served to lubricate the process of transfer.

Below, Lestari from Indonesia related how she helped expand her company’s business to roundabout design.

No one in our company can design [roundabout], at the time when I started... because I know design, I started that and because I experienced that in Indonesia - there’s lots of roundabouts there... I know how it works... [interviewer: how did you start the design?] I had to learn especially ... Canadian based standards... every municipality ha[s] different bylaws...as a transportation engineer, I had to know... bylaws, development staging... for each development, each land use... .. self-learned..., I went into training for software and ... [learned] to analyse ...[using] a certain sort of software that’s been developed in Australia and New Zealand (Lestari).

According to Lestari, roundabout design was not a common design in Vancouver when she came to Canada. She had never designed a roundabout prior to coming to Canada either. Yet, she helped her company expand into this area of business. In this process, her design training reticulated rhizomatically with her empirical experiences with roundabout in Indonesia, as well as knowledge of local policies and regulations in Canada, what Williams (2007b) calls embedded knowledge, as she developed facility in the use of a particular software developed out of Canada. Continuous learning served to fuse all these different kinds of knowing as she worked towards roundabout design.

Negotiating being and becoming

Knowledge transfer is not merely about knowing and doing. To a great extent, it is also about bringing the self to bear in a new place. This theme is most evident in interviews with women, and immigrants from developing contexts, who suggested that they contributed to their work in Canada with not only what they know, but also professional habitus such as adaptability, work ethics, and cognitive disposition as engineers. Quinn from Fiji for instance related that because he used to work in rural areas, he learned to communicate with impoverished and isolated communities beyond written literacy, which turned out to be an asset when he worked with the indigenous community up in the North in Canada. Klara from Mexico also shared that coming from an engineering background, she has a structured disposition. With this background, she was able to introduce structure across department to the sales people.

Of note, while some related their professional habitus and dispositions as ‘the essence of engineers’ (in the language of Ren from Taiwan), that structured their participation in Canadian workplaces, some respondents stressed that they’ve also experienced a process of what some would call ‘growing’ or becoming. Fiona from Venezuela said:

I have grown [...]. If you talk[ed] to me four years ago ... maybe I was not this outgoing [...] Different fears that I’ve overcome over these years [...] Fears of my accent, fears of not being that technical, fears of not being that grey hair [...] And now I feel more relaxed. Now I talk and I think, well if they want to hear [me], fine, if not, bad on them, not on me.

I put my idea forward. If somebody wants to listen [...] great [...] If not, maybe next time. I'm more easy-going now... I guess time helps (Fiona).

Fiona apparently grew from someone who strove to be heard to someone who was confident and secure. In this process, she also developed personal mechanisms to deal with workplace politics associated with language differences, and prejudices against the young, and the new, while finding ways to voice herself.

Sociocultural and sociomaterial organisation of transfer

How immigrants bring forth their knowing, doing, and being only partially accounts for how knowledge transfer may transpire at work. Respondents' accounts also shed light on the sociocultural and sociomaterial relations that are crucial in shaping whether and how the respondents were enrolled within expansive work practices. These include access to epistemic and boundary objects, receptivity of professional community, and the rise of (niche) needs at work.

Unfolding with epistemic and boundary objects

Non-human things, including the *things* worked on, i.e., epistemic objects (Knorr Cetina 2001), and *things* to work with, i.e., boundary objects (Star, 2010) are ever present in all cases of transfer shared. These objects include, but are not limited to, engineering design, blueprints, engineering codes, protocols and manuals, researcher papers, textbooks, machinery equipment, and computer software.

Few respondents in the study located a job that matched exactly with what they did back in their home countries. Epistemic and boundary objects sometimes served as an important means for them to identify points of entry to engineering practices in Canada. For instance, Dennis from Kenya said:

I joined the company as the person who develops the algorithms for the software because this software company produced engineering software [...] I need to test the software to make sure there were no bugs ... this software that they were producing I had used [...] in Africa (Dennis).

In this particular case, Dennis' familiarity with the software, as a user, excited the employer and enabled him to 'plug into' a work process organised around the same software, now an epistemic object (Knorr Cetina, 2001) that needs to be continuously developed.

