



PhDetectives: Revealing PhD Competencies and Employment Trends in Canada



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EXECUTIVE SUMMARY

PhDetectives: Revealing PhD Competencies and Employment Trends in Canada

Overview

In the context of an evolving PhD employment landscape, the present report aims to explore the value of the PhD in professional settings through a pool of competencies that bridges the skills developed during the doctorate and those searched for by employers.

Key Findings

- Using a competency framework containing over 100 skills, behaviors, and dispositions, we have identified a pool of competencies likely to be found in PhDs in Canada. This PhD competency pool includes 38 “core” competencies that can be found in PhDs irrespective of their profile, as well as complimentary competencies that are specific to aspects of the PhD profile (e.g., discipline, seniority, mode of financing the doctorate).
- In analyzing this pool of competencies from the perspectives of PhDs and employers together, we have uncovered points of convergence (e.g., core competencies such as scientific and technical expertise) and divergence (e.g., transferable competencies that can be formalized, behaviors, and dispositions) in the needs and expectations of employers and the competencies reportedly developed by PhDs.
- An examination of the profiles of PhD holders and the organizations that employ them have highlighted several areas of opportunity for future PhD employment, including positions in various sectors, in public and private institutions, as well as in roles focused on research and development (R&D) and outside of R&D.

How to use this report

The purpose of this report is to provide a tool to help PhDs, employers, and higher education stakeholders in identifying, understanding, and communicating skills based on a pool of competencies that are likely to be found in PhDs.

The structure of the report is as follows:

Chapter 1: Introduction

Chapter 2: Methodology

Chapter 3: PhD Competencies

Chapter 4: Competency alignment and PhD employment integration

Chapter 5: PhD Careers

Chapter 6: Conclusions and recommendations

How to cite this report

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Chapter 1. Introduction

1.1. Context: PhDs in Canada

1.1.1. Defining the PhD

In Canada, a doctorate of philosophy (PhD) represents the third tier in the hierarchy of postsecondary education, in that it is typically sought following the completion of a bachelor's and a master's degree, and includes the preparation of a dissertation based on extensive and original research contributions to one's field (EduCanada, 2019; Maldonado, Wiggers, & Arnold, 2013). According to the Council of Ministers of Education, Canada, "Holders of the doctoral degree must have demonstrated a high degree of intellectual autonomy, an ability to conceptualize, design, and implement projects for the generation of significant new knowledge and/or understanding, and an ability to create and interpret knowledge that extends the forefront of a discipline, usually through original research or creative activity" (2007). While minor variations in program requirements exist between fields and institutions, there are four components of PhD programs that are considered to be the norm across Canada: 1) courses; 2) a thesis/dissertation proposal; 3) a comprehensive exam; and 4) a thesis/dissertation with an oral defense (for a more detailed explanation of each of these components, see Rose, 2012). According to Rose (2012), most PhD programs are designed with the intention of completion in 4 years but can take up to 6 or 7 years in many cases. Furthermore, the time it takes to complete a PhD program often varies by discipline. For example, data from the 15 most research intensive universities in Canada showed the average time to complete a PhD to be between 5 and 6 years, with students in the social sciences and humanities taking, on average, a year longer than PhDs in sciences and engineering to complete their degree (Edge & Munro, 2015).

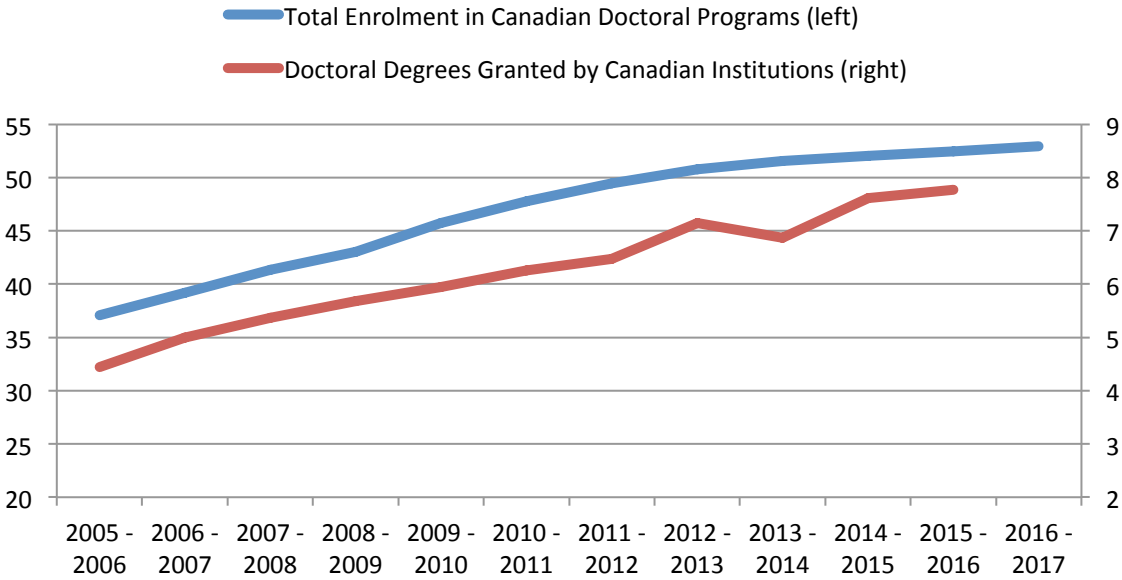
1.1.2. Trends and statistics

Canada has experienced significant growth in the number of PhDs held in the population (175,685 people aged 24-65 held doctoral degrees in 2016 as compared to 141,535 in 2006, Statistics Canada), as well as annual enrolments and degrees granted (Edge & Munro, 2015; Statistics Canada). In Canada, there are 36 PhD degree-granting universities, with just under 1%

of the population aged 24-65 holding PhDs (Statistics Canada). In the 2015/2016 academic year, there were 52,422 doctoral degree enrolments, with over 70% of enrolments occurring in the provinces of Ontario or Quebec (21,009 and 16,176, respectively; Statistics Canada). As depicted below in Figure 1, doctoral enrolment and degree granting in Canada have demonstrated consistent trends of growth between 2005 and 2016/17 (latest data available, Statistics Canada).

Figure 1

Doctoral Program Enrolments and Degrees Granted in Canada by Academic Year, 2005-2016
(number, 000s)



Sources: Statistics Canada, Table 37-10-0018-01 and Table 37-10-0020-01.

Also of note is the large proportion of international students that comprise Canada’s PhD population. In 2014, international students made up just over 21% of university doctorate degree graduates in Canada, showing an average annual growth rate of 18.6 per cent since 2006 (Canada’s Fundamental Science Review, 2017). This proportion of international students likely contributes to a high rate of migration seen following the completion of a PhD in Canada.

For example, reports tracking PhD graduates from universities in Quebec and Ontario reported that 34-36% of 2008/2009 PhDs were employed outside of Canada 5-6 years after graduation (Ontario: Jonker, 2016; Quebec: Trace, n.d.).

With respect to fields of study, the doctoral degree holders in Canada aged 25-64 in 2016 had completed their programs in: science and science technologies (35.6%); social and behavioral sciences (15.8%); engineering and engineering technologies (13.5%); arts and humanities (10.8%); health care (6.4%); mathematics and computer information sciences (5.7%); education and teaching (3.9%); business and administration (3.4%); legal professional studies (2.5%); trades, services, natural resources, and conservation (2.4%; Statistics Canada).

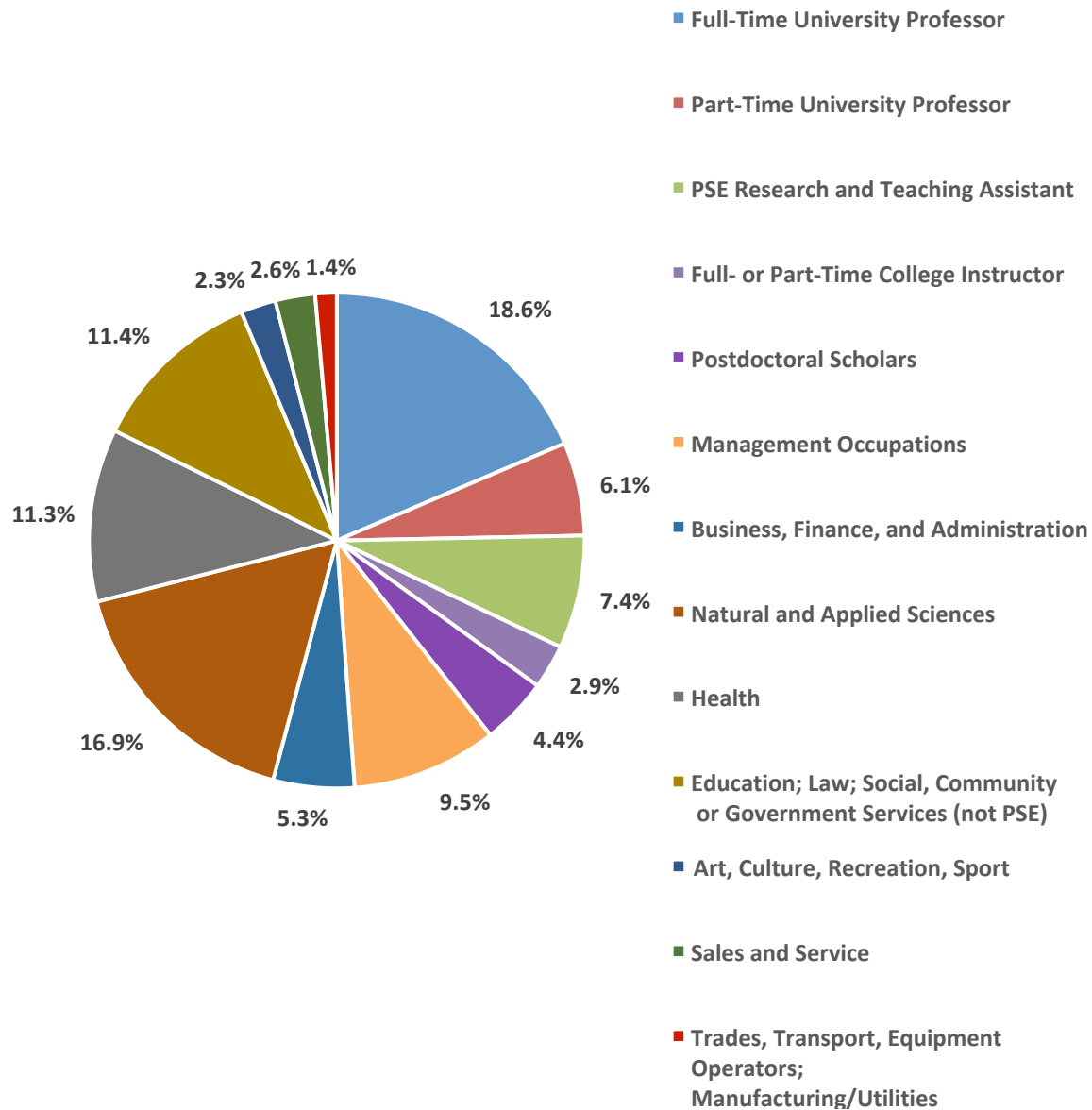
Taking a look now at the career intentions and actual employment of PhDs, numerous reports across Canada indicate misalignment between the two. For example, a 2015 Conference Board of Canada (CBC) report focused on preparing PhDs for careers in Canada indicated that 60% of those beginning a PhD program aspire to be a university professor but in reality, less than 20% of Canada's PhDs are employed as full-time university professors. Out of those with a PhD in Canada, roughly another 20% are employed in positions other than full-time professor in the postsecondary education sector (e.g., post-doctoral fellows, part-time lecturers, academic or student affairs, etc.), totaling approximately 40% of PhDs pursuing careers within academia, and leaving the remaining 60% of PhDs to find careers outside of academia (e.g., industry, government, and non-governmental organizations; see Figure 2).

As tenure-track professor positions continue to decline, the considerable number of PhDs searching for jobs outside of academia is likely to grow (Edge & Munro, 2015; Olson, 2016). There is no shortage of media attention regarding the employment trends of PhDs in Canada, with perspectives ranging from that of a "PhD crisis" acknowledging that only 2% of the jobs in the country require a PhD (e.g., Torunczyk Schein, 2019) to more optimistic views of PhDs having the potential to fuel growth in non-academic sectors (e.g., McIntyre, 2015). As less than

1% of the Canadian population holds a PhD, 2% of PhD positions indicates that the issue may not be the number of positions available to them (Chevrier, Lindsay, & Lafon, 2019).

Figure 2

Where are Canada's PhDs Employed?



Sources: Statistics Canada, National Household Survey, 2011; Canadian Association of Postdoctoral Scholars; The Conference Board of Canada (2015).

General themes across reports on the state of the employability of PhDs in Canada highlight a mismatch between perceptions of the purpose of PhD programs. Traditionally, the purpose of PhD programs was to train future professors. However, an influx in PhDs driven by increased access, financial resources, and cultural expectations of higher education attainment (to name a few), paired with changing labor market demands (e.g., industry growth, education budget cuts, non-renewal of academic positions instead filled by part-time lecturers) have altered the landscape of the PhD. In Canada, declining professorships (new posts and renewals) can be at least partially attributed to federal and provincial budget cuts in research and university funding. For example, major budget cuts in Quebec universities and colleges totaling a cost of \$106 million (an 8.6% decrease) in 2012-2013 deeply impacted the research sector, including hampering the hiring of professors in several universities (Ministère de l'Éducation, du Loisir et du Sport; MELS, 2011; Olson, 2016). In light of changing PhD employment opportunities, viewing the purpose of a PhD program as training advanced researchers through the process of research rather than solely for the purpose of research more accurately aligns with the career outcomes recently observed and coincides with the emerging perspectives advocated by leading organizations in Canada (e.g., Organization for Economic Cooperation and Development, OECD, 2005; CBC, Edge & Munro, 2015).

1.1.3. Have PhDs adapted to the job market?

The notion of success in the form of a tenure-track position following a PhD is no longer an adequate benchmark in judging PhDs' contributions to society; however, information pertaining to the types of jobs PhDs obtain, their preparedness for their positions, the extent to which they use their skills, and their job satisfaction is lacking at the national level. In response to this problem, the Council of Canadian Academies launched an expert panel in May of 2019 aimed at examining the main challenges faced by PhDs in Canada in pursuit of their career and plans to release a report painting a "comprehensive portrait" of PhD employability sometime in 2020 (Shen, 2019). In the meantime, a national debate as to whether the skills and training received by PhD holders is being fully capitalized upon by the Canadian economy has prompted some organizations and institutions to begin taking a closer look at the career outcomes of PhD

graduates with the goal of better understanding their preparedness for the present-day job market.

A notable contribution to understanding PhD skills and employability is a report published by the CBC in 2015, which illustrates the importance of valuing and preparing PhDs for their careers through a comprehensive look at employment data on PhDs across Canada. As such, the CBC highlights the importance of PhD education relevant to Canada's economic, social, and cultural well-being outside of postsecondary education, as well as the challenges they face in transitioning to such careers. Also of note are the Survey of Earned Doctorates (SED), which provides annual data on doctoral graduates upon graduation since the 2003/2004 academic year, and the National Graduates Survey (NGS), which provides information on a representative sample of graduates from Canadian postsecondary education institutions two years post-graduation. These two surveys have been linked in a report by Desjardins and King (2011) to provide a more comprehensive illustration of PhD employment outcomes, in which they have highlighted that the skills of doctoral graduates have been underutilized, with nearly one third of graduates reporting in the NGS that they were working in a position that did not require a doctoral degree 2 years after graduating.

At a field-specific level, The TRaCE project has also tracked employment outcomes of over 2,700 PhD graduates in the humanities (2004 to 2015) from 24 Canadian universities, highlighting trends of status, location, and fields of employment (Trace, n.d.). At the provincial level, The Higher Education Quality Council of Ontario (HEQCO) released a 2016 report tracking similar employment outcomes of over 2,000 PhDs who graduated from all Ontario universities in 2009 (Jonker, 2016).

At the university level, the 10,000 PhDs project at the University of Toronto (Ontario) similarly examined the 2016 employment status of PhDs who graduated between 2000 and 2015 (Reithmeier et al., 2018). McGill University (Quebec) has similarly reported on employment outcomes (rates and types of employers) of 453 PhDs who graduated in 2013 and 2014, with

additional information showing 25% of PhDs to report feeling overqualified in their position 2 years after graduation. In a similar vein, the University of British Columbia (UBC) tracked career outcomes for over 3,000 PhDs between 2005 and 2013 and found that PhD holders in faculty positions felt well-prepared for their careers but this was not the case for many PhDs in non-academic careers who responded to the survey (UBC Faculty of Graduate & Postdoctoral Studies, 2017).

Across the few existing national, provincial, and institutional reports, consistent themes with respect to the misalignment of perceptions of PhDs and the labour market are apparent. Firstly, an identifiable driver behind the aforementioned reports is that PhDs are not well informed of the labour market, which has been attributed to multiple factors including a lack of information and transparency. Another issue that PhDs, faculty members, employers, and recruiters alike have reported is that PhDs have difficulty identifying the skills needed to fill certain positions outside of academia (Durette, Fournier, & Lafon, 2012, 2014; Olson, 2016). Despite the recognition of PhD skills to be a potential source of innovation in Canadian industry (Edge & Munro, 2015), a number of barriers to PhD employability remain, particularly with respect to non-academic positions. In addition to a lack of realistic expectations that reflect the labour market and difficulty in identifying transferable skills, some of the reasons that PhDs have difficulties in developing their skills outside the world of research include 1) complete immersion in their doctoral research leaving few opportunities for self-reflection and career planning; 2) if transferable skills are identified, PhDs often consider such valuable skills to be obvious, self-evident and of little interest to a future employer; 3) a lack of understanding of how to label and promote transferable skills in non-academic language and settings; 4) little or no self-confidence outside the academic world; and 5) fear of negative perceptions of employers towards them (Olson, 2016).

1.1.4. Are employers ready for PhDs?

Further to misaligned perceptions as to the purpose of a PhD, many Canadian employers harbor misperceptions of the skills and competencies of PhDs and their added value to the non-academic labour force, making them reluctant to hire PhDs (Edge & Munro, 2015). As

highlighted in an interview with Sherbrooke University (Quebec) Professor Jean-Claude Coallier, employers often still have stereotypical perceptions of PhDs, believing that they work in areas that are too specialized, are too lengthy in their communications (e.g., taking too long to answer a question), and lack business acumen (Dalmont, 2018). Due to a lack of visibility of the transferable skills many PhDs possess, employers are unable to see past the PhD as a hyper-specialized expert, perceiving PhDs solely as researchers and much less as communicators, project managers, entrepreneurs, innovators, or managers.

Overall, there appears to be a lack of knowledge of what the doctorate is and the transferable skills that this training allows PhDs to develop through research. One reason for this misunderstanding may be that there is currently no formal list of doctoral competencies commonly endorsed by universities, graduate faculties, government granting agencies, etc., or those that do exist are not comprehensive. Another reason that employers have difficulty identifying the skills of PhDs is that doctoral training is, by definition, extremely varied (e.g., by field, university, province) and unique in that dissertation research is intended to address new questions in ways that will lead to uniquely innovative results, and this lack of knowledge is reflected in a lack of recognition and value of the doctorate across a number of institutions. For example, the doctorate is not recognized by most collective agreements and the degree is rarely requested even for positions that may require it (hence the 2% of jobs in Canada that require a PhD; Torunczyk Schein, 2019). Additionally, the majority of available data for PhDs is lumped in with data for master's degrees, leaving a lack of information specific to PhDs (e.g., Statistics Canada).

Across Canada, the CBC indicates key elements of employers' receptor capacity for PhDs as being weak. In the Conference Board's How Canada Performs Innovation Report Card, Canada earns a grade of "D" and ranks 15th out of 16 peer countries on business spending on R&D. As business R&D spending is concentrated in a small number of firms relative to comparable OECD countries, PhDs employed in research positions outside of academia tend to be found in only a few sectors (e.g., pharmaceuticals), or in public sector research and policy institutions (Edge &

Munro, 2015). Effectively, while PhDs possess a number of transferable skills and the potential to contribute to innovation in Canadian industries, these skills are woefully underutilized in the private sector.

In short, finding a common ground between companies and doctoral graduates is a crucial issue in the context of socio-economic transition to a knowledge-based economy, with the importance of such relationships between companies and other organizations being highlighted by the OECD (2005) as a way to pursue the acquisition of specialized knowledge in tandem with the growth of innovation. However, there is a common lack of knowledge between doctoral graduates and private employers, especially with respect to each other's skills and needs, resulting in difficulty on both sides in bridging the gap. Given the present lack of information regarding comprehensive and universally acknowledged PhD skills, a framework of doctoral competencies would help organizations better understand doctoral graduates and help doctoral graduates develop appropriate career paths, leading to the obtainment of rewarding, satisfying employment following graduation.

1.2. Doctoral Competencies

If a better understanding of the competencies of PhDs represents a solution between misaligned perceptions of PhDs and employers regarding the value of PhD skills in non-academic settings, then a clear definition of competencies is in order. A competency is an identifiable skill or practice (Sadler, 2007), with “competencies” constituting the available resources that a professional should be able to mobilize in order to act competently in specific situations and contexts (Le Boterf, 1994; 2004). Important to note is the difference between skills, practices, and attitudes that comprise “competencies”, and one’s ability to orchestrate their repertoire of competencies in order to act with “competence”. For comparison, competence has been defined as “a large number of competencies” paired with “the capability to orchestrate knowledge and skill independently, in a range of contexts, on demand and to a high level of proficiency” (Sadler, 2013). Effectively, competencies fall under the umbrella of competence when they are successfully mobilized, therefore, it is important to note that

demonstrating a collection of discrete competencies is not equivalent to being able to use them effectively as a whole (Sadler, 2007).

In the context of the PhD, competencies can be understood as the resources available to doctorate holders to act competently (Le Boterf, 1994; 2004). When transferred to professional settings, these PhD competencies are paramount in determining success for both PhDs and the companies that employ them. As these competencies are central to the hiring process, increasing PhDs' and employers' awareness and understanding of doctoral skills is, in our opinion, one of the most effective ways of fostering PhDs' employability in Canada. In order to do this, we propose that a framework for doctoral competencies would ameliorate misconceptions of PhDs and their potential to contribute to innovative growth in Canadian private and public sectors.

1.3. Competency Frameworks

In an effort to provide a better understanding of the composition of competencies gained during PhD training, several reference frameworks have been developed. In the province of Quebec, a reference framework of the competencies targeted in graduate training (master's and doctoral degrees) developed by Montreal Polytechnic (2014) was updated and published by the Association of Deans of Graduate Studies in Quebec (ADÉSAQ, 2015; 2018), providing a framework of knowledge, skills, and qualities expected of doctoral graduates in 5 key areas of competencies: 1) professional and scientific production; 2) knowledge and a critical eye (e.g., critical thinking); 3) communication; 4) normative aspects and integrity (e.g., ethics); and 5) professional and personal development. While these are competencies that are to be expected from graduate training (as opposed to competencies that have been verified as actually being obtained by PhD holders following graduation), this framework provides a solid base for competencies of PhD holders in Quebec, Canada.

As for Canada more generally, Mitacs, a non-profit organization that hosts research internship programs designed to increase connections between highly educated graduates and the private sector across Canada, has compiled a matrix of graduate and post-doctoral competencies based

on literature aligning with their development objectives that includes core competencies of: 1) leadership and management; 2) communication and relationship building; 3) personal and professional management; and 4) entrepreneurialism. While Mitacs initiatives and their resulting competency framework is not specific to PhDs as it is inclusive of master's degrees, their identification of competencies and subsequent research focused on employer experiences and expectations remains a valuable source of information in that it includes perspectives of both PhDs and the companies within which they worked (Karoli, 2013). With respect to professional development programming, Rose (2012) identified "transferable or workplace readiness skills" such as leadership and team building, managing group dynamics, entrepreneurial thinking, communication, and ethics, as well as conflict, time, and project management, as frequently addressed topics of professional development for graduate studies (master's and doctoral degrees) in a survey of universities across Canada.

On an international level, reference frameworks have been developed in a number of other countries to detail and categorize doctoral competencies including England (Jackson, 2007; McCarthy & Simm, 2006; Morgavi et al., 2007; Morris & Cushlow, 2000; Souter, 2005; Vitae, 2011) and the United States (Peterson, 2009; University of Washington, 2011), as well as across Europe (Borrell-Damian, 2009). For example, The Researcher Development Framework (RDF; Vitae, 2011) proposes a hierarchical competency framework using a classification of four main categories (knowledge and intellectual abilities; personal effectiveness; research governance and organization; and engagement, influence, and impact), which are further divided into three subcategories.

Drawing from the hierarchical nature of the RDF presented by Vitae (2011) and the work of Borrell-Damian (2009) examining the influence of discipline on the pool of PhD competencies, Durette et al. (2014) developed a competency framework of 121 competencies categorized into 6 domains based on a research study with 2794 PhDs in France (see also Durette et al., 2012). By using a ground-up methodology to assess competencies reported to be held by PhDs either during or following their degree completion, Durette and colleagues were able to solidify a base

of competencies actually held by PhDs (as opposed to anticipated competencies) across disciplines and thematize them into categories of: 1) knowledge and technical skills; 2) transferable competencies that can be formalized (e.g., communication, innovation management); 3) transferable competencies that cannot be formalized (e.g., cognitive abilities, ability to collaborate); 4) dispositions (e.g., creativity, autonomy); 5) behaviors (e.g., perseverance); and 6) meta-competencies (e.g., capacity for adaptation).

In the context of PhDs competencies in Canada, there are three main limitations of the previous competency frameworks presented. First, province-specific and international frameworks may lack nuance that captures PhD competencies within the Canadian context. Second, many competency frameworks are not specific to doctoral graduates (e.g., master's and doctoral degrees are often combined). Lastly, most of the existing frameworks draw from expected or desired skills anticipated to be developed by PhDs rather than empirically evidenced competencies held. An exception to the latter two limitations is the PhD competency framework presented by Durette et al. (2012, 2014), which specifically assessed competencies actually held by PhDs. As other previous works are of limited use to employers (and other stakeholders) who want to better understand the skills of PhDs to guide them in hiring doctoral graduates, we draw from the work of Durette et al. (2012, 2014) in using their list of competencies developed by PhDs through doctoral training and valued in their jobs following graduation.

1.4. Research Objectives and Questions

1.4.1. Objectives

The objective of the present research is to produce a Canadian reference framework of competencies developed at the doctorate level, based on the perceptions of doctoral graduates and employers. With respect to the competency framework itself, the objectives are threefold.

1. To facilitate alignment between doctoral graduates and employers, by allowing employers to better understand the skills of doctoral graduates and allowing doctoral graduates to better value their own skills
2. To be a tool for PhDs that will enable them to appropriate their professional development and thus promote their employability
3. To be a tool for employers that will allow them to better understand the doctorate and doctoral competencies, and to use them as a basis for job development, descriptions, evaluations, etc., as well as to guide them in finding candidates and to better understand candidates' trajectories

1.4.2. Research Questions

Given that alignment between perceptions of PhDs and employers is crucial within the context of socio-economic transition toward a knowledge economy, the objective of the study is to facilitate this meeting through two main research questions:

1. What are the core competencies of PhDs in Canada?
2. Are these competencies in line with the needs of employers in terms of skills?

Results from our research as well as our doctoral competency framework may benefit doctoral trainees, professors, academic institutions, research funding agencies and governments with paths for reflection and action regarding the development of doctoral skills and competencies. For instance, a doctoral competency framework may assist doctoral trainees in reflecting on their skill development, professional avenues and employability; guide professors in supervising and mentoring doctoral trainees, and attesting to their skill development as they apply for scholarships, internships or jobs; assist postsecondary institutions in developing their own tools to guide program design and evaluation; and finally, inspire agencies and governmental bodies such as education ministries, funding agencies, and internship sponsors in adopting formal skill development requirements as an integral part of their fund allocation frameworks.

Chapter 2. Methodology

To answer our research questions, the first step in our study methodology was to survey PhDs and employers across Canada via an online questionnaire tailored for each group.

2.1. Participants

2.1.1. PhDs

A total of 1,084 doctoral degree holders and doctoral candidates responded to the questionnaire for PhD holders and candidates. Of these respondents, 633 (58%) were doctoral degree holders and 451 (42%) were doctoral candidates.

Data adjustments for sample representativeness

In order to assess how representative our study sample is with respect to the Canadian population, we conducted a Pearson's Chi-squared test analysis to examine potential effects of variables likely to influence the employment of PhDs. Specifically, we tested potential cross dependencies of gender, the sector of activity of employed PhD holders, citizenship status, joint-program participation, employment status, field of doctoral research, and years since dissertation defense (i.e., seniority). Results of the P-value in the Chi-squared analyses indicated several significant cross-dependencies between variables likely to influence the employment of PhDs (see Table 1).

Table 1

Chi-square analyses of potential factors of influence on PhD employment

Chi-square p values prior to adjustment						
Sector	Citizenship status	Joint program	Employment	Research field	Seniority	
0.002992374	0.946901807	0.2701935	0.146892169	1.07E-19	0.078344718	Gender
	0.149271778	0.514559857	4.86E-14	6.07387E-05	0.000602445	Sector
		2.62175E-05	0.035911446	7.05E-12	6.38E-08	Citizenship status
			0.013038746	0.690984958	0.054753725	Joint program
				0.154040552	3.97407E-06	Employment
					0.744944714	Research field

Note. Cells in red indicate dependencies ($p < .05$).

We then realized 4 consecutive adjustments based on gender, field of doctoral research, and citizenship status by applying to our data set a weight calculated by comparing the most recent available data (Edge & Munro, 2015; Statistics Canada, 2016 census) to our own results. The aim of each step was to decrease dependencies between variables, resulting in sample data that is more representative of the population (see Table 2).

Table 2

Adjustment of data for PhD respondents

Discipline of doctoral research				
	Raw data	Adjusted data	National data	“Ventilated” national data
Physical & life sciences & technologies	14,7 %	30,4 %	27,5 %	28,3 %
Social & behavioural sciences & law	19 %	15,7 %	18,5 %	19,04 %
Architecture, engineering & related technologies	15,5 %	15,8 %	14 %	14 %
Health & related fields	25,8 %	12,4 %	12,7 %	13,07 %
Humanities	5,8 %	8 %	9,2 %	9,47 %
Mathematics, computer & information sciences	4,6 %	6,5 %	5,4 %	5,56 %
Business, management & public administration	7 %	4,4 %	4,1 %	4,22 %
Education	4,3 %	3,5 %	4 %	4 %

Visual & performing arts, & communications technologies	1,3 %	1,6 %	1,6 %	1,65 %
Agriculture, natural resources & conservation	-	-	2,8 %	-
Personal, protective & transportation services	-	-	0,1 %	-
Interdisciplinary studies	2,2 %	1,7 %	-	-
Gender				
	Raw data	Adjusted data	National data	
Female	51 %	39,5 %	41,7 %	
Male	47,8 %	59,4 %	58,3 %	
Other	1,1 %	1,1 %	-	
Citizenship status				
	Raw data	Adjusted data	National data	
Canadian citizen	61 %	49,6 %	49,6 %	
Non-Canadian citizen	39 %	50,4 %	50,4 %	

Responding PhDs' discipline of doctoral research

The disciplines of doctoral research presented in Table 2 are those used by the Government of Canada to classify major fields of study for individuals who have earned a doctorate (Statistics Canada, 2016 census). Since we had deliberately allowed participants the opportunity to select

from a more expansive range of disciplines (28), we categorized the disciplines originally chosen into the domains represented by Statistics Canada. We also created an additional category titled “interdisciplinary studies”. Category regroupings can be found in Appendix A. As can be seen in Table 2, there were two categories assessed by Statistics Canada for which there were no matches from the original data set of our study (agriculture, natural resources, and conservation; and personal, protective, and transportation services). Given that these two categories represented less than 3% of the population, we ventilated, or evenly distributed, this 3% across the remaining disciplines before adjusting our data.

Responding PhDs’ age and level of degree completion

The PhD candidates who participated in the present study had a median age of 31 years. Among them, 13% were in the first year of their program, 17% in their second year, 18% in their third year, and 52% were in their fourth year or higher (see Appendix B for the complete distribution of PhD candidates’ level of seniority). The PhD holders who participated in the present study (i.e., those who had completed their degree) had a median age of 38 years. Additionally, the average time of degree completion reported by PhD holders was 5.06 years. Recalling from Chapter 1, completion times for PhD programs in Canada have been reported to be between 5 and 6 years by the Conference Board of Canada (CBC, Edge & Munro, 2015), with students in the social sciences and humanities taking, on average, a year longer than PhDs in sciences and engineering to complete their degree.

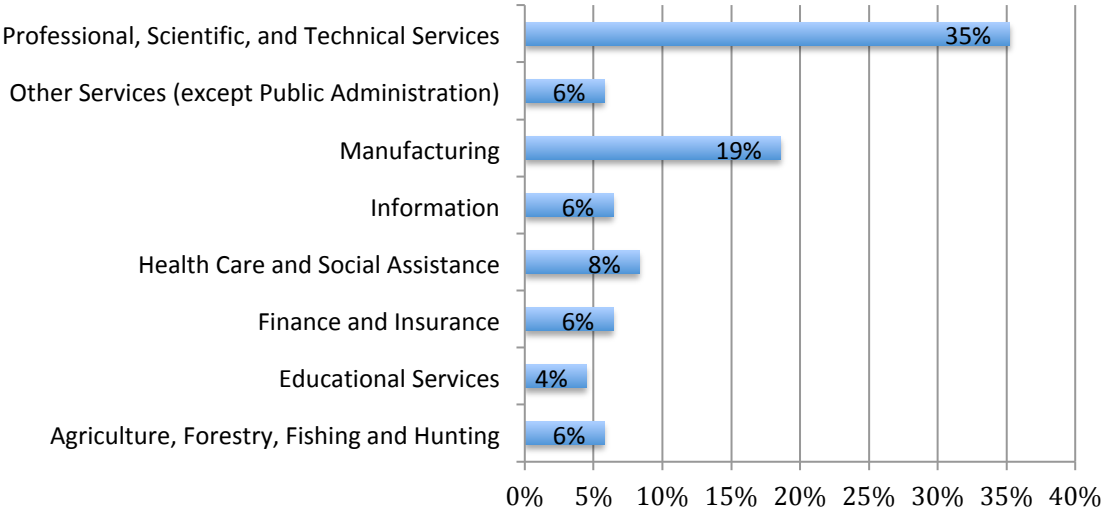
2.1.2. Employers

In total, 155 organizations responded to the questionnaire for employers. Unlike the PhD sample, there were no adjustments made to the data collected from employers. With respect to the structure of the organizations represented in the present study, 66% were private organizations, 20% were non-profit organizations or associations, 8% were public (non-university) organizations, and 5% were universities (including public universities). Although there is not readily available data on separate employee percentages for NPOs, universities, and private organizations in Canada, we are able to confirm representativeness of our sample with respect to the national data on private organizations, which constituted 64.35% of

Canadian employment in 2018 (Statistics Canada). As for the distribution of participating organizations by sector of activity, we've presented the eight most frequent sectors in Figure 3.

Figure 3

The eight sectors of activity most frequently represented by participating organizations

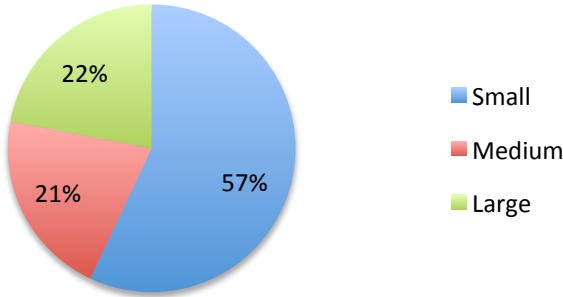


As can be seen in Figure 3, professional, scientific, and technical services represent, by far, the largest sector of activity for organizations that responded to the employer questionnaire at 35.26%. Following suit, manufacturing represents a sizeable sector of activity for this group at 18.59%, with the remaining depicted sectors trailing between 4% and 8% (agriculture, forestry, fishing, and hunting; educational services; finance and insurance; health care and social assistance; information; other services). Other sectors represented in the questionnaire include: arts, entertainment, and recreation; public administration; transportation and warehousing; construction; public services; accommodation and food services; company and enterprise management; and retail trade. A complete distribution of the sectors of activity represented by responding organizations is available in Appendix C.

With respect to location, the majority of responding organization headquarters was located in Quebec (70%), followed by British Columbia (14%) and Ontario (13%), and the remaining provinces following at 1% each (Alberta, Prince Edward Island, Manitoba, Newfoundland and Labrador). Additionally, 62% of these organizations reported engaging in international activity.

Looking at the size of the organizations represented, we've categorized participating organizations based on the definition provided by the Government of Canada (2019; 1-99 employees = small; 100-499 employees = medium; 500+ employees = large). As can be seen in Figure 4 below, most were organizations were small in size at 57%, with just over 20% being medium or large in size.

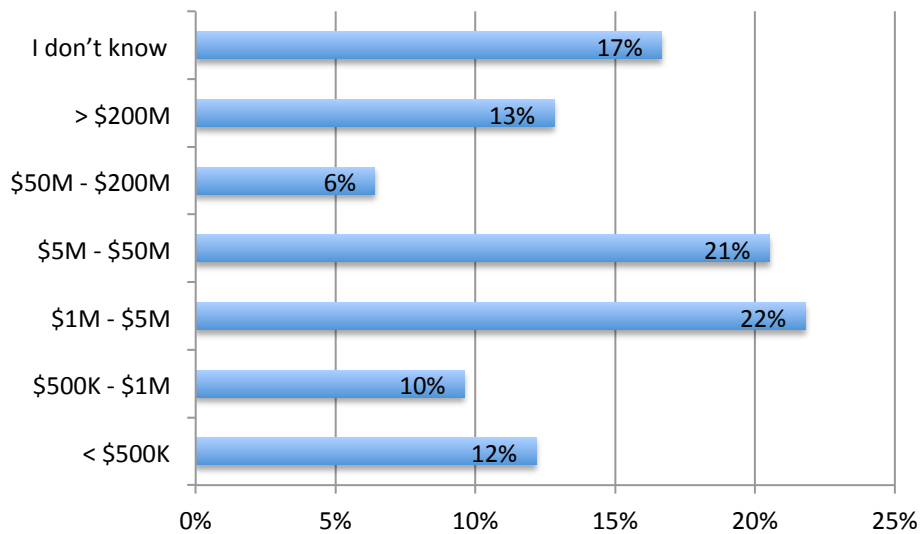
Figure 4
Distribution of responding organizations by size



Additionally, in an attempt to understand available resources, we examined the annual turnover of participating organizations, depicted in Figure 5 below.

Figure 5

Annual turnover of responding organizations



Turning now to the employers who specifically responded to the questionnaire on behalf of their organizations, 31% reported holding a PhD themselves. The three most frequent roles of responding employers were human resources (28%), executive (26%), and research and/or development (including academic appointment; 23%). Other roles represented include: administration, communication, finance, healthcare, IT, marketing, production, teaching and/or training, consulting, and sales. The complete distribution of responding employer roles can be found in Appendix D.

2.2. Materials

Two questionnaires, one for each PhDs and employers, were completed online via SurveyMonkey. Participants were invited to complete the surveys through online and social media advertisements (e.g., LinkedIn), direct email, and in-person invitations (with a shared link to the survey). Additionally, participant recruitment was realized through the promotional efforts and support of our partners in this research project, the Canadian Association of Postgraduate Studies (CAPS), Finance Montreal, and Mitacs.

2.2.1. PhD candidates and degree holders questionnaire

The questionnaire for PhD candidates and degree holders was comprised of three parts: 1) background and demographic information; 2) most recent professional experience; and 3) competency identification. Given that the most recent professional experience of a PhD candidate is, in fact, completing their doctorate, PhDs whose degree completion was still in progress were filtered directly to questions pertaining to competencies following the first section. In order to better understand the context of responding PhDs' experiences, a number of questions related to demographic and background information were first presented, including: the year of defense and completion time (or program year for those yet to complete their degree), discipline, institution, sources of funding, and internship participation. As we will see in the next chapter, we examine this demographic and background information to identify factors that potentially influence competencies developed during doctoral training.