Wade, who had prior work experience as a contractor in Australia, worked for a principal in Canada at the time of the interview. He shared that when he worked as a contractor, he would 'pull through the drawings and the specifications [to]...find things that have changed from the tender..., cost them up, and say, 'This is how much it's going to cost,' put in a claim'. While working for the principal in Canada, he would 'identify some of those things in advance ...pre-empt the changes, try and minimise them, and also be able to see through a little bit of the smokescreens they throw'. In this case, engineering drawings and specifications have served as the boundary objects (Star, 2010) that enabled Wade to cross boundaries of work with confidence. This case also suggests that there is a degree of interpretive flexibility (Star, 2010) to these documents, depending on the economic interests of the subjects/readers and the positions they hold in the organisation of the work process.

In the two cases shared above, objects such as software and engineering drawings helped articulate the respondents to particular work processes, where their prior knowledge and experiences were leveraged but repurposed. In the account shared by Oscar from Ecuador, he also transformed the nature (being) of the object that he worked on.

I am a hands-on engineer actually. I was in very technical jobs so I got that experience... I started [in a] company [in Canada that] manufactures electronic devices. I was able to easily understand that kind of devices to repair those devices at components levels... [T]hat was helpful for the company because they used to ... replace the whole controller if something failed (Oscar).

While the whole device would be treated as a defect when things went wrong, Oscar transformed the materiality of the device by scaling down problems to the component level, which constituted a significant change to the practices at work.

Reception of peer professionals

If it takes the coming together of people and objects for immigrants to expand knowing and doing at work, it takes open reception of peer professionals for at least some of the immigrants to be enrolled in expansive work activities in the first place. The majority of respondents mentioned at least one professional peer who trusted them, mentored them, involved them, and/or sponsored them, which made it possible for them to aspire for, and take up expanded roles and responsibilities at work. Karla from Mexico for instance related that her former manager not only listened to her, but also involved her fully in the work process. She said: 'From day one,... my manager [...] always told me, 'No, no, we're a team. You and me.' So everything he did, he involved me.' Given the generous induction of the manager, Karla grew quickly within the organisation to a managerial position.

Gena was a mechanical engineer from Iran. She entered a geology company in Vancouver as a draftsperson but she became the technical backbone of the company within a year. She attributed her success to the trust of a supervisor. She said:

[My supervisor] was [...the] designated person... responsible for quality control... Although I wasn't a geologist or a mining engineer, he would sign off on my work because he would trust my data. He checked me at the beginning a few times ... he knew that he could trust me (Gena).

When Gena volunteered to develop a geological model, the turning point of her career, most of her colleagues were in doubt. She said,

My supervisor however was willing to take that risk on me...he gave me one month time and said, go home and even work at home and see what you can do. I went home and in one month I build the model and came back and said here's the model, and they were all flabbergasted (Gena).

Rise and recognition of (niche) needs

It should be noted that reception of professional peers alone does not warrant opportunities for immigrants. Where the respondents reported a significant contribution, there was often a particular and sometimes unique need at work that engaged their efforts, and generated individual and collective actions and interactions (Engeström, 2001). In the case of Gena, her opportunity to shine was in part because of a problem arising at work:

They had a big problem technically speaking [...] In mining, you need to build and model around your deposit and then use [a particular] mathematical method to estimate your resources. If you can't do that then you don't know how much gold or iron or whatever you have there underground. So in order to go fundraise or finance your project, or drill further [...] the first and foremost critical thing is to have your math ready [...] They didn't have that (Gena).

We know the rest of the story – Gena rose to the occasion and built the model within a month. The whole event of knowledge transfer, as recounted by Gena, was occasioned by a business exigency: the company had to choose between paying a hefty fee to an external consultant and taking a chance on Gena. It went with Gena.

A number of other respondents also related stories where they stumbled upon a niche market, which allowed them to expand their scope of work or professional responsibilities. In most of the cases, though, the onus of identifying (niche) needs was on the respondents. There are however also instances where workplace professionals also shared the responsibility of identification. Karla was trained in the interdisciplinary area of Mechatronics, which Klara believed put her at a disadvantage as the job descriptions she came across were geared towards either mechanical or electronic engineering. She had to downplay her career goal and applied for a position as a sales representative. She however had a surprise encounter when she went for the interview. She shared:

[B]ut they saw my resume... and when I got there they said, 'We really don't see you as an outside sales person, but ... the person that we had in our electric automation department left and we need someone, to look after that and that ... matches your background.'