With respect to the professional experiences of PhD holders, questions were focused on their most recent professional experience (outside of their doctorate). Questions in this second part pertained to their employment status (e.g., permanent positions, short-term positions, etc.), institution size and structure (e.g., university, private, public), sector of employment, department and function (e.g., R&D), location of employment, duration of employment (as of survey completion), and compensation. In addition to a question assessing academic career intentions during the completion of their PhD, PhD holders were also asked to rate the importance of their PhD in preparing them for their career, as well as their satisfaction with their PhD program. As we will explore in Chapter 5, responses to these questions were used to analyze and map the main employment opportunities for PhDs both in and outside of R&D sectors. Combined, these indicators will allow us to assess one of the original driving questions of this study, the added value of the doctorate to PhDs' careers.

The third and final section of the questionnaire focused on PhD competencies and was designed with the purpose of creating the first comprehensive PhD competency framework in the Canadian context. To do this, we asked PhD candidates and degree holders to identify

competencies they developed or improved during their doctoral training, as well as how often PhD holders with professional experience relied upon those competencies in their current (or most recent) employment position. Specifically, PhDs were asked to select competencies from a complete list of the 121 competencies outlined in the PhD competency framework of Durette et al. (2012, 2014). Prior to the execution of the present study, the original competency list was adapted to the Canadian cultural context and translated to English and Quebec French. The competency framework presented by Durette and colleagues is the only competency framework developed with a grounded-theory approach in assessing competencies actually developed during doctoral training and was constructed by thematically coding reported competencies of 2,794 PhDs in France. Building upon this extensive work, the present study assesses the extent to which PhDs in Canada identify with the almost exhaustive list of competencies within this framework. The entire PhD questionnaire can be found in Appendix E.

2.2.2. Employer questionnaire

The questionnaire for employers was also organized into three parts: 1) organization background information; 2) competency needs; and 3) integration of PhDs. The first part consisting of organization background information aims to characterize organizational profiles and included: organization type (e.g., public, private, university, non-profit), sector, international activity, annual turnover, number of employees, corporate office location, recruitment volume for the previous year, and professional or skills development offerings. Employers were also asked about their level of education (PhD or other) and role within their organization.

In order to understand the competency needs of organizations, the second part of the survey asked employers to answer questions related to their most recent hire. Specifically, we inquired about that person's role, years of experience, and the three main competencies they possessed. To identify competencies most frequently sought by employers, we also asked about difficulties in filling roles and specific positions when recruiting.

The third and final part of the questionnaire was intended to assess the integration of PhDs into organizations, both in the past and in the future. To do this, we asked employers about the number of PhDs employed within their organization and if employers had previously recruited a PhD. For employers who had previously hired a PhD, we asked questions specific to their most recent PhD hire regarding the PhD's domain of doctoral research and which type of position they held. We also asked employers about their perceptions of the necessity of a PhD for the most recently filled position (by a PhD), years of experience upon hire, method of recruitment, satisfaction with the hire, if they noticed a difference between new hires with and without a PhD, and the likelihood that they would hire a PhD holder again. If employers indicated that they would hire a PhD again, we also asked questions pertaining to roles, specific positions, and anticipated salary, as well as their opinion as to whose responsibility it is to support PhD holders in gaining industry knowledge.

For employers who had hired PhDs, we asked them to indicate for which competencies the most recent PhD was hired for by selecting from the list of 121 competencies presented in the PhD questionnaire (Durette et al., 2012, 2014). Employers who had hired PhDs were also asked to indicate the three main competencies they believed to be lacking or not sufficiently developed by their last PhD hire from the same list of competencies. In this way, it is possible to analyze employer perceptions of PhD competencies and how they are aligned with organizational needs. The entire employer questionnaire can be found in Appendix F.

Chapter 3. PhD Competencies

3.1. Objectives

The current chapter aims to present the first comprehensive PhD competency framework in Canada, based on reports of competencies actually developed during the doctorate. Recalling from the previous chapter, we assessed the complete list of PhD competencies identified in Durette et al.'s (2012, 2014) PhD competency framework. This framework consists of 121 competencies previously identified by PhDs, which are sub-divided into six categories.

Durette et al.'s (2012, 2014) framework is organized into 6 main categories of competencies:

1. **Knowledge and technical skills:** this category consists of one competency grouping, scientific and technical expertise, which comprises all of the knowledge and skills required for techniques specific to the particular field of the doctorate. There is a potentially infinite number of them because each domain develops its own knowledge (e.g., knowledge in molecular biology, knowledge of information theory) and its own techniques (e.g., the "Polymerase Chain Reaction" in the field of biology), and can only be used in a very specialized setting. Therefore, they have been grouped together as one competency rather than being listed since it is not possible to create an exhaustive list;
2. **Transferable competencies that can be formalized:** these correspond with competencies developed in professional situations that can be directly transferred from one professional situation to another (e.g., project management or communication). These competencies are also characterized by being based on formalized knowledge, which is possible to be formed theoretically (i.e., knowledge that can be learned in a course);
3. **Transferable competencies that cannot be formalized:** these correspond with competencies that are also transferable to many professional situations but, unlike transferable competencies that can be formalized, these competencies (e.g. the ability

to manage complex issues or the ability to “take a step back”) are not based on formalized knowledge (i.e., knowledge that cannot be learned in a course);

4. **Dispositions:** this category includes aptitudes and qualities that compliment transferable competencies. For example, it is possible to manage complex issues with rigour and/or open mindedness, to manage a project efficiently, etc...;
5. **Behaviours:** this category includes competencies related to one’s behavior (e.g., interpersonal skills, ambition, perseverance, independence);
6. **Meta-competencies:** these are specific competencies that can be used to either develop one’s pool of competencies or to better mobilize existing competencies more efficiently in professional situations. This category is comprised of two competencies: learning capacity and adaptation capacity.

What is a pool of competencies?

One of the main objectives of this study was to present a pool of competencies available specifically to PhDs in the Canadian context. The framework of PhD competencies presents a comprehensive pool of competencies because it is the mobilization of these competencies in conjunction with each other that is likely to be specific to the PhD, rather than a specific competency alone. Two types of competencies constitute this pool, those that we find to have the same probability of being developed by a PhD regardless of their profile (which we will call core competencies), and those that are specific to certain profiles (which we will call specific competencies). For the purpose of the present study, a profile refers to a set of factors that can influence PhD competencies.

3.2. Method of Analysis

3.2.1. Factors of influence on PhD competencies

Following, partially, from Durette et al. (2012, 2014), we examined three factors that could influence PhD competencies: the discipline of doctoral research, the number of years passed since the dissertation defense, and the method of financing the doctorate (university, government funding, personal resources, etc.). For each factor, we performed a Pearson’s Chi-

square test to analyze the significance of the influence of each of the factors on each of the PhD competencies. Thus, any competencies that were significantly influenced ($p > .05$) by one of these factors will be referred to as specific competencies in the results section of this chapter. Competencies that were not influenced by PhDs' discipline, number of years since defense, and mode of finance will be referred to as core competencies. Uniquely, there were four competencies influenced by all three factors examined, namely, scientific and technical expertise, digital technology/computer science, finding funding opportunities, and research methods. Given that findings for these three competencies were influenced by all factors examined, they were retained as core competencies.

3.2.2. Power

The power of a test corresponds to the probability of finding an effect in the sample knowing that it is present in the population. If the power of a test is 20% for example, this means that there is an 80% chance of not finding a significant effect even though one exists in the population. The power of a test depends on the number of people in the sample tested (in this case, it concerns how many PhDs indicated each competency in question). For each variable, we have therefore calculated the minimum number of indications of each competency to obtain an acceptable power threshold of 70%. Competencies whose overall number of indications was below 70% have been declared "unclassifiable" and were not included in the analysis. Indeed, if the overall number of indications of a competency in the data is too low, the significance test is not valid because its power is too low. Lastly, the effect size of the Chi-square test needed to be above .01 in order for a competency to be considered for analysis; otherwise, it was not retained because the estimated effect size of less than .01 in the population (again, determined by sample size) would be almost negligible. From the original list of 121 PhD competencies, 109 were retained for analysis, with the remaining 12 being deemed unclassifiable due to low power/effect size.

3.3. Results

Figure 6 represents the pool of PhD competencies analyzed from PhD candidates and degree holders who indicated competencies that they developed or strengthened during their

doctorate. Core competencies are represented at the center of the figure. The percentage given for each competency represents the percentage of PhDs who indicated each competency out of all responding PhDs who indicated competencies. Competencies that were found to be specific to the PhD profile (i.e., discipline of doctoral research, years since defense, mode of finance) are represented in the periphery, along with their specifying factor. No percentage is given for specific competencies since the percentage varies according to each factor.

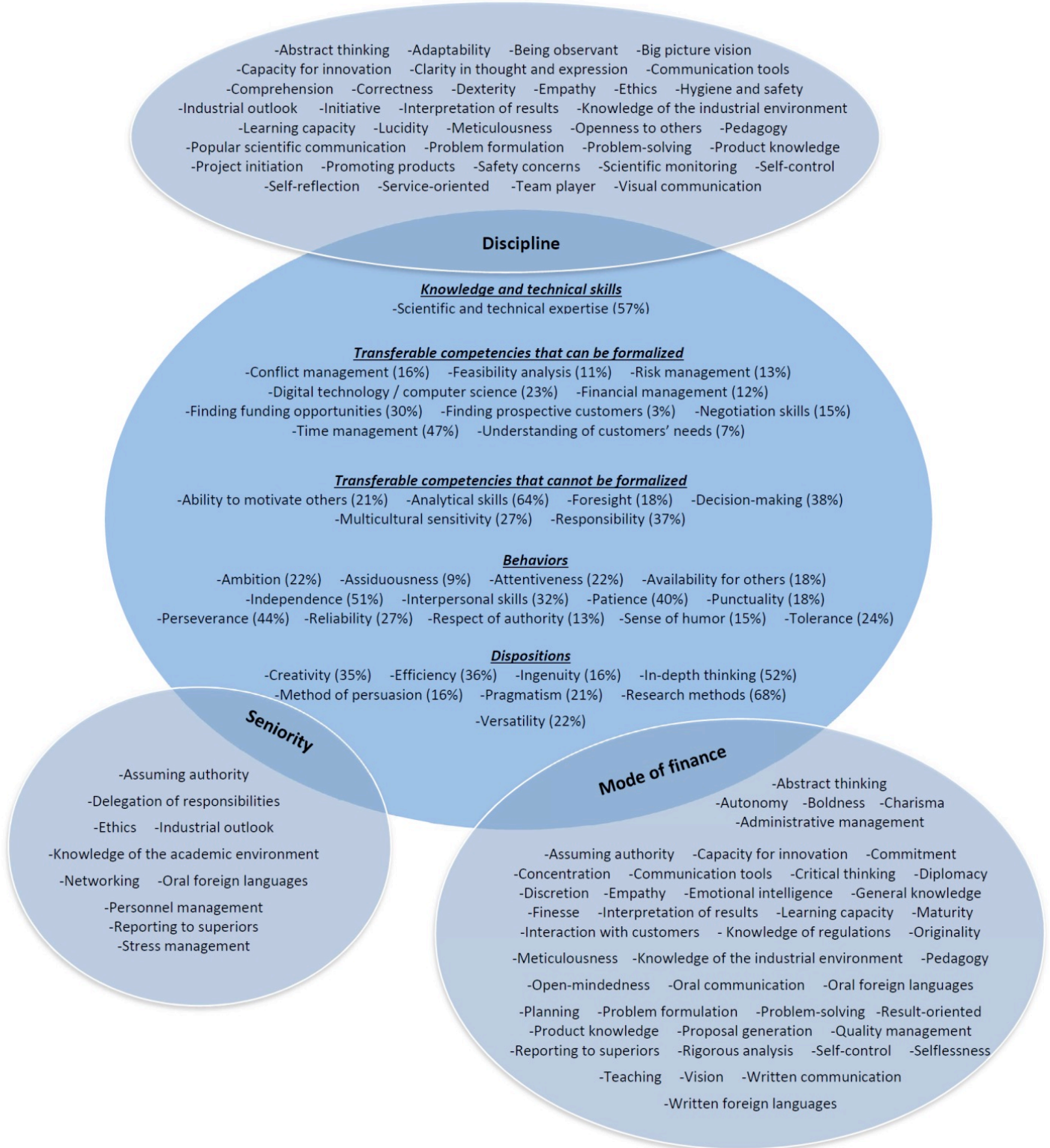
Knowledge and technical skills:

Scientific and technical expertise was indicated by 57% of PhDs, coming in at the third most frequent core competency reported, and was influenced by all three factors of the PhD profile examined (discipline, years since defense, and mode of finance).

Transferable competencies that can be formalized:

Of the framework's 36 transferable competencies that can be formalized, eight competencies did not depend on the PhD profile: conflict management (16%), feasibility analysis (11%), financial management (12%), finding prospective customers (3%), negotiation skills (15%), risk management (13%), time management (47%), and understanding of customers' needs (7%). As mentioned above, digital technology/computer science (23%) and finding funding opportunities (30%) were found to be influenced by all three factors examined. The remaining transferable competencies that can be formalized (e.g., written communication, oral communication, teaching, planning) were influenced by at least one of the PhD profile factors examined (see Figure 6). One competency from this category did not reach the 70% power cut-off to be included in the analysis and was deemed unclassifiable, namely, research promotion and valorization.

Figure 6



Transferable competencies that cannot be formalized:

Of the framework's 22 transferable competencies that cannot be formalized, six competencies were classified as core competencies (i.e., not influenced by PhD profile factors): ability to motivate others (21%), analytical skills (64%), foresight (18%), decision-making (38%), multicultural sensitivity (27%), and responsibility (37%). Analytical skills was the second most frequent core competency reported by PhDs. The remaining transferable competencies that cannot be formalized (e.g., abstract thinking, comprehension, critical thinking, problem-solving, interpretation of results) were influenced by at least one of the PhD profile factors examined (see Figure 6). One competency from this category, reviewing/synthesizing, was deemed unclassifiable.

Behaviors:

Of the framework's 35 behavior competencies, 13 could be classified as core PhD competencies: ambition (22%), assiduousness (9%), attentiveness (22%), availability for others (18%), independence (51%), interpersonal skills (32%), patience (40%), punctuality (18%), perseverance (44%), reliability (27%), respect of authority (13%), sense of humor (15%), and tolerance (24%). The remaining competencies classified as behaviors (e.g., emotional intelligence, commitment, stress management) were influenced by at least one of the PhD profile factors examined (see Figure 6). Eight competencies from this category, were deemed unclassifiable: self-confidence, resilience, enthusiasm, modesty, curiosity, honesty, sincerity, and conflict mediation.

Dispositions:

Of the framework's 25 competencies classified as dispositions, seven were identified as core competencies: creativity (35%), efficiency (36%), ingenuity (16%), in-depth thinking (52%), method of persuasion (16%), pragmatism (21%), and versatility (22%). As mentioned above, research methods was influenced by all three PhD profile factors examined and, notably, was the most frequently reported core competency among PhDs (68%). The remaining competencies classified as dispositions (e.g., rigorous analysis, clarity in thought and

expression, meticulousness) were influenced by at least one of the PhD profile factors examined (see Figure 6). Two competencies from this category, accuracy and astuteness, were deemed unclassifiable.

Meta-competencies:

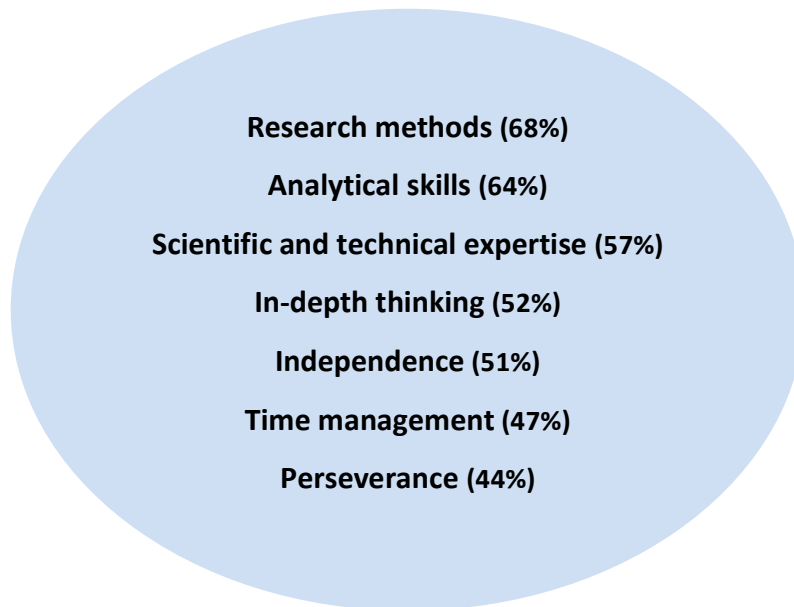
Finally, both of the framework's meta-competencies, learning capacity and adaptability, were influenced by at least one of the PhD profile factors and thus, were not retained as core competencies.

Core competencies

Focusing specifically on the core competencies, we observe that the number of PhDs who reported each of these competencies varies, ranging from 68% (research methods) to 3% (finding prospective customers). Though each of the core competencies identified importantly represent potential areas of competency development, here we will focus on competencies that were mentioned by at least 40% of the PhDs in the present study. By narrowing down the core competencies to only those that were substantially represented, we can be more certain that these competencies are likely to be found in PhDs across Canada. Figure 7 presents a final list of core competencies developed by PhDs. Notably, all competency categories, with the exception of meta-competencies, are represented in the final list of core PhD competencies.

Figure 7

Final list of core competencies developed by PhDs



3.4. Results Summary

Results in the current chapter present evidence of a pool of competencies developed by PhDs during their doctoral training. A total of 109 competencies from Durette et al.'s (2012, 2014) PhD competency framework were retained in the analysis, providing a competency pool specific to PhDs in Canada. Specifically, we have identified 38 core competencies likely to be found in PhDs regardless of their profile, as well as three groups of specific competencies likely to be influenced by factors of: 1) discipline of doctoral research, 2) years since defense, or seniority, and 3) mode of financing during the doctorate. In a further step, we have narrowed down a final list of core competencies most frequently represented in our sample, and therefore, most likely to be found in the Canadian PhD population (i.e., research methods, analytical skills, scientific and technical expertise, in-depth thinking, independence, time management, and perseverance). Taken together, these competencies represent a varied pool of knowledge, skills, behaviors, and dispositions that PhDs have to draw on in professional situations.

Chapter 4. Competency Alignment and PhD Employment Integration

4.1. Objectives

Turning now to the second part of this investigation, we examine the question of fit between the PhD competencies analyzed in Chapter 3 and employers' needs and expectations. In the previous results chapter, we identified competencies likely to be found in PhDs in Canada, including core competencies that can be found in PhDs across disciplines, as well as specific competencies influenced by factors that constitute the PhD profile (i.e., discipline of doctoral research, seniority, mode of financing the doctorate). Following from the PhD competencies presented, this fourth chapter aims to 1) determine to what degree these competencies are aligned with employers' needs and expectations in Canada, and 2) explore the integration of PhDs in various types of organizations by examining profiles of organizations that hire PhDs and profiles of PhDs they employ.

4.2. Method of Analysis

To answer the question of fit, we posed several questions to the employers surveyed. We first inquired as to general hiring trends within their organization, such as which positions employers had recently filled, and which were difficult to fill. In this way, we were able to identify the types of roles most frequently sought and needed by organizations, regardless of any consideration as to level of education (i.e., PhD or not). We also asked employers open-ended questions as to the three most difficult competencies to find when hiring and matched the responses with our pool of PhD competencies in order to assess alignment between employers' needs and PhD competencies. Additionally, in cases where organizations had already recruited PhDs, we asked them to elaborate on which positions PhDs were hired into and for which competencies. In this way, we were able to identify the competencies for which PhDs are most known and searched for by employers. Of these employers, we also asked them to indicate competencies that they thought could be improved by PhDs they've hired. By examining PhD competencies alongside employers' expectations and ongoing needs specific to PhD hires, we are able to present a more comprehensive overview of competencies sought and held with respect to the recruitment of PhD holders in Canada and how they align with each other.

Following an assessment of competency alignment, we go on to examine information on employers' most recent PhD hires to understand the profiles of employed PhDs and the organizations within which they work. Lastly, we take a look at future prospects for PhD employment with responses from employers who indicated that their organization intends to hire new PhDs in the coming months.

4.3. Results

4.3.1. Alignment between PhD competencies and employer needs and expectations

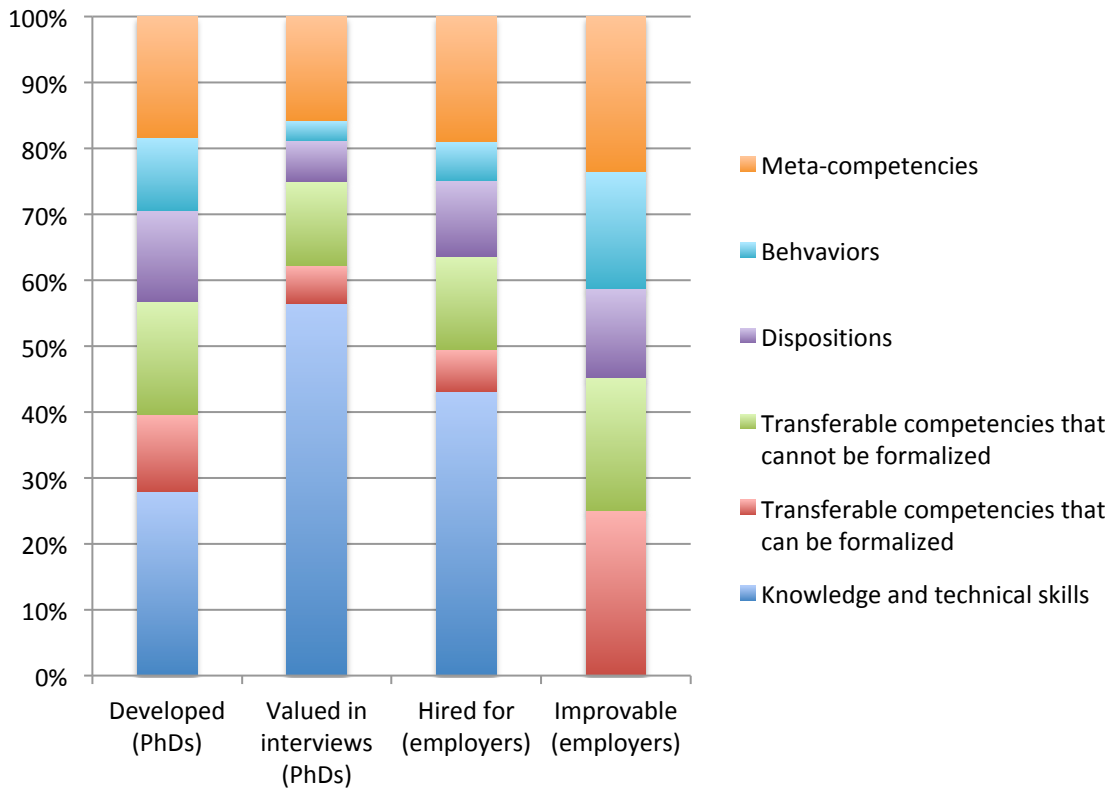
First, we compared the distribution of PhD competencies and employers' responses by competency category (e.g., scientific and technical skills, transferable competencies that can be formalized, etc.; for a definition of these categories, see section 3.1) as a function of the type of question asked, both to PhDs and employers (i.e., competencies developed during the PhD, competencies valued by PhDs in an interview, competencies for which employers recently hired a PhD, and competencies employers reported needing improvement based on their most recent PhD hire). The results are shown in Figure 8.

This graph allows us to analyze the fit between the potential of PhDs (i.e., developed competencies) and the needs and expectations of employers. Overall, there are few notable trends observed in the data. Firstly, knowledge and technical skills represents the most strongly emphasized competency category across PhDs and employers. Second, PhDs reported having developed a wider array of competencies than they reported valuing for a future job interview (e.g., 11.02% of behavior competencies developed during the doctorate vs. 3.07% of behavior competencies valued in interviews). In a similar fashion, the competencies for which employers reported hiring PhDs is more narrow than the array of the competencies PhDs reported having developed during their doctoral training (e.g., transferable competencies that can be developed represents 6.44% of competencies employers reported hiring PhDs for vs. 11.79% of competencies PhDs reported having developed). Lastly, transferable competencies that can be formalized (e.g., written and oral communication, time and conflict management) represent the

most observable discrepancy between competencies developed and valued by PhDs and of those for which employers report hiring PhDs and citing as areas of improvement.

Figure 8

Proportion of competency categories as a function of question posed to PhDs and employers

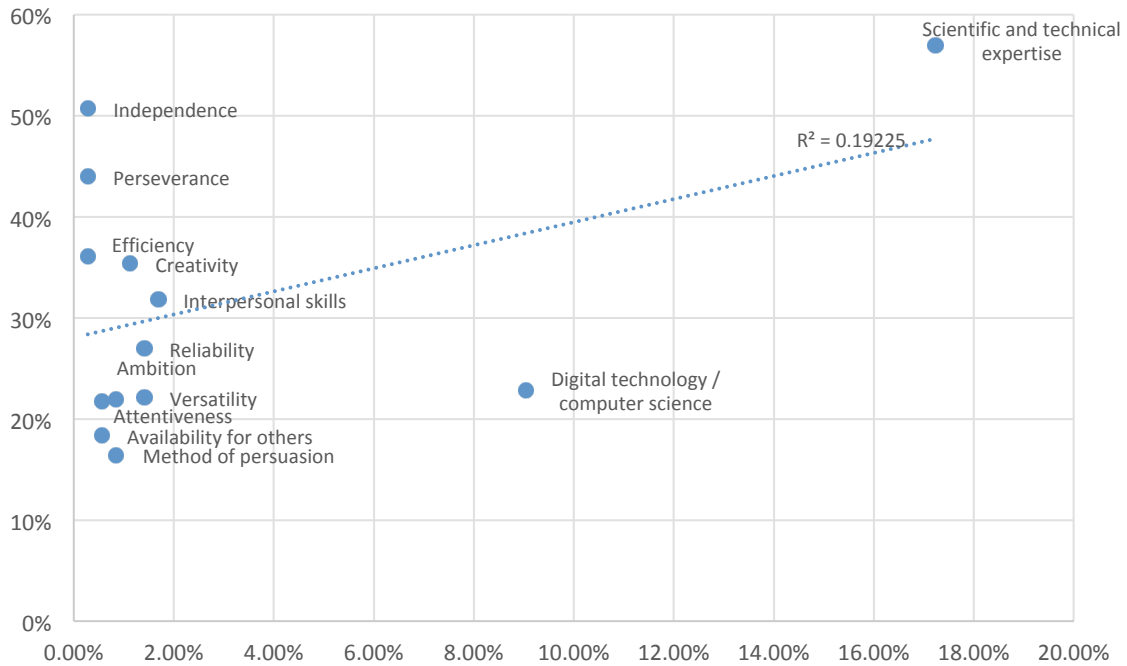


Turning now to the alignment between individual competencies searched for by employers and those developed by PhDs, Figure 9 depicts the common core competencies reported by PhDs and those that employers reported being difficult to find. Specifically, Figure 9 shows core competencies searched for by employers (% of employers) in relation to the percentage of PhDs reporting these competencies. A correlation analysis between these two competency measurements showed a Pearson’s correlation of $r = .44$, indicating a medium sized relationship between core competencies searched for by employers and reported by PhDs ($R^2 = .19$). Overall, we observe the most frequently sought (by employers, 17%) and reported (by PhDs,

57%) core competency to be scientific and technical expertise, and the largest gaps for independence (0.28% employer searched vs. 51% PhD reported) as well as perseverance (0.28% employer searched vs. 44% PhD reported).

Figure 9

Alignment of core competencies reported by PhDs and those searched for by employers (%)

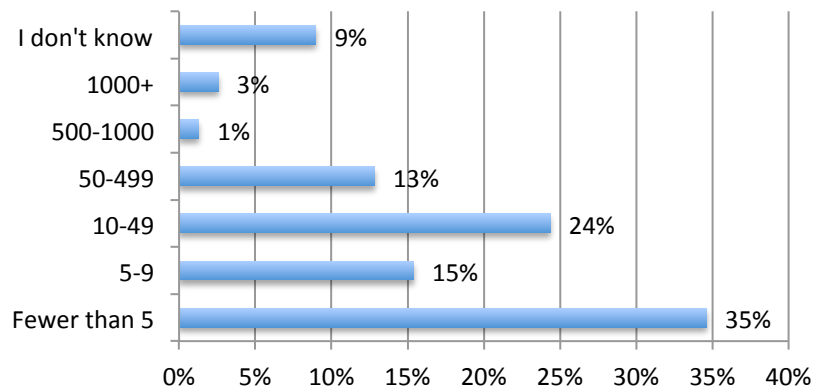


4.3.2. General recruitment

To understand the needs of employers more generally, before getting into the specific expectations of PhDs, employers were asked to report and expand upon the most recent hire within their organization, regardless of education level (i.e., PhD or not). Of the organizations surveyed, half (50%) of employers reported hiring less than ten new employees within the previous year (Figure 10).

Figure 10

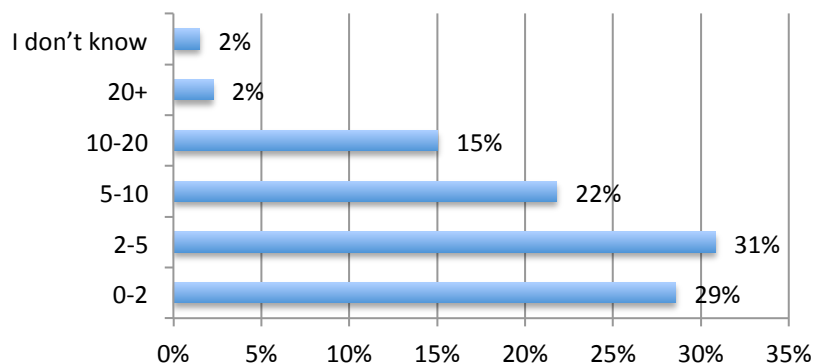
Number of employees hired within the previous year by responding organizations



Generally, 44% of new hires were for roles in research and/or development, while other roles included administration, consulting, executive, finance, IT, marketing, production, teaching and/or training, communication, sales, and health care (see Appendix G for the complete distribution of general roles for new hires across organizations). With respect to years of experience upon hire, the most frequently represented range of years of experience was between two and five years at 31% (see Figure 11 for the distribution of years of experience for employers' most recent hire).

Figure 11

Years of experience for employers' most recent hire (general)



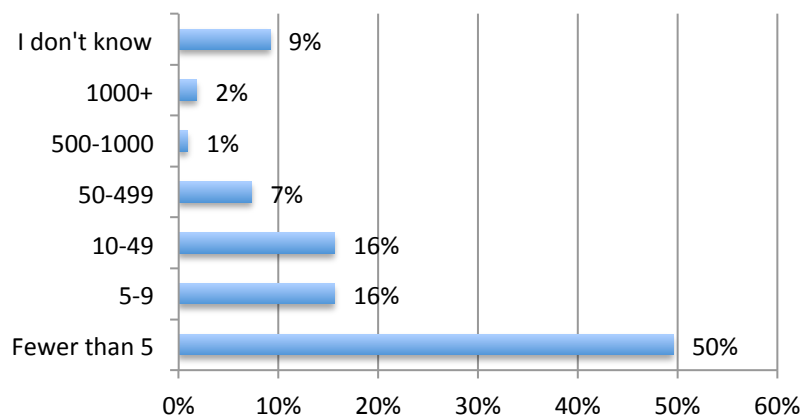
Of the employers surveyed, 74% reported that there are more difficult positions to fill compared to others. More specifically, the top three most difficult roles to fill within these employers' organizations were research and/or development, IT, and production (see Appendix H for the complete distribution of employers' most difficult roles to fill).

4.3.3. PhD recruitment

Shifting the focus to the recruitment of PhDs in particular, 70% of employers surveyed reported having a PhD working within their organization. Of these employers, 50% reported working with fewer than five PhDs (see Figure 12).

Figure 12

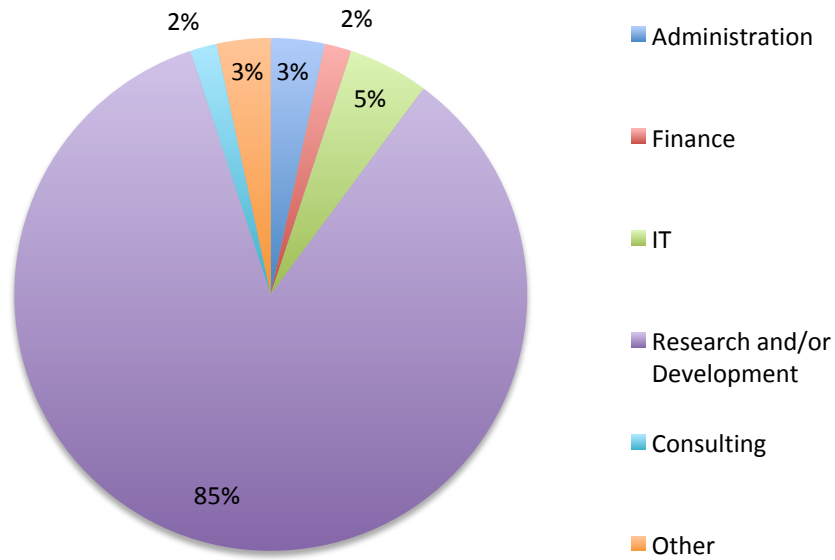
Number of PhDs working within employers' organizations



From all of the employers who responded to the questionnaire, 55% reported previously hiring a PhD. With regard to these employers' most recent PhD hire, 85% were for positions in R&D (including academic appointments), with the remaining roles being filled in IT (5%), administration (3%), finance and consulting (2% each), and other positions (3%; see Figure 13). Recalling that 45% of employers' overall most recent hires were for R&D positions, R&D represents a substantially larger proportion of employer's most recent PhD hires. On another note, the other roles for which employers had recently hired a PhD represent areas of opportunity regarding future employment prospects for PhDs.

Figure 13

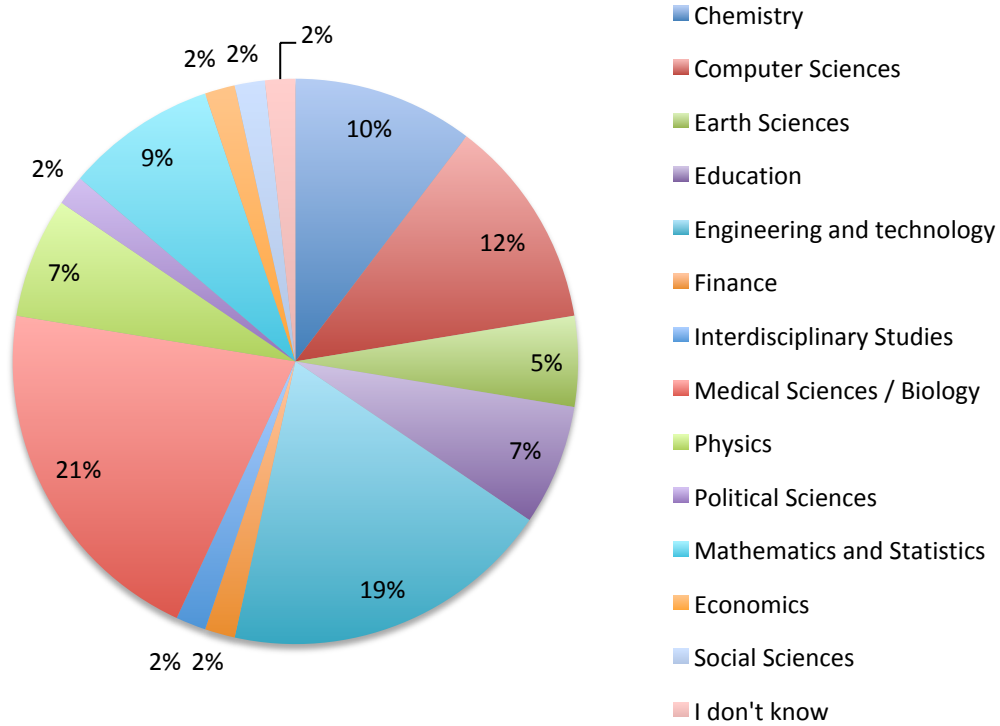
Roles of recent PhD hires reported by employers



Looking at recent PhD hires' doctoral research fields within the organizations surveyed, PhDs had completed their doctoral research mainly in the areas of medical sciences/biology (21%), engineering and technology (19%), computer sciences (12%), and chemistry (10%). Other areas of doctoral research included earth sciences, education, finance, interdisciplinary studies, physics, political sciences, mathematics and statistics, economics, and social sciences. The complete distribution of doctoral research disciplines for employers' most recent PhD hires is depicted in Figure 14.

Figure 14

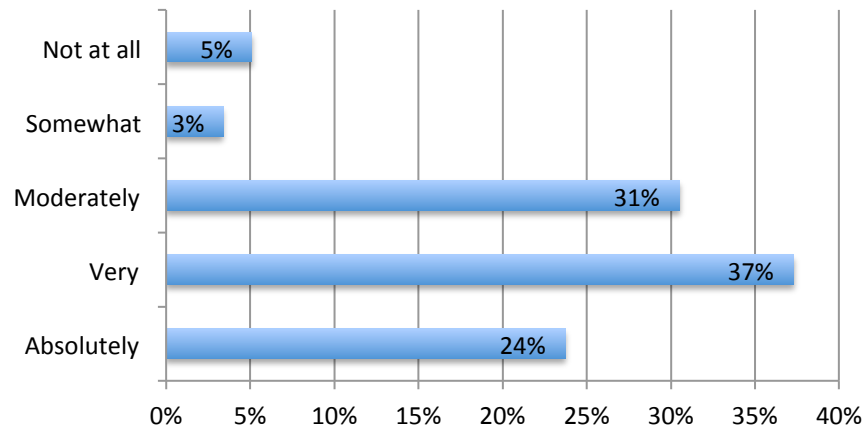
Fields of doctoral research of employers' most recent PhD hires



Regarding the positions into which PhDs were most recently hired, 61% of employers agreed that a doctoral degree was “very “ or “absolutely” necessary for the position (Figure 15).

Figure 15

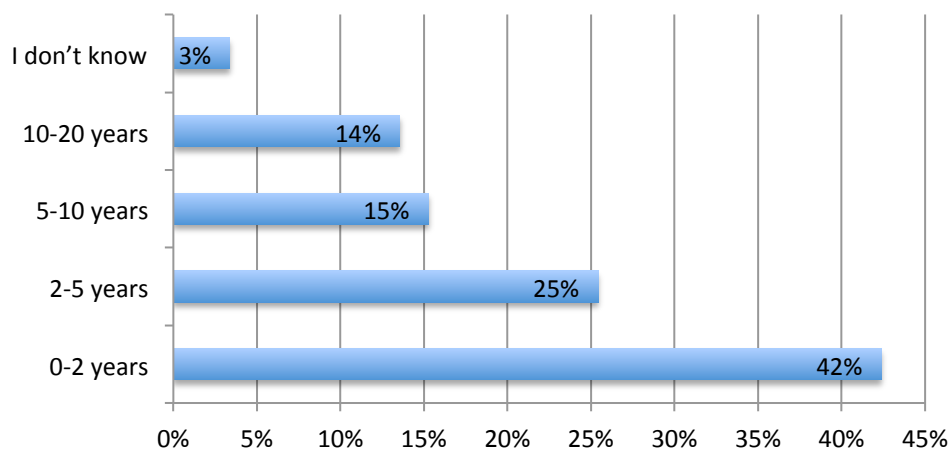
Employer perceptions of the necessity of a doctoral degree for the position into which they most recently hired a PhD



With respect to previous experience (aside from doctoral training) of PhDs recently hired by responding employers, 42% of PhDs were hired with 0-2 years of experience (see Figure 16 below). It is important to note here that while we can recall that 2-5 years of experience was most frequently reported for employers' overall most recent hires (31%), PhD doctoral training as a professional experience should be considered in the difference between reported years of experience between general and PhD hires.