In this particular case, the recruiters identified Karla as suitable for a position not posted yet. They might not have done anything extraordinary. However, by making this connection, they certainly helped reverse the politics of job search, and enabled Karla to step into a position where she could better utilise her qualifications.

Discussion and conclusion

In contrast to all the limelight shed on expatriate and return migrants who are acclaimed for transmitting knowledge from the west to the rest of the world, immigrants living in the west are rarely addressed as agents of knowledge transfer. This asymmetrical literature, together with the dominant realist approach used in studies of migration and knowledge transfer, conjures the image of the west as the epistemic centre. It also serves to fragment knowing and leaves unaddressed the fluid and developing nature of knowing and knowledge. This paper endeavors to rectify this picture through an examination of immigrant engineers' narratives of their contribution to the expansion of engineering practices in Canada. Rather than producing a typology of unique knowledge that immigrants 'transfer', it focuses on how knowledge transfer transpires within practices.

Conceptually, this paper is informed by the practice turn (Schatzki, 2001). It sees knowledge transfer as a continuous process of unfolding within sociocultural and sociomaterial practices. Of note, the sociocultural and sociomaterial images of practice do not sit easily together. The former, exemplified by CHAT and CofP, focus more on the cultural, communal, political, and economic relations that are theoretically generative of opportunities for immigrants. The latter, particularly the image of assemblage and rhizomatic thinking are more apt at capturing the immediate formation of associations without deferring to rational priors. In doing so, it also defies ontological hierarchy attributed to different entities, including ways of knowing. What these sociocultural and

sociomaterial heuristics share in common, however, is a relational thinking. They all point to the direction that it is in the constitution of practices that issues of identity, knowing and learning should be approached (ibid.). When brought together, they help unveil both the organised and emergent property of knowledge practices.

Informed by the practice-based heuristic of knowledge transfer, I examined the knowledge transfer stories and events narrated by 22 immigrant engineers in Canada. These accounts of transfer point to three interconnected ways through which the respondents made their contributions, i.e., assembling knowledge, mobilizing the capacity of learning to learn, and negotiating being and becoming. It also shows some sociocultural and sociomaterial relations constituting the knowledge transfer events, including access to boundary and epistemic objects within professions, encounter with receptive peer professionals, as well as the rise of a (niche) need at work.

This paper has both theoretical and empirical implications for knowledge transfer in the context of migration. Theoretically, it challenges the traditional image associated with knowledge transfer, i.e., the transport of knowledge as a thing across place. It instead gives rise to some rather fluid images of transfer, such as assembling, reticulating, and enrolling within practices. These alternative images are important in that they help open our eyes to the multitude of actors involved in the constitution of knowledge-intensive events where different ways of knowing and doing become knotted. The new images of transfer do not necessarily dismiss social or organisational order or rational prior. For instance, by referring to CHAT, we come to see that actors – human and non-humans – are often mobilised around a social concern or a collective problem that demands attention, efforts, actions and interactions (Engeström, 2001). Yet, at the same time, they also remind us that social orders are not self-propagating. Rather, they exist in the organisation of practices, which is enacted from moment to moment. This process-orientation in our appreciation of knowledge transfer practices may help reveal multiple points of intervention and interruption.

What should be noted though is that the practice turn, with its focus on the relational constitution of practice, does not necessarily address relations of differences, which are nonetheless significant in shaping immigrants' experiences. For instance, a number of women, and a few men from less developed contexts hesitated to take up the position as knowledge transfer agents at the beginning of the interviews. They considered themselves, using the language of Ian from China more "in the learning mode". They were also more likely to share stories of wrestles around who they are, and how they should comport and communicate themselves. Olteanca from Romania related,

Unless we really are put in difficult situations, we are not inclined as human beings to make those kinds of efforts... Coming here I find I had to question every single action, belief and habit that I had ... I got to a point where I said 'Okay, wait a minute, I'm changing everything here, who am I' (Olteanca).