Figure 16

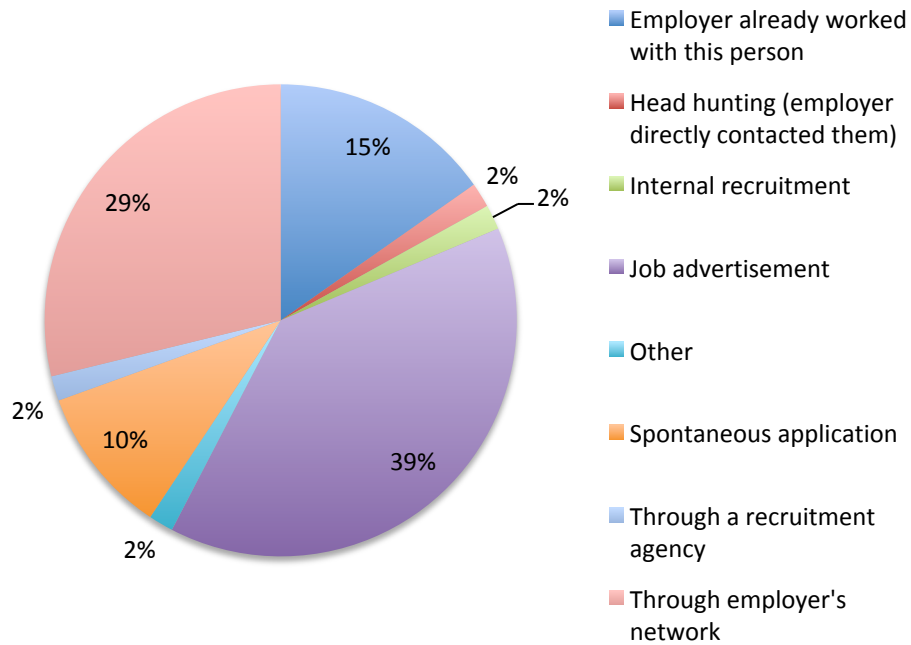
Years of experience of PhDs upon hire by employers surveyed (most recent PhD hire)



Employers reported finding their most recent PhD hires mainly via job advertisements (39%), through their network (29%), having already worked with the individual (15%), and spontaneous applications (10%; Figure 17). Other methods of recruitment included head hunting, internal recruitment, recruitment agencies, and other methods.

Figure 17

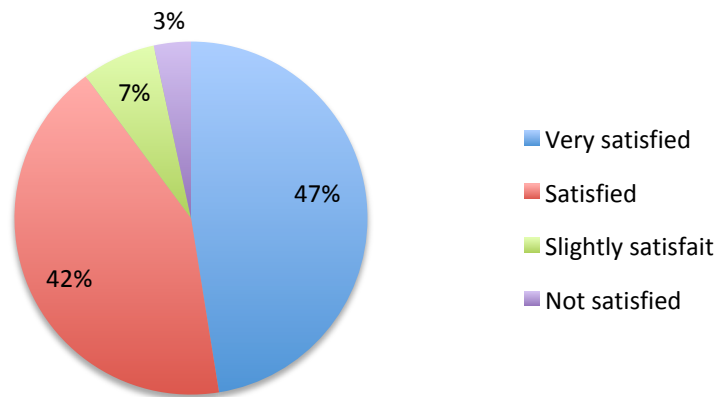
Recruitment methods for responding employers' most recent PhD hire



Regarding satisfaction with their most recent PhD hire, 89% of employers reported being “very satisfied” or “satisfied” (Figure 18).

Figure 18

Responding employer satisfaction with their most recent PhD hire



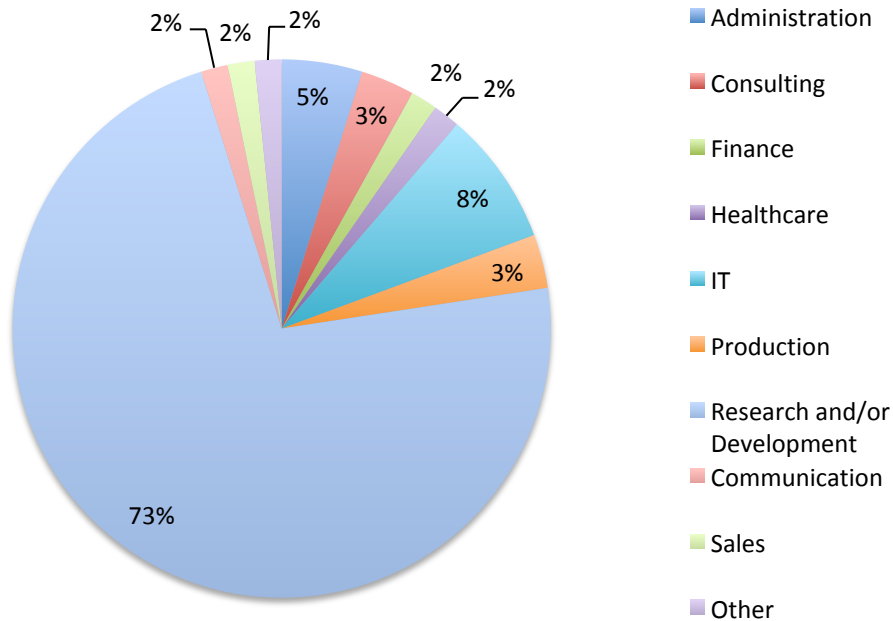
Of the employers who had previously hired a PhD, 48% reported observed differences between new PhD hires compared to new hires without PhDs. For example, employers commented, “PhD holders are a little better at looking at the bigger picture” and cited, “stronger literature review and technique”.

4.3.4. Future PhD recruitment

When asked if they would hire a PhD holder again, 88% of employers who had previously hired a PhD indicated yes, and another 8% indicated maybe (e.g., depending on the situation, nature of the position, etc.), with the remaining 4% indicating no. Of the employers indicating yes or maybe, 48% reported that they would be hiring a new PhD within the next few months. 73% of these employers had intentions to hire another PhD for R&D roles. Other intended roles included IT (8%), administration (5%), consulting and production (3% each), as well as finance, healthcare, communication, sales, and other positions (Figure 19).

Figure 19

Responding employers' intended roles for new PhD hires

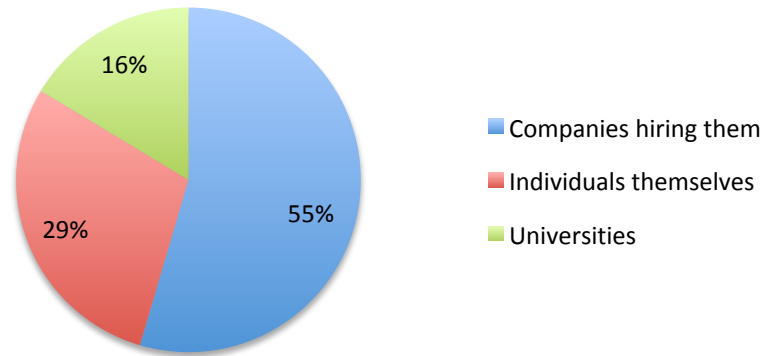


Anticipated annual salaries for these positions ranged up to \$150,000 (CAD), however 62% of employers reported anticipated salaries for new PhD hires to be between \$60,000 and \$80,000.

Lastly, when we asked employers about their opinion as to whose role it is to support PhD holders in gaining industry knowledge, 55% of employers indicated the companies within which PhDs are hired, 29% indicated PhDs themselves, and 16% indicating universities (Figure 20).

Figure 20

Employers' opinions as to whose role it is to support PhD holders in gaining industry knowledge



4.4 Results Summary

Overall, the present results offer a number of insights regarding the alignment between PhD competencies developed during doctoral training and employer needs and expectations, the profiles of employers (and organizations) that hire PhDs, and the profiles of PhDs most recently employed by participating organizations. With respect to competency alignment, observed discrepancies between competencies developed and valued by PhDs, as well as those for which employers hire PhDs and those that were reported to be improvable, leave much room for discussion. As the purpose of the present report is to be objective in providing transparent information on competency alignment, we cannot validate or more heavily weight one perspective against another with the present data alone (e.g., without qualitative data). However, the data presented importantly highlight that competency categories of behaviors, dispositions, and transferable competencies that can be formalized (e.g., written and oral communication, time and conflict management) are areas that represent misaligned perceptions for both PhDs and employers.

Despite misalignment between some categories of competencies more broadly, there was notable alignment of individual core competencies between those searched for by employers and those reported by PhDs. Looking more closely at the alignment of individual competencies, results showed scientific and technical expertise (17%) and digital technology/computer science (9%) to be the most frequent core competencies searched for by employers.

With respect to the integration of PhDs into professional organizations, employers reported hiring PhD degree holders mainly for positions in R&D (85%), as well as a number of other positions outside of R&D (e.g., IT, administration, finance, consulting). PhD hires also represented diverse backgrounds with respect to fields of doctoral research. Overall, employers were satisfied with PhD hires (e.g., 89% were “very satisfied” or “satisfied” with their most recent PhD hire); however, perceptions as to the necessity of a PhD for the roles filled were not as consistent (e.g., 61% of employers agreed that a doctoral degree was “very “ or “absolutely” necessary for the most recent position filled by a PhD).

Looking forward to future PhD recruitment, a promising number of employers indicated that they would hire a PhD again (88% of employers who had previously hired a PhD). With respect to these intended hires, a large portion (73%) were for R&D roles, with other intended roles shedding light on opportunities in IT, administration, consulting, production, finance, healthcare, communication, and sales. Turning to compensation, anticipated annual salary ranges for the positions intended for new PhD hires were largely (62%) between \$60,000 and \$80,000. Lastly, employers presented varying views on accountability for supporting PhD holders in gaining industry knowledge, with the majority (55%) pointing responsibility to the companies that hire PhDs.

Chapter 5. PhD Careers

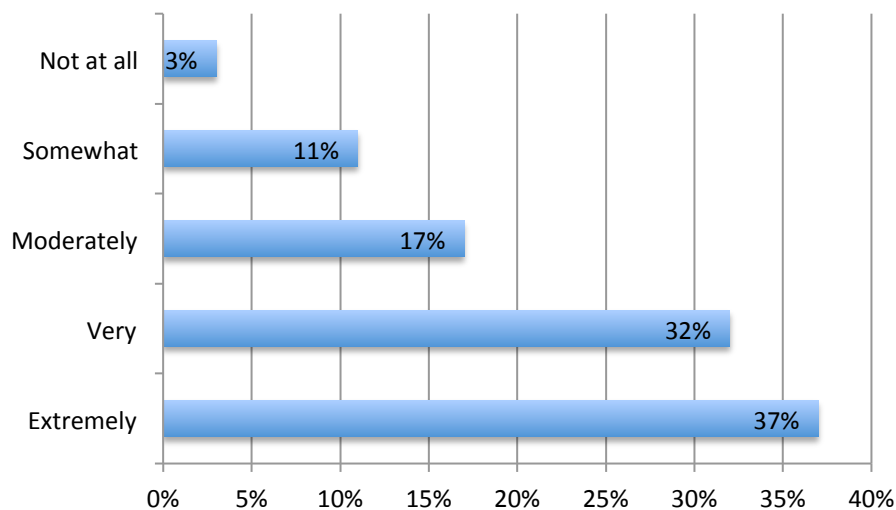
Turning back now to the PhD holders who participated in our research study, the objective of this fifth and final results chapter is to provide an overview of the professional opportunities for PhD holders in Canada. The following employment analyses highlight careers in the public, private or non-profit sectors, and in research and development positions (R&D) or positions outside R&D. Alongside employment characteristics, we also examine PhDs holders' satisfaction with their doctoral program and salary expectations. Furthermore, we analyze interactions between specific employment characteristics (e.g., type of employing institution by number of years passed since the dissertation defense).

5.1. The PhD and Employment

As can be seen in Figure 21, 69% of PhD holders rated the importance of their PhD as “very” or “extremely important” in preparing them for their career. Only 3% of PhD holders rated their PhD as being “not at all” important in preparing them for their career.

Figure 21

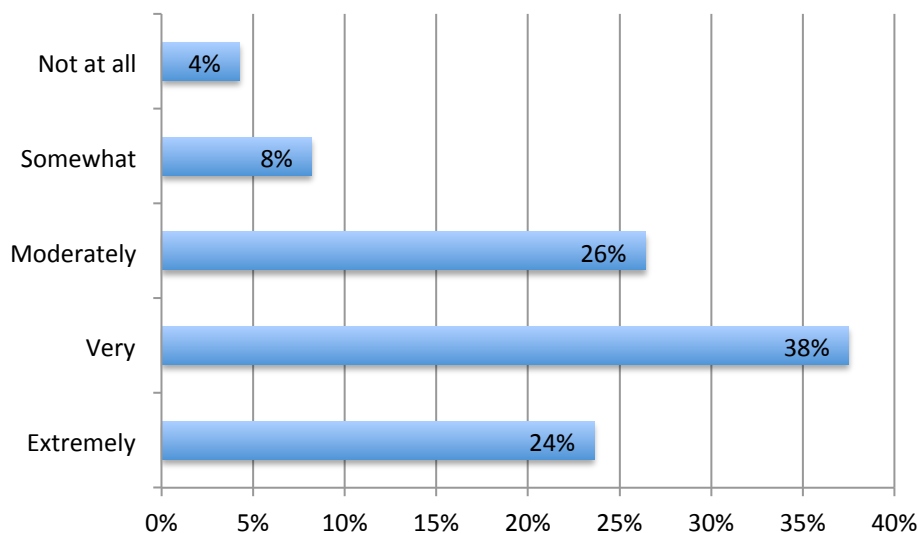
Importance of the PhD in preparing responding PhD holders for their career



With respect to their doctoral programs, 88% of PhD holders reported positive satisfaction, as can be seen in Figure 22.

Figure 22

Responding PhD holders' satisfaction with their doctoral program



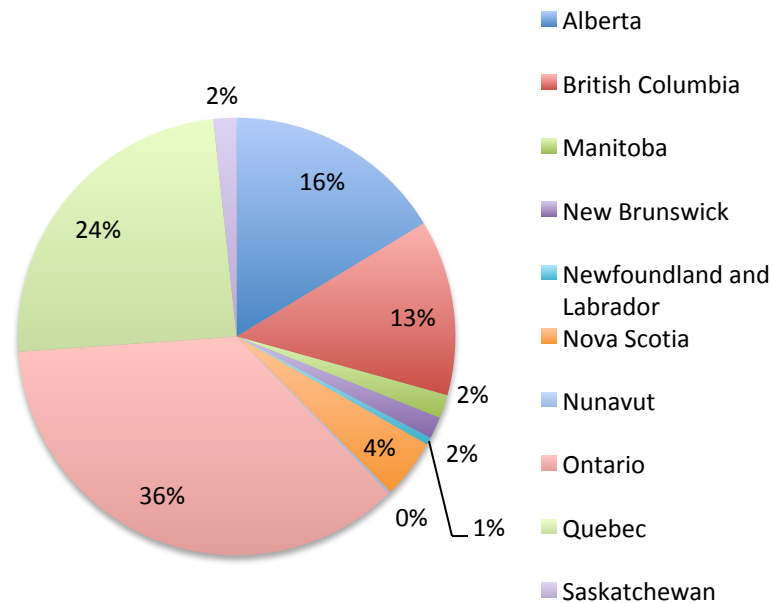
Of the PhD holders responding to our questionnaire, 15% reported to be actively looking for a job (or another opportunity), and 4% were engaged in further studies, obtaining a certification, or voluntarily retired. Statistics Canada census data reported by the Conference Board of Canada (CBC, Edge & Munro, 2015), the employment rate of PhDs was 85.6% in 2011 and the unemployment rate was approximately 4.1% in 2011 (lower than the estimated rates of all other education levels that year, including for those with master's degrees -5%-). This suggests that approximately 11% of PhD holders are looking for a better opportunity while having a position.

Regarding location of employment for PhD holders, 84% were employed within Canada and 16% were employed outside of Canada. Of the 84% of employed PhD holders working within Canada, 60% were employed in the provinces of Ontario (24%) and Quebec (36%), as can be seen in the distribution of provinces of employment depicted in Figure 23. Looking to the most recent information available from the Government of Canada, census data of employment by

province from Statistics Canada shows that 21% of individuals holding Masters' and PhD degrees were employed in Quebec in 2016 and 46% were employed in Ontario. Additionally, 29% of PhD graduates in 2016 completed their degree at Quebec universities, while 40% completed their degrees in Ontario that year (Statistics Canada). As for the 16% of PhD holders from our study that were employed and working outside of Canada, 35% of them were employed in the U.S., 18% in France, and 11% in the U.K. (see Appendix I for the complete distribution of PhD holder employment locations outside of Canada).

Figure 23

Provinces of employment for responding PhD holders within Canada



5.2. PhD Employment: Types of Institutions

Of PhD holders responding to our survey, 66% reported wanting an academic career. In reality, 53% were working at a university, which is higher compared to the national average of 40% reported by the CBC (Edge & Munro, 2015). Following universities, 30% of PhD holders were employed in private, industrial, or commercial institutions, 14% worked in public (social or

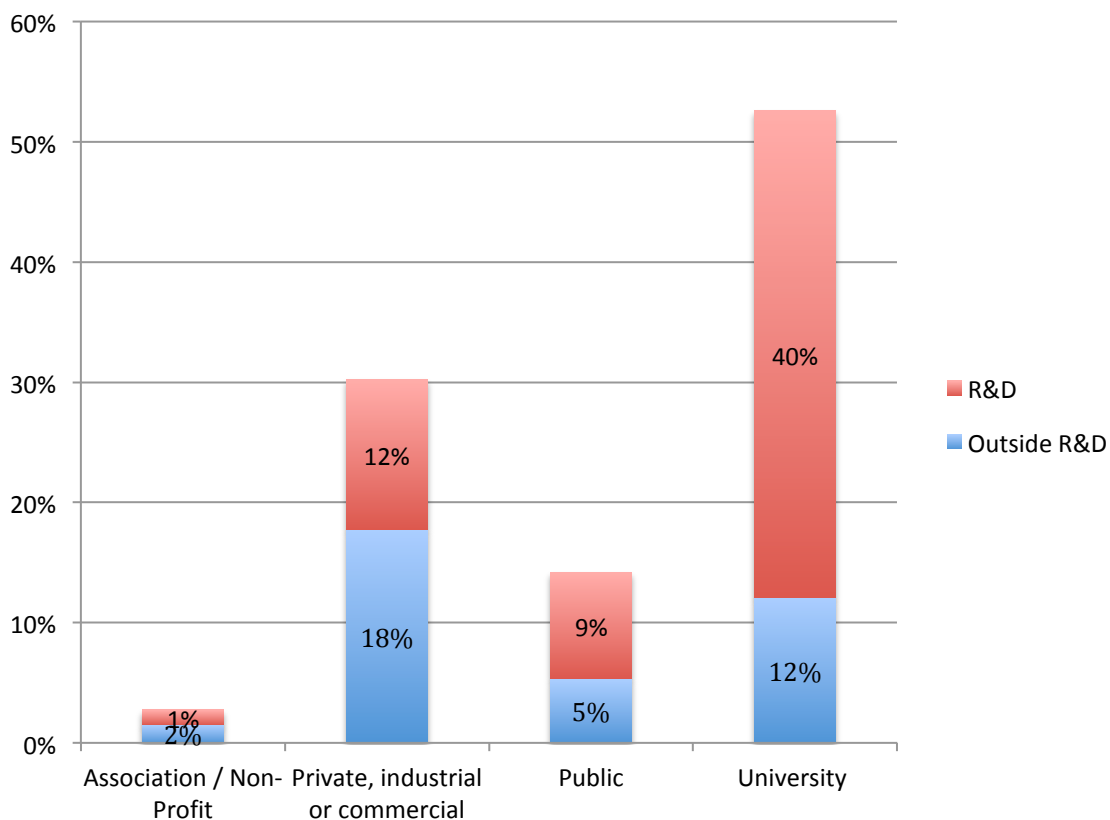
governmental services, health, education outside university) institutions, and 3% worked in associations or non-profit organizations.

5.2.1. Institution type by job function (R&D vs. outside R&D)

Overall, 63% of responding PhD holders reported working in R&D positions and 37% reported working in positions outside of R&D. Given common perceptions of PhDs to be solely researchers, 37% represents a promising area of potential careers for PhDs, particularly in private institutions. Taking a closer look (Figure 24), we've examined the distributions of R&D positions within the different types of institutions in which responding PhD holders were employed. As depicted in Figure 24 below, more than half of PhD holders working in private institutions were employed in positions outside of R&D (60%), whereas just under 36% of PhDs working in public institutions had positions outside of R&D.

Figure 24

Responding PhD holders' job function (R&D vs. outside of R&D) by institution type

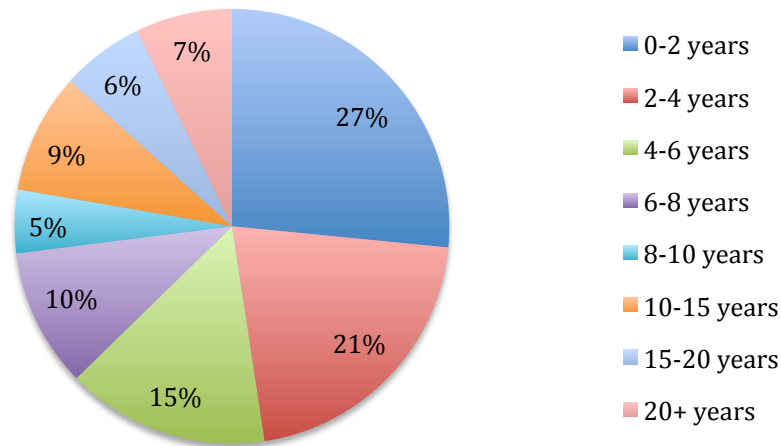


5.2.2. Institution type by number of years since dissertation defense

Of all PhD holders responding to our questionnaire, almost half (48%) had defended their dissertation within the previous four years, with a median of 4.67 years (and an average of 7.56 years) passed since their defense (see Figure 25 for the complete distribution of number of years passed since the dissertation defense of responding PhD holders).

Figure 25

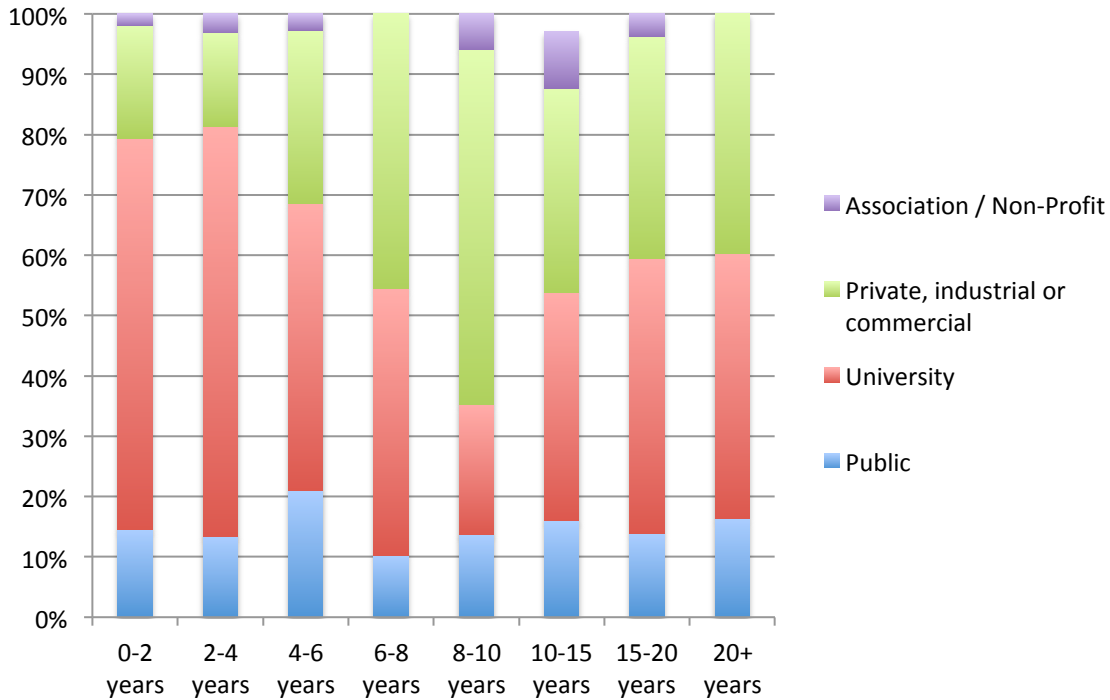
Number of years passed since the dissertation defense of responding PhD holders



Looking now at institution type as a function of the number of years passed since defending their dissertation, we are able to see more specific trends of PhD holders' employment. For example, a trend was observed where PhD holders occupied more university positions early on in their career and more private, as well as increased non-profit, positions only after the first four years following their defense (Figure 26).

Figure 26

Responding PhD employment by type of institution and number of years since dissertation defense



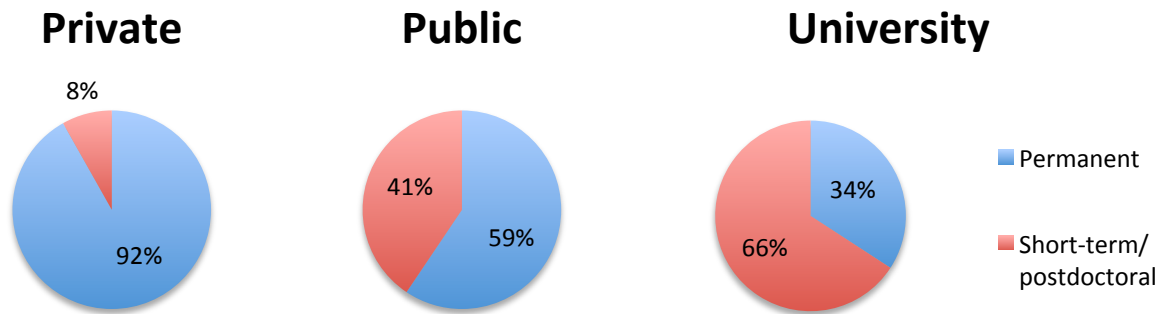
The trends in Figure 26 are likely due, at least in part, to a substantial number of postdoctoral and short-term positions observed within universities, as we will see in the following section exploring the professional situation of PhD holders.

5.3. PhD Employment: Professional Situation

Turning now to employment situation, 56% of responding PhD holders occupied a permanent (or salaried) position, or were self-employed, with the remaining 44% of PhD holders occupying short-term or postdoctoral positions. Looking more specifically as to the types of institutions in which responding PhD holders were employed (Figure 27), we can see that positions in private (92%) and public (59%) institutions were mainly permanent, while more than half (66%) of university positions were short-term or postdoctoral positions.

Figure 27

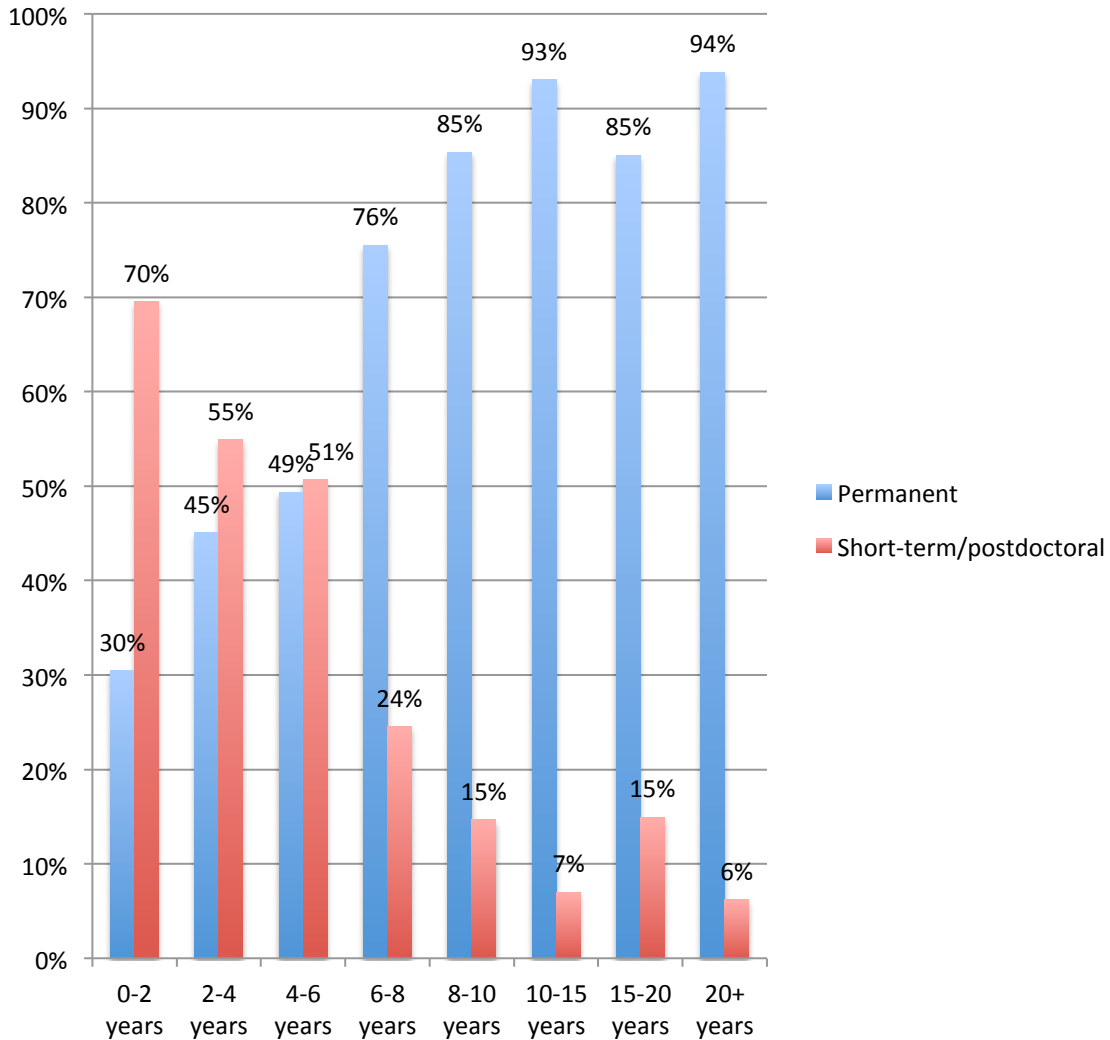
Responding PhD employment by professional situation and institution type



Quite clearly, an inverse trend is observed in which short-term and postdoctoral positions are more predominant early on and decrease with the number of years passed from PhD holders' dissertation defense, whereas permanent positions represent the minority early on in PhD holders' careers but increase dramatically with the number of years passed following the defense (Figure 28). Professional stabilization seems to occur between the 4th and 6th year after the doctorate.

Figure 28

Responding PhD holders' employment by professional situation and number of years since dissertation defense

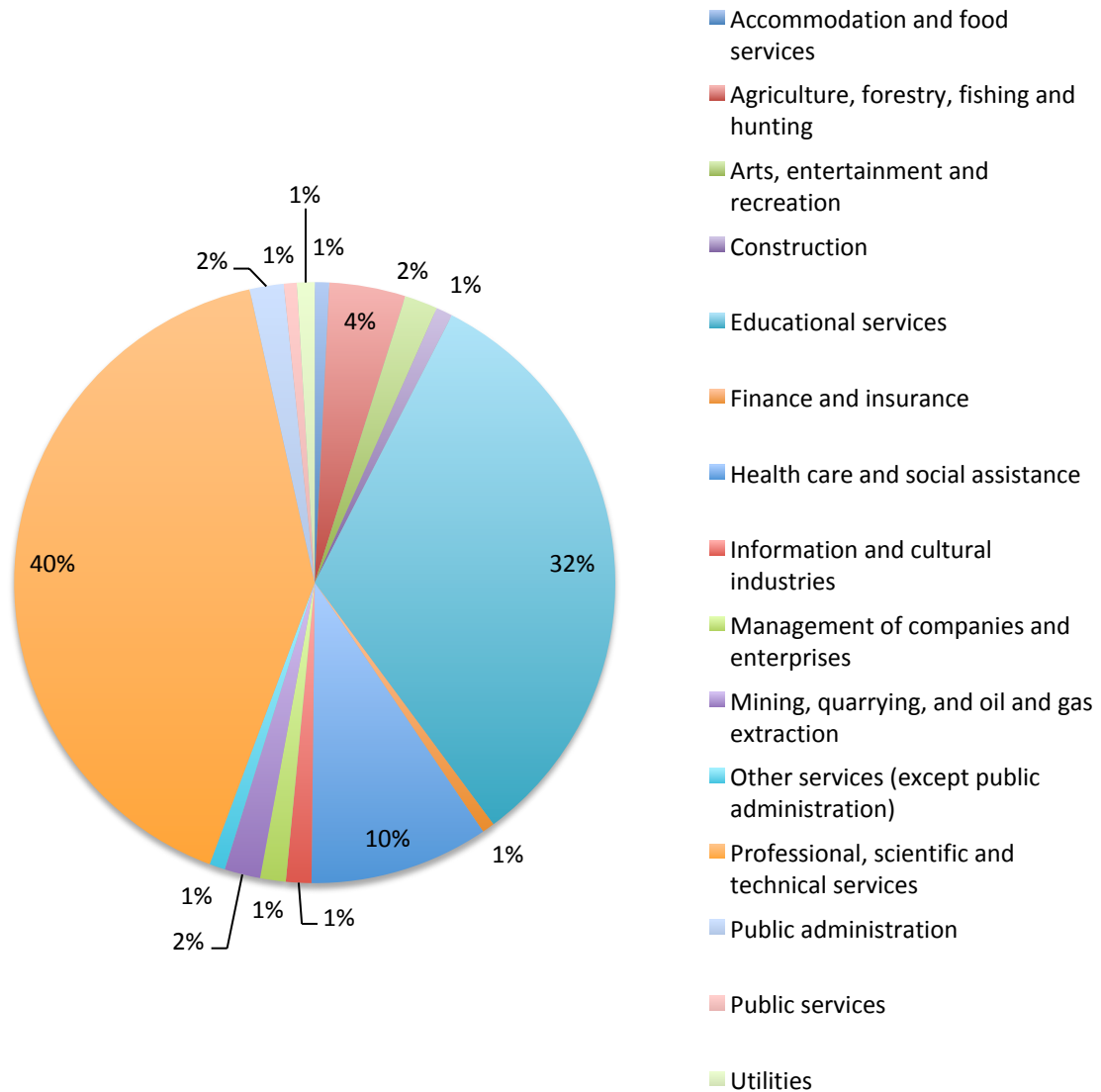


5.4. PhD Employment: Sector of Activity

Moving on to the examination of which sectors of employment were occupied by responding PhD holders, the most represented sectors were professional, scientific, and technical services (40%), and educational services (32%), followed by health care and social assistance (10%). The full distribution of PhD holder sectors of activity is depicted in Figure 29 below.

Figure 29

Responding PhD holder employment by sector of activity



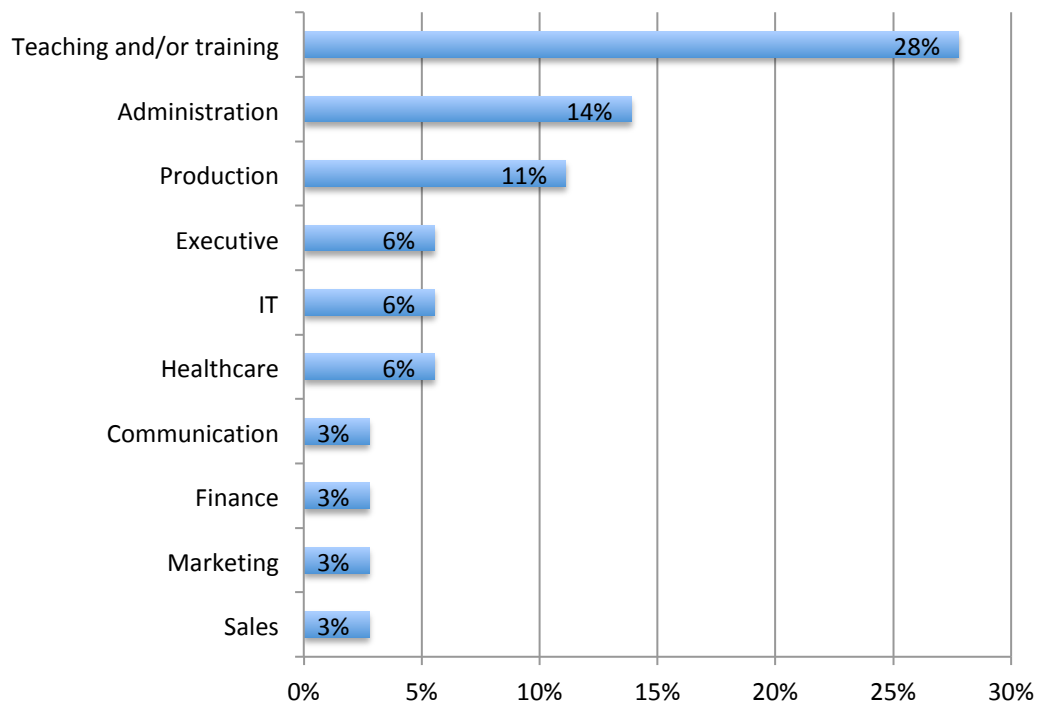
5.5. PhD Employment: Positions outside of R&D

Returning now to responding PhD holders' job function, we found 37% of PhD holders to hold positions outside of R&D. The most frequently occupied non-R&D positions were teaching and/or training positions (28%), followed by consulting (19%), administration (i.e., performance

of executive duties; 14%), and production (11%). Figure 30 provides the complete distribution of non-R&D positions occupied by responding PhD holders. As indicated earlier in the chapter, these positions shed an important light on the opportunities available to PhD holders in Canada outside of mainstream R&D positions.

Figure 30

Responding PhD holder positions outside of R&D

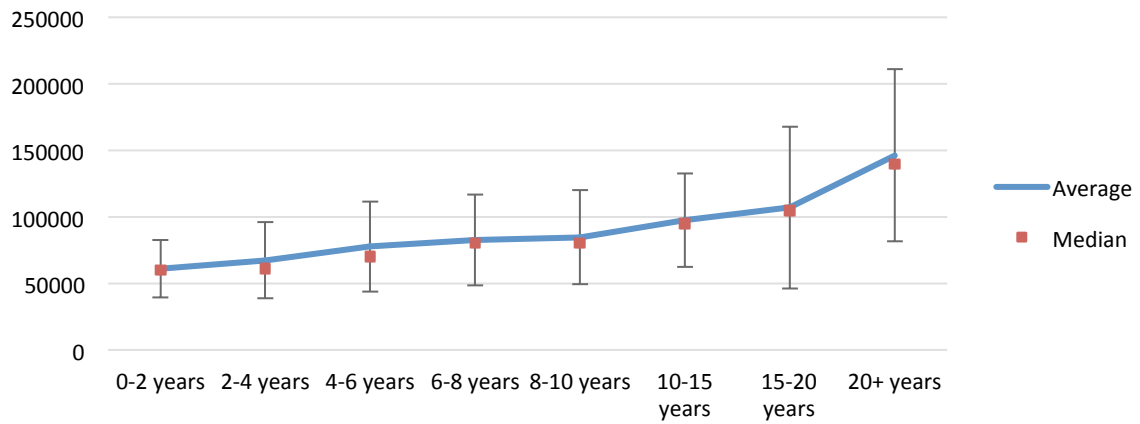


5.6. PhD Employment: Compensation

The final section of this results chapter deals with responding PhD holders' compensation. PhD holders reported an average salary of \$80,775 (CAD), with the median salary of PhD holders coming in at \$70,000 (with the 1st and 3rd quartiles found to be at \$50,000 and \$100,000, respectively). Figure 31 shows a trend of increasing PhD salaries with seniority.