The kind of identity struggles that the respondents related are not merely about defining the self in a new context. It is more about negotiating the history in person. Individuals, carry with them a history etched with power disparities along relations of differences such as gender, race, and class. A conception of knowledge transfer solely based on the practice turn does not necessarily take into consideration the burden of history. To address this issue, further research is needed to critically investigate the relationships between identity, power and knowledge practices.

It needs to be mentioned, given the small number of respondents, this paper does not take into account of all that may have impacted respondents' capacity to participate in the expansion of professional practices. For instance, when recounting their

immigration trajectories, a few respondents from non-English speaking countries related making special efforts to enhance their English proficiency, including efforts at accent reduction. Yet, language differences do not figure significantly in their accounts of how they made a difference at work. As such, this paper does not address the relationship between language and knowledge transfer. For the same reason, this paper is not in a position to comment on the impacts of a range of other factors that might be relevant in immigrants' knowledge transfer experiences. These include but are not limited to countries of origin, immigration status, pathway of migration, specialized area of practices, years of prior experiences, and size of companies where they were employed. As well, the paper relies on immigrants' narratives and perceptions of their experiences. For a comprehensive understanding of immigrants' knowledge transfer practices, multiple voices and perspectives need to be engaged in future research.

Despite the limitations above, the paper has practical implications for professions, and workplace professionals working to integrate immigrants. First, not all respondents positioned themselves as knowledge transfer agents, although all of them had stories to tell where they helped expand professional practices. Immigrants' self-perception is often a reflection of how they have been received, perceived, and positioned in the public. It is as such imperative that professions turn a critical eye towards professional and public media and discourses. Inquiries need to be made as to who are typically positioned as the major contributors to the professions, and how these normative images should be questioned, interrupted, and pluralized. Second, while CofPs are supposedly conduits of practice-based knowing and learning, only about a third of the research respondents related that they tapped into professional associations and communities for issues others than licensing. Among them, only four played a proactive role in building professional networks for and with (immigrant) engineers. When they had questions or needed to solve particular problems, the majority of them resorted to textual materials, technical training programs, and the learning selves. Their lack of connection with professional organisations should not be taken to mean that professional CofPs do not matter in immigrants' professional practices. It however suggests that professional organisations should play a more proactive role in engaging immigrants within professional communities. Among others, open professional forums may help make knowledge objects accessible to all. Also, mentoring programs may also serve as a hospitable meeting point for immigrant newcomers and interested hosts.

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Table 1. Demographic information

Pseudonym	Place of origin	Gender	Age	Year of arrival in Canada	Immigration status upon arrival in Canada	Highest education
Anna	UK	F	41-45	2005	Temporary visa (work holiday)	Master
Caden	Columbia	M	31-35	2007	Student visa	Master
Dennis	Kenya	M	46-50	2005	Skilled immigrant	Master
Edvard	Hungary	M	56-60	1983	Refugee	Masters
Fiona	Venezuela	F	36-45	2009	Skilled immigrant	Bachelor
Gena	Iran	F	41-45	2002	Skilled immigrant	Bachelor
Hann	India	M	46-50	2002	Skilled immigrant	Bachelor
Ian	China	M	36-45	2004	Skilled immigrant	Bachelor
Jagan	Nepal	M	36-45	2001	Skilled immigrant	PhD
Karla	Mexico	F	26-35	2012	Temporary Visa (Visitor)	Bachelor
Lestari	Indonesia	F	26-35	2003	Family class	Bachelor
Mike	UK	M	46-50	2012	Work permit	Master
Nancy	Ireland	F	31-35	2012	Temporary visa (work holiday)	PhD
Oscar	Ecuador	M	36-40	2009	Skilled immigrant	Bachelor
Pablo	Czech	M	26-30	2013	Family class	Masters
Quinn	Fiji	M	36-40	2012	Family class	Bachelor
Ren	Taiwan	M	51-55	2000	Skilled immigrant	PhD
Olteanca	Romania	F	41-45	1997	Skilled immigrant	Master
Taylor	Czech Republic	M	36-40	2009	Temporary worker (work holiday)	Master
Usha	UK	F	41-45	2007	Work permit	Master
Victor	Nigeria	M	56-60	2001	Skilled immigrant	Bachelor
Wade	Australia	M	26-35	2014	Temporary visa (work holiday)	Bachelor