Figure 31

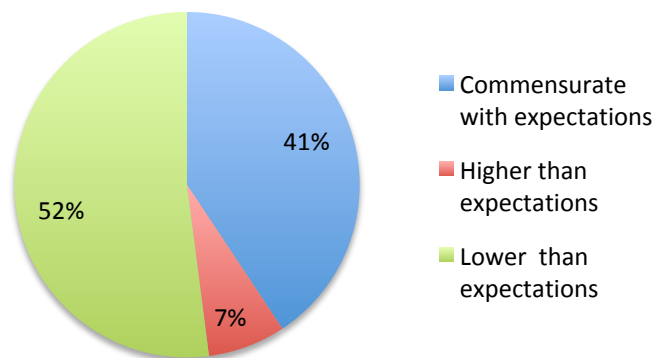
PhD salary by seniority



Regarding salary expectations, just over half of responding PhD holders reported earning a salary that was lower than what they had expected (Figure 32).

Figure 32

PhD holders' salary with regard to expectations



5.7. Results Summary

In examining the data on PhD holders from the present study, we have touched upon a number of trends with respect to employment status, institution type, and positions, as well as how some of these employment characteristics interact with the number of years passed since the dissertation defense. Firstly, the fact that the majority of PhD holders rated their doctoral degree as highly important in preparing them for their career sheds a positive light on doctoral programs with respect to career preparation. With respect to the types of positions occupied, trends showed 44% of PhD holders to occupy short-term or postdoctoral positions, with most of these positions taking place at a university early on in their career. Inversely, more PhDs were employed in permanent positions and in private institutions after a few years. Turning to employment prospects for PhDs in Canada, numerous sectors of activity were represented by the PhD holders surveyed. In particular, scientific and technical services, educational services, and healthcare and social assistance represented the most frequent sectors of activity occupied by responding PhD holders. PhD holders working in non-R&D roles were employed mainly in teaching and/or training, consulting, administration, and production positions.

Overall, the results presented in this chapter surrounding characteristics of PhD careers shed light on various opportunities for PhD holders in Canada, as well as interacting trends. While increasing permanent positions by number of years since PhD defense and various non-R&D positions highlight positive themes from the present study data, there are also notable areas of improvement. For example, the majority of PhD holders (52%) reported receiving a salary that was below their expectations, indicating either low salaries for PhD holders or expectations that were too high as a result of a lack of knowledge of the labour market. For reference, the Canadian Postdoctoral National reported that nearly half of all postdoctoral fellows earned an annual income of less than \$45,000 (CAD) in their 2016 survey report (Canadian Association of Postdoctoral Scholars; CAPS, 2016). Again, given that nearly half of the PhD holders sampled in our study had defended their dissertation in the previous four years and were employed in either short-term or postdoctoral positions, results pertaining to salary satisfaction do not come as a surprise in light of the existing CAPS salary data.

Chapter 6. Conclusions and Recommendations

6.1. Conclusions

In the context of moving toward a knowledge-based society and economy, opportunities for PhDs to fuel innovation in both academic and non-academic roles in Canada become increasingly apparent. In response to a shifting landscape of PhD employment that involves trends toward non-academic careers, this report presents findings of the first nation-wide study of PhD competencies developed during doctoral training alongside the needs and expectations of employing organizations in Canada. Through the lens of Durette et al.'s (2012, 2014) PhD competency framework, findings from the present study provide valuable insights on the pool of competencies likely to be possessed by PhDs across disciplines, as well as competencies specific to factors of the PhD profile (i.e., discipline of doctoral research, seniority, and mode of financing the doctorate).

Given that there are a number of misperceptions surrounding PhDs, their skills, and the organizations that employ them, the present study aims to provide transparency on the topic of PhD employment integration in two ways. First, by helping PhDs identify their competencies and employment opportunities in the context of the current labour market and second, by aiding organizations that employ PhDs (past, present, or future) in gaining a better understanding of PhD competencies and the employment profiles of PhD holders. Our approach to evaluating competency alignment has led to several observations that introduce novel information into the existing literature on PhD competencies and employment integration in Canada.

Firstly, the identification of a pool of core competencies provides a reference framework of PhD competencies that extend beyond traditional perceptions of scientific knowledge and technical expertise being the sole asset of PhDs in professional settings. Specifically, the 38 core competencies identified represent additional categories of behaviors, dispositions, and skills that can be learned formally and informally (e.g., inside vs. outside of a formal learning setting).

Of importance is the combination of these competencies that specifies the potential of PhDs to be successful in their careers, in that acting competently in professional situations requires one to go beyond drawing upon individual skills and to mobilize their pool of competencies in conjunction with each other in the context of accomplishing a professional task. Going beyond the pool of core competencies, results from this study have also shown PhDs to develop additional competencies that enrich the pool of core competencies, and that these competencies are specific to characteristics of the PhD profile (i.e., discipline of doctoral research, seniority, mode of financing during PhD; Figure 6).

Secondly, since a pool of PhD competencies provides a basis for comparing the competencies reported by PhDs and the needs of employers, we have been able to observe where there is alignment between PhD competencies and the needs and expectations of employers, as well as where misperceptions may lie. For example, we observed scientific and technical expertise, digital technology/computer science, and interpersonal skills to be the top three core competencies searched for by employers, indicating that the PhD fosters the development of competencies that are currently crucial for organizations. Accordingly, findings of employers who have already hired PhDs to report high levels of satisfaction with previous PhD hires (89% “satisfied” or “very satisfied; Figure 18)” and to have intentions to hire a PhD again (88% indicating yes and 8% indicating maybe) serve to validate this notion.

Finally, when examining PhD employment integration in Canada, we observed a number of professional opportunities in the profiles of employed PhD holders and the organizations that employ them. The present study provides evidence that PhDs are already utilizing their competencies in a wide range of sectors, in public and private structures, as well as in roles directly related to R&D and in other roles (teaching, training, consulting, administration, etc.). Overall, we hope that this report will be used as a tool in recalibrating our perceptions of the PhD, the value of the competencies developed during the process of doctoral training, and the potential for PhDs to mobilize these competencies in professional roles that drive the Canadian economy.

6.2. Recommendations

Following from our conclusions in the context of an evolving PhD employment landscape, we introduce here a few recommendations concerning PhDs, competencies, and employment integration. There are a number of key stakeholders involved in the processes of identifying and developing competencies during doctoral training, as well as in fully utilizing and successfully mobilizing them in professional situations (e.g., PhDs, universities, supervisors, deans, program directors, recruiters, employing organizations, Tri-council agencies, education and professional organizations). Given that multiple roles are often simultaneously involved throughout these processes, recommendations are thematized based on their subject matter.

6.2.1. Career Planning

While career planning services and professional development programming continue to be a staple in higher education institutions, there are still many PhDs who do not engage in career planning prior to their defense (e.g., 14% of PhD holders did not consider their PhD as important in preparing them for their career; Figure 21). One recommendation is for PhDs to engage in career planning prior to and during the beginning stages of their doctoral program as opposed to only in the later stages. Recommended activities include increasing awareness of non-academic career options such as being knowledgeable of data on PhD employment outcomes, as well as the different types of careers that exist and the skills associated with such careers. Furthermore, we recommend increasing awareness of the motivations for entering doctoral training and subsequent career preparation in light of recent research emphasizing the importance of understanding such motivations with respect to personal, intellectual, and professional motivations in a study exploring how Canadian PhDs navigate their career paths (Skakni, 2018).

6.2.2. Competency awareness

Following from the observation of our pool of competencies to be a link between PhDs and employers, we recommend increasing awareness of competencies developed through research and doctoral training. As indicated above, this process requires the involvement and commitment of PhDs, universities (and individual personnel), recruiters, employers, and

involved organizations. For example, the notion of doctoral competencies could be introduced in quality assessment and program design & evaluation frameworks (beyond PhD programs, one example is the CanMEDS framework for competency-based medical education in Canada), as well as be a compulsive part of funding programs (e.g., Tri-Council). As increased awareness and focus on PhD competencies opens the door to employment opportunities and communication between PhDs and employers, this recommendation aligns with recent initiatives of the Canadian Council of Academies in gaining a deeper understanding of the barriers to PhD career transitions, and we hope that the present report will serve as a tool to support PhDs and institutions in overcoming those barriers.

6.2.3. Employment

Recommendations surrounding the employment integration of PhDs include the structuring of positions that leverage the competency pool of PhDs, which could be highly beneficial for employing organizations with respect to innovation and productivity, as well as PhD employee retention. Additionally, we call for positions that require a PhD to be advertised as such, and that the time dedicated to doctoral training be recognized as professional work since valuable competencies with the potential to extend to other professional situations are developed during this period. With respect to the currently available labour market information specific to PhDs, we also recommend that data collected in future research differentiate between outcomes for MAs and PhDs in order to address a gap of information on PhD employment experiences, trends, and outcomes.

6.2.4. Partnerships

Our final recommendation pertains to the creation and strengthening of industry-academic partnerships, which includes activities such as promoting PhD participation in industrial activities early on in doctoral training to develop a non-academic network, and having employers come into university classes to give information sessions and coordinate professional experience-building activities. Similarly, such partnerships would provide employers with opportunities to get to know PhDs and to grow their recruitment network (see present study results and Edge & Munro, 2015 for findings of PhD integration to be an indicator

of future PhD hires). Other potential activities include events with industry partners where PhDs could have an opportunity to immerse themselves in solving unfamiliar problems, such as case study challenges with a sponsored award for winners.

6.3. Future Directions

Finally, there are a number of future directions to explore with regard to research and practical applications of PhD competency identification, development, and mobilization, particularly in relation to employment. A first step in future directions involves deeper exploration into perceptions on these topics, with qualitative content for example, from multiple sources (e.g., PhDs, supervising faculty, deans, employers). By delving into the perceptions of multiple sources, we will be better equipped to understand roots and trends of alignment or misalignment between perceptions (e.g., employers' perceptions of PhDs, PhDs' perceptions of the labour market). A second step in future directions involves solving issues of translation, or language differences, between PhDs and non-academic employers when describing competencies. Whether for differences in general vocabulary used between PhDs and employers, or for differing definitions of competencies, a translation guide or a lexicon of competencies would be a valuable asset in supporting communication between PhDs and employers.

Beyond perceptions and communication, further examination of PhD experiences during and after transitioning into non-research positions is needed. In addition to qualitative methods, quantitative analyses of PhD job and salary satisfaction would provide useful labour market information, just as analyses of doctoral training satisfaction and value in PhD careers would be advantageous in helping maintain quality assurance of higher education programs, particularly with regard to employability. Longitudinal research examining the steps that comprise PhD career paths would also provide valuable information as to career preparation and transition experiences. Lastly, the question of whether PhDs utilize competencies to their full extent in professional positions remains to be answered. As such, an addendum to this report with additional data findings will be published to answer some of these questions (e.g., perceptions of PhDs, employers, and deans based on qualitative data; PhD employment satisfaction and

competence utilization). In the future, we hope to address some of these issues and foster an ongoing dialogue on the value of the PhD and how competencies can be effectively mobilized in helping PhDs make gainful contributions to an evolving knowledge society and economy.

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Appendix A: Category Regroupings of PhD Research Disciplines

Table A1

Corresponding disciplines of doctoral research between questionnaire response options and major fields of study for earned doctorates surveyed by the Statistics Canada (2016 census)

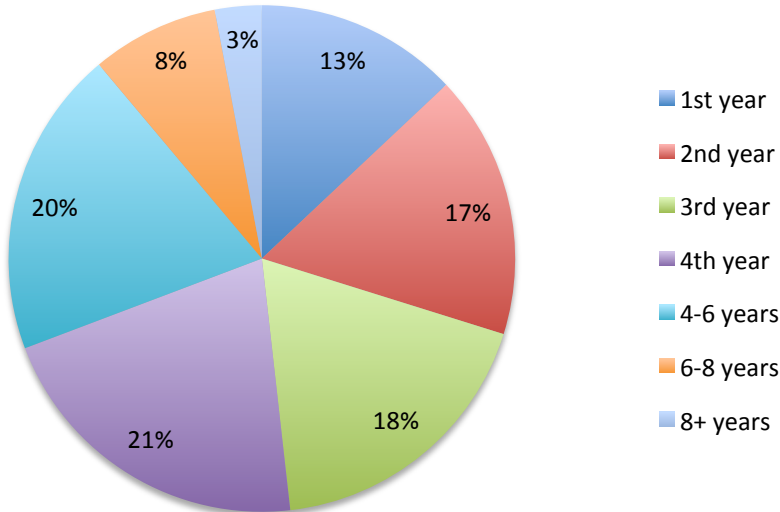
	Physical & life sciences & technologies	Social & behavioural sciences & law	Architecture, engineering & related technologies	Health & related fields	Humanities	Mathematics, computer & information sciences	Business, management & public administration	Education	Visual & performing arts, & communications technologies	Agriculture, natural resources & conservation	Personal, protective & transportation services
Administration & Management							x				
Anthropology		x									
Arts									x		
Chemistry	x										
Computer Sciences						x					
Earth Sciences	x										
Economics							x				
Education								x			
Engineering & technology			x								
Finance							x				
Geography		x									
History					x						
Humanities					x						
Languages & literature					x						
Law		x									
Management							x				
Mathematics & Statistics						x					
Medical Sciences & biology				x							
Philosophy					x						
Physics	x										
Political Sciences							x				
Psychology		x									
Religious Studies		x									
Social Sciences		x									

Sociology		x										
Space Sciences	x											

Appendix B: Responding PhD Candidates' Level of Seniority

Figure B1

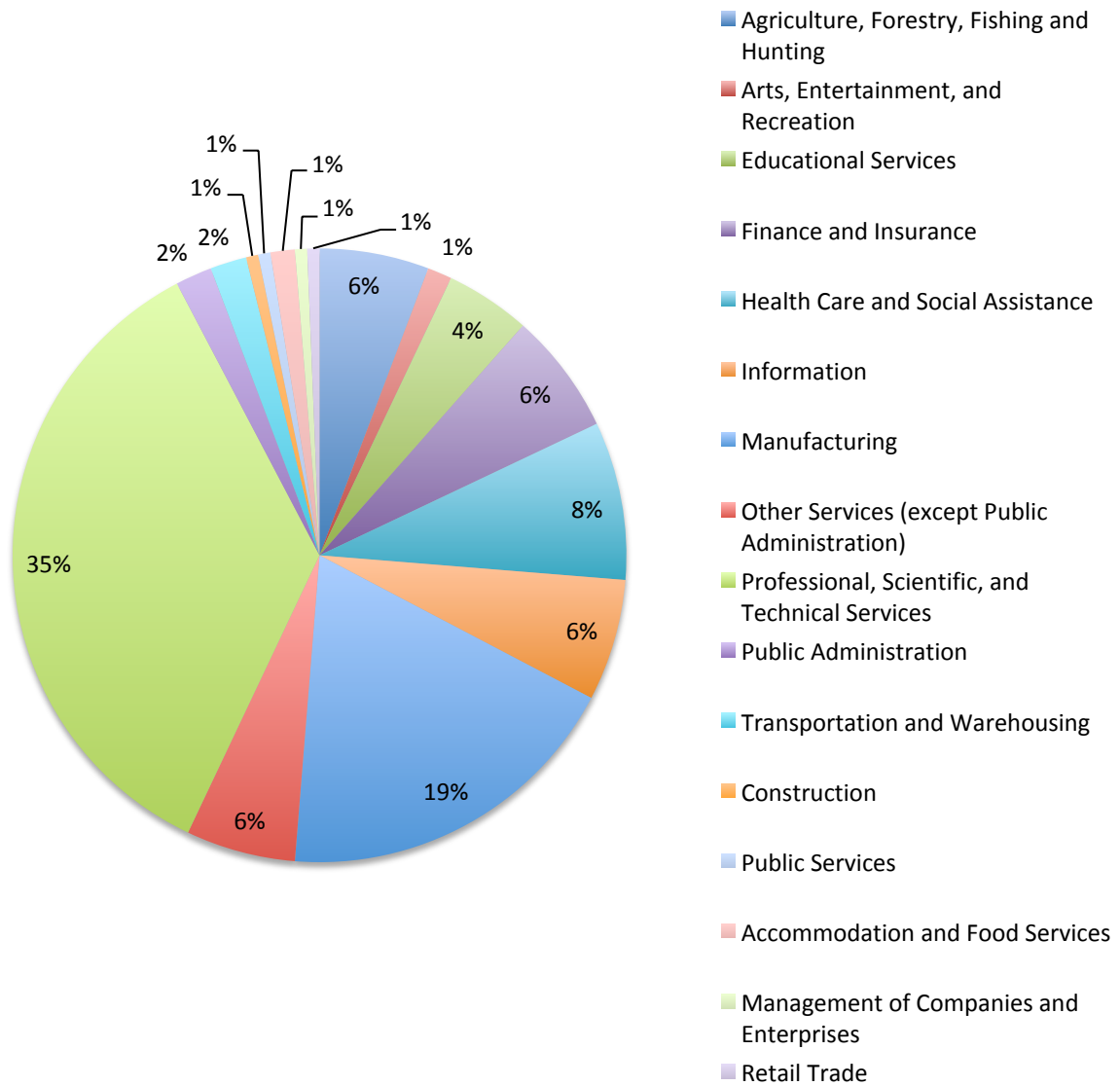
Distribution of responding PhD candidates by number of years since beginning their doctoral training



Appendix C: Sectors of Activity of Responding Organizations

Figure C1

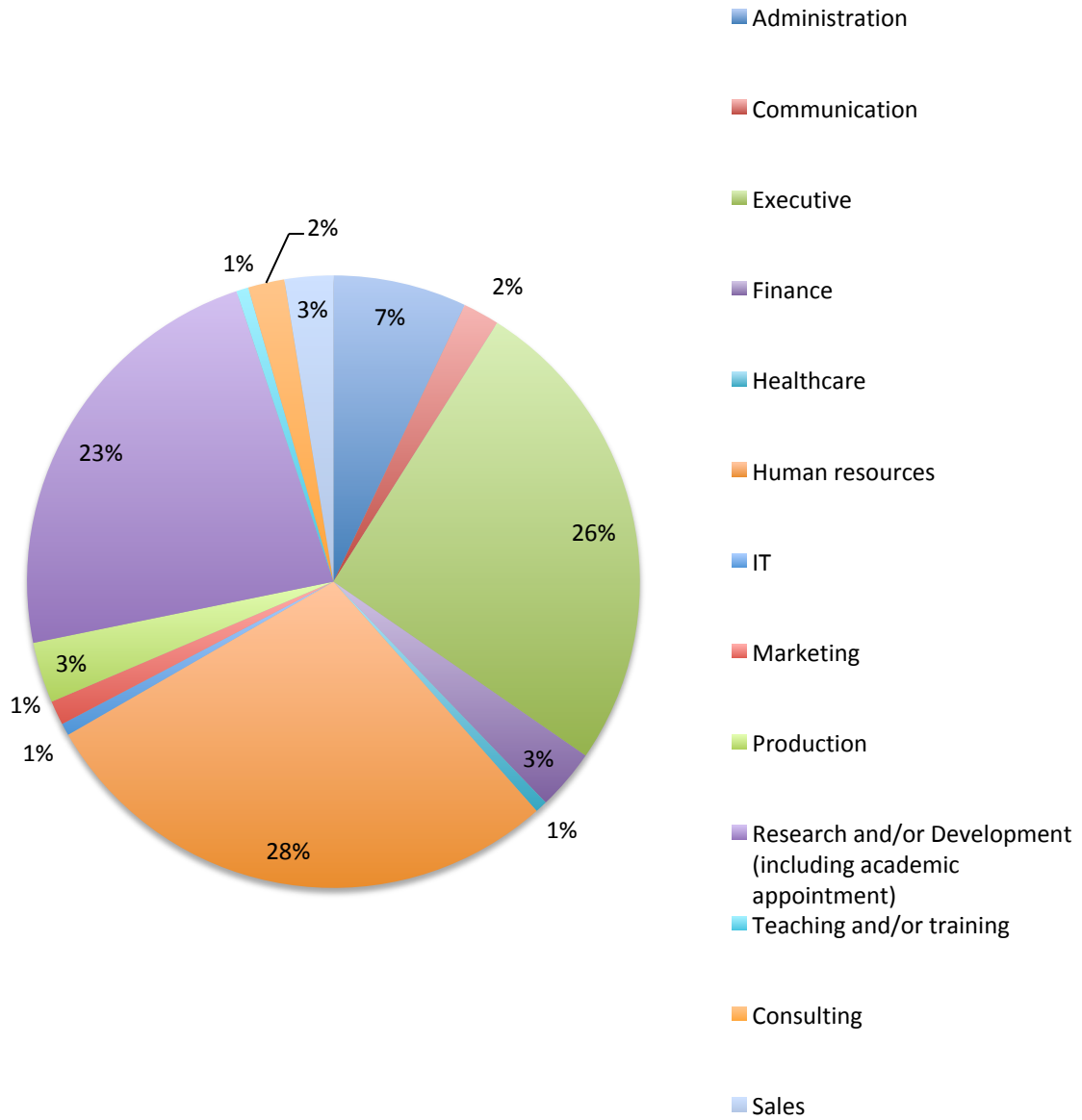
Distribution of sectors of activity of responding organizations



Appendix D: Roles of Responding Employers

Figure D1

Distribution of roles of responding employers



Appendix E: PhD Survey

What is your date of birth? (MM/DD/YYYY)

What is your gender?

1. Male
2. Female
3. Other

What is your citizenship?

Afghanistan	Chile	Guinea
Albania	China	Guinea-Bissau
Algeria	Colombia	Guyana
Andorra	Comoros	Haiti
Angola	Congo	Honduras
Antigua & Deps	Congo {Democratic Rep}	Hungary
Argentina	Costa Rica	Iceland
Armenia	Croatia	India
Australia	Cuba	Indonesia
Austria	Cyprus	Iran
Azerbaijan	Czech Republic	Iraq
Bahamas	Denmark	Ireland {Republic}
Bahrain	Djibouti	Israel
Bangladesh	Dominica	Italy
Barbados	Dominican Republic	Ivory Coast
Belarus	East Timor	Jamaica
Belgium	Ecuador	Japan
Belize	Egypt	Jordan
Benin	El Salvador	Kazakhstan
Bhutan	Equatorial Guinea	Kenya
Bolivia	Eritrea	Kiribati
Bosnia Herzegovina	Estonia	Korea North
Botswana	Ethiopia	Korea South
Brazil	Fiji	Kosovo
Brunei	Finland	Kuwait
Bulgaria	France	Kyrgyzstan
Burkina	Gabon	Laos
Burundi	Gambia	Latvia
Cambodia	Georgia	Lebanon
Cameroon	Germany	Lesotho
Canada	Ghana	Liberia
Cape Verde	Greece	Libya
Central African Rep	Grenada	Liechtenstein
Chad	Guatemala	Lithuania

Luxembourg	Panama	Suriname
Macedonia	Papua New Guinea	Swaziland
Madagascar	Paraguay	Sweden
Malawi	Peru	Switzerland
Malaysia	Philippines	Syria
Maldives	Poland	Taiwan
Mali	Portugal	Tajikistan
Malta	Qatar	Tanzania
Marshall Islands	Romania	Thailand
Mauritania	Russian Federation	Togo
Mauritius	Rwanda	Tonga
Mexico	St Kitts & Nevis	Trinidad & Tobago
Micronesia	St Lucia	Tunisia
Moldova	Saint Vincent & the	Turkey
Monaco	Grenadines	Turkmenistan
Mongolia	Samoa	Tuvalu
Montenegro	San Marino	Uganda
Morocco	Sao Tome & Principe	Ukraine
Mozambique	Saudi Arabia	United Arab Emirates
Myanmar, {Burma}	Senegal	United Kingdom
Namibia	Serbia	United States
Nauru	Seychelles	Uruguay
Nepal	Sierra Leone	Uzbekistan
Netherlands	Singapore	Vanuatu
New Zealand	Slovakia	Vatican City
Nicaragua	Slovenia	Venezuela
Niger	Solomon Islands	Vietnam
Nigeria	Somalia	Yemen
Norway	South Africa	Zambia
Oman	Spain	Zimbabwe
Pakistan	Sri Lanka	Other (please specify)
Palau	Sudan	

When did you start your PhD? (MM/DD/YYYY)

At which post-secondary institution did you (or will you) obtain your PhD?

Athabasca University	Emily Carr University of Art + Design
University of Alberta	Carr University of Art + Designn
University of Calgary	Fairleigh Dickinson University
University of Lethbridge	Kwantlen Polytechnic University
MacEwan University	QUEST UNIVERSITY CANADA
Mount Royal University	Royal Roads University (Victoria)
Capilano University	Simon Fraser University

Thompson Rivers University
Trinity Western University (Langley)
University of Victoria
University of British Columbia Okanagan
University of British Columbia Vancouver
University of the Fraser Valley
University of Northern British Columbia
University of Victoria
Vancouver Island University
Brandon University
Canadian Mennonite University
Université de Saint-Boniface
The University of Winnipeg
University of Manitoba
University College of the North
Crandall University
Mount Allison University
St. Thomas University
St. Stephen's University
University of Moncton
University of New Brunswick
Atlantic School of Theology
Nova Scotia Agricultural College
Acadia University
Cape Breton University
Dalhousie University
The University of King's College
Mount Saint Vincent University
NSCAD University
St. Francis Xavier University
Saint Mary's University
Université Sainte-Anne
Algoma University
Brock University
Carleton University
Dominican university college
University of Guelph
Université de Hearst
Lakehead University
Laurentian University
McMaster University
Royal Military College of Canada
Nipissing University
Ontario College of Art and Design University

University of Ontario Institute of
Technology
University of Ottawa,
Queen's University
Ryerson University
St. Lawrence College
Saint Paul University
University of Toronto
Trent University
Tyndale University College and Seminary
University of Waterloo
University of Western Ontario
Wilfrid Laurier University
University of Windsor
York University
University of Prince Edward Island
Bishop's University
Concordia University
Université de Sherbrooke
Université Laval
McGill University
Université de Montréal
Polytechnique Montréal
HEC Montréal
Université du Québec (Québec)
Université du Québec en Abitibi-
Témiscamingue (Rouyn-Noranda)
Université du Québec à Chicoutimi
(Saguenay)
Université du Québec à Montréal
(Montréal)
Université du Québec en Outaouais
(Gatineau)
Université du Québec à Rimouski
Université du Québec à Trois-Rivières
École de technologie supérieure
École nationale d'administration publique
Institut national de la recherche scientifique
TÉLUQ university
First Nations University of Canada
University of Regina
University of Saskatchewan
Other (please specify)

Is/Was your PhD part of a cotutelle (joint university) doctoral program? (Please specify with which country)

<<Chosen from the same list of countries provided for citizenship>>

Have you defended your PhD?

1. No, still working on it
2. No, I left the program
3. Yes, when? (MM/DD/YYYY)

In what discipline is/was your PhD research?

- | | |
|----------------------------------|----------------------------------|
| 1. Arts | 15. Languages and literature |
| 2. Administration and Management | 16. Law |
| 3. Anthropology | 17. Management |
| 4. Chemistry | 18. Mathematics and Statistics |
| 5. Computer Sciences | 19. Medical Sciences and biology |
| 6. Education | 20. Philosophy |
| 7. Finance | 21. Physics |
| 8. Earth Sciences | 22. Political Sciences |
| 9. Economics | 23. Psychology |
| 10. Engineering and technology | 24. Religious Studies |
| 11. Geography | 25. Social Sciences |
| 12. History | 26. Sociology |
| 13. Humanities | 27. Space Science |
| 14. Interdisciplinary Studies | |

How did you fund your PhD?

1. Personal award or scholarship
2. Research grant from your supervisor
3. A professional activity related to your academic interests
4. A professional activity unrelated to your academic interests
5. Personal resources
6. Other (please specify)

What is/was the major source of funding that you received?

- | | |
|--|---------------------------|
| 1. Federal funds: CIHR, SSHRC or NSERC | 5. University |
| 2. Other federal funds | 6. Mitacs |
| 3. Provincial funds | 7. Foreign government |
| 4. Company | 8. Personal resources |
| | 9. Other (please specify) |

What is your current professional situation?

1. You occupy a permanent position (or salaried position)
2. You occupy a short-term or postdoctoral position
3. You are self-employed (e.g. business owner, independent)
4. You are currently looking for a position
5. You have undertaken new studies or certification
6. You are voluntarily unemployed or retired
7. Other (please specify)

Start date: (MM/DD/YYYY)

How important was your PhD in preparing you for your career?

1. Not at all
2. Somewhat
3. Moderately
4. Very
5. Extremely

How satisfied are you with your PhD program?

1. Not at all
2. Somewhat
3. Moderately
4. Very
5. Extremely

During your PhD, was your goal to pursue an academic career?

1. Yes
2. No

Have you had professional experience outside of the university (e.g., internships, research collaboration, Mitacs) during your PhD?

1. Yes, with a Mitacs internship
2. Yes, without a Mitacs internship
3. No

Where is your workplace located?

<<Within Canada:>>

Ontario	British Columbia	Newfoundland and Labrador
Quebec	Prince Edward Island	Northwest Territories
Nova Scotia	Saskatchewan	Yukon
New Brunswick	Alberta	Nunavut
Manitoba		

<<Outside of Canada: Chosen from the same list of countries provided for citizenship>>

In which type of institution are you working?

1. Public (social or governmental services, health, education outside university)
2. University (colleges and public university included)
3. Private, industrial or commercial
4. Association / Non-Profit
5. Other (please specify)

What is your employer's sector of activity?

1. Agriculture, forestry, fishing and hunting
2. Mining, quarrying, and oil and gas extraction
3. Utilities
4. Construction
5. Wholesale trade
6. Information and cultural industries
7. Finance and insurance
8. Real estate and rental and leasing
9. Professional, scientific and technical services
10. Management of companies and enterprises
11. Administrative and support, waste management and remediation services
12. Educational services
13. Health care and social assistance
14. Arts, entertainment and recreation
15. Accommodation and food services
16. Other services (except public administration)
17. Public administration
18. Other (please specify)

How many employees work in your organization?

1. 0 - 9 employees
2. 10 - 19 employees
3. 20 - 49 employees
4. 50 - 99 employees
5. 100 - 249 employees
6. 250 - 499 employees
7. 500 - 4999 employees
8. ≥ 5000 employees

What function/department do you occupy within your organization?

1. Research and/or Development including academic appointment
2. Teaching and/or training
3. Consulting
4. IT
5. Sales
6. Executive
7. Marketing
8. Communication
9. Finance
10. Production
11. Administration
12. Healthcare
13. Other (please specify)
14. Open-Ended Response

What is your job title?

What is your annual salary before taxes in Canadian dollars?

On average, what are your yearly bonuses in Canadian dollars?

Is your salary:

1. Commensurate with your expectations?
2. Higher than your expectations?
3. Lower than your expectations?

Below is a list of competencies, including skills, knowledge, and attributes, that have been suggested by PhD graduates in a previous survey. Select all competencies that you have gained or improved during your PhD (at least 5).

1. Scientific and technical expertise
2. Knowledge of the academic environment
3. Knowledge of the industrial environment
4. Knowledge of regulations
5. Ethics
6. Safety concerns
7. Written communication
8. Oral communication
9. Visual communication
10. Popular scientific communication
11. Teaching
12. Pedagogy
13. Communication tools
14. Digital technology / computer science
15. Scientific monitoring
16. Research promotion and valorization
17. Project initiation
18. Feasibility study
19. Finding funding opportunities
20. Planning
21. Time management
22. Personnel management
23. Financial management
24. Quality management
25. Conflict management
26. Risk management
27. Reporting to superiors
28. Result-oriented
29. Written foreign languages
30. Oral foreign languages
31. Product knowledge
32. Understanding of customers' needs
33. Finding prospective customers
34. Negotiation skills
35. Interaction with customers
36. Promoting products
37. Administrative management
38. General knowledge
39. Big picture vision
40. Foresight
41. Industrial outlook
42. Capacity for innovation
43. Analytical skills
44. Reviewing/Synthesizing
45. Abstract thinking
46. Comprehension
47. Critical thinking
48. Problem formulation
49. Problem-solving
50. Interpretation of results
51. Team player
52. Networking
53. Multicultural sensitivity
54. Decision-making
55. Ability to motivate others
56. Delegation of responsibilities
57. Assuming authority
58. Responsibility
59. Self-reflection
60. Research methods
61. Rigorous analysis
62. Pragmatic
63. Meticulousness
64. Proposal generation
65. Method of persuasion
66. Clarity in thought and expression
67. Open-mindedness
68. Initiative
69. Being observant
70. Discretion

- | | |
|----------------------------|------------------------------|
| 71. Concentration | 97. Patience |
| 72. Efficiency | 98. Empathy |
| 73. Versatility | 99. Diplomacy |
| 74. Ingenuity | 100. Enthusiasm |
| 75. Creativity | 101. Modesty |
| 76. In-depth thinking | 102. Curiosity |
| 77. Lucidity | 103. Honesty |
| 78. Accuracy | 104. Reliability |
| 79. Originality | 105. Charisma |
| 80. Finesse | 106. Ambition |
| 81. Astuteness | 107. Availability for others |
| 82. Correctness | 108. Punctuality |
| 83. Autonomy | 109. Service-oriented |
| 84. Dexterity | 110. Assiduousness |
| 85. Boldness | 111. Sense of humor |
| 86. Independence | 112. Respect of authority |
| 87. Attentiveness | 113. Hygiene and safety |
| 88. Interpersonal skills | 114. Maturity |
| 89. Tolerance | 115. Sincerity |
| 90. Emotional intelligence | 116. Conflict mediation |
| 91. Openness to others | 117. Self-control |
| 92. Perseverance | 118. Vision |
| 93. Commitment | 119. Selflessness |
| 94. Stress management | 120. Learning capacity |
| 95. Self-confidence | 121. Adaptability |
| 96. Resilience | |

What are the 3 competencies you feel would be most important to emphasize in a future job interview?

<<Chosen from the above list of 121 competencies>>

If you would like to receive the results of this survey, please provide your email address.

Please leave any comments or suggestions you may have about this survey.

Appendix F: Employer Survey

What type of organization are you working in?

1. Public (outside university)
2. University (public university included)
3. Private
4. Association / Non-Profit
5. Other (please specify)

What is your organization's sector of activity?

1. Agriculture, Forestry, Fishing and Hunting
2. Mining, Quarrying, and Oil and Gas Extraction
3. Construction
4. Manufacturing
5. Wholesale Trade
6. Retail Trade
7. Transportation and Warehousing
8. Information
9. Finance and Insurance
10. Real Estate and Rental and Leasing
11. Professional, Scientific, and Technical Services
12. Management of Companies and Enterprises
13. Administrative and support, waste management and remediation services
14. Educational Services
15. Health Care and Social Assistance
16. Arts, Entertainment, and Recreation
17. Accommodation and Food Services
18. Other Services (except Public Administration)
19. Public Administration
20. Other (please specify)

Does your organization do business internationally?

1. Yes
2. No
3. I don't know

Where is your workplace located?

<<Within Canada>>

Alberta	Nova Scotia	Newfoundland and Labrador
British Columbia	Ontario	Northwest Territories
Prince Edward Island	Quebec	Nunavut
Manitoba	Saskatchewan	Yukon
New Brunswick		

<<Outside of Canada>>

Afghanistan	Antigua & Deps	Azerbaijan
Albania	Argentina	Bahamas
Algeria	Armenia	Bahrain
Andorra	Australia	Bangladesh
Angola	Austria	Barbados

Belarus	France	Macedonia
Belgium	Gabon	Madagascar
Belize	Gambia	Malawi
Benin	Georgia	Malaysia
Bhutan	Germany	Maldives
Bolivia	Ghana	Mali
Bosnia Herzegovina	Greece	Malta
Botswana	Grenada	Marshall Islands
Brazil	Guatemala	Mauritania
Brunei	Guinea	Mauritius
Bulgaria	Guinea-Bissau	Mexico
Burkina	Guyana	Micronesia
Burundi	Haiti	Moldova
Cambodia	Honduras	Monaco
Cameroon	Hungary	Mongolia
Canada	Iceland	Montenegro
Cape Verde	India	Morocco
Central African Rep	Indonesia	Mozambique
Chad	Iran	Myanmar, {Burma}
Chile	Iraq	Namibia
China	Ireland {Republic}	Nauru
Colombia	Israel	Nepal
Comoros	Italy	Netherlands
Congo	Ivory Coast	New Zealand
Congo {Democratic Rep}	Jamaica	Nicaragua
Costa Rica	Japan	Niger
Croatia	Jordan	Nigeria
Cuba	Kazakhstan	Norway
Cyprus	Kenya	Oman
Czech Republic	Kiribati	Pakistan
Denmark	Korea North	Palau
Djibouti	Korea South	Panama
Dominica	Kosovo	Papua New Guinea
Dominican Republic	Kuwait	Paraguay
East Timor	Kyrgyzstan	Peru
Ecuador	Laos	Philippines
Egypt	Latvia	Poland
El Salvador	Lebanon	Portugal
Equatorial Guinea	Lesotho	Qatar
Eritrea	Liberia	Romania
Estonia	Libya	Russian Federation
Ethiopia	Liechtenstein	Rwanda
Fiji	Lithuania	St Kitts & Nevis
Finland	Luxembourg	St Lucia

Saint Vincent & the Grenadines	Sri Lanka	Tuvalu
Samoa	Sudan	Uganda
San Marino	Suriname	Ukraine
Sao Tome & Principe	Swaziland	United Arab Emirates
Saudi Arabia	Sweden	United Kingdom
Senegal	Switzerland	United States
Serbia	Syria	Uruguay
Seychelles	Taiwan	Uzbekistan
Sierra Leone	Tajikistan	Vanuatu
Singapore	Tanzania	Vatican City
Slovakia	Thailand	Venezuela
Slovenia	Togo	Vietnam
Solomon Islands	Tonga	Yemen
Somalia	Trinidad & Tobago	Zambia
South Africa	Tunisia	Zimbabwe
Spain	Turkey	Other (please specify)
	Turkmenistan	

What is your organization's annual turnover? (in Canadian dollars)

1. Less than 500 000
2. Between 500 000 & 1 million
3. Between 1 & 5 millions
4. Between 5 & 50 millions
5. Between 50 & 200 millions
6. More than 200 millions
7. I don't know

How many employees work in your organization?

1. Between 0 & 9
2. Between 10 & 19
3. Between 20 & 49
4. Between 50 & 99
5. Between 100 & 249
6. Between 250 & 499
7. Between 500 & 4999
8. More than 5000

How many employees did your organization recruit last year?

1. Fewer than 5 employees
2. Between 5 & 9 employees
3. Between 10 & 49 employees
4. Between 50 & 499 employees
5. Between 500 & 1000 employees
6. More than 1000 employees
7. I don't know

In what area/department do you work?

1. Human resources
2. Research and/or Development including academic appointment
3. Teaching and/or training
4. Consulting
5. IT
6. Sales
7. Executive
8. Marketing
9. Communication
10. Finance
11. Production
12. Administration
13. Healthcare

14. Other (please specify)

What is your job title?

Are there PhD holders employed in your organization?

1. Yes
2. No
3. I don't know

How many employees hold PhDs in your organization?

1. Fewer than 5
2. Between 5 and 9
3. Between 10 and 49
4. Between 50 and 499
5. Between 500 and 1000
6. More than 1000
7. I don't know

Do you hold a PhD?

1. Yes
2. No

What is the main role/function of the last person you recruited?

- | | |
|--|----------------------------|
| 1. Research and/or Development
including academic appointment | 7. Marketing |
| 2. Teaching and/or training | 8. Communication |
| 3. Consulting | 9. Finance |
| 4. IT | 10. Production |
| 5. Sales | 11. Administration |
| 6. Executive | 12. Healthcare |
| | 13. Other (please specify) |

What is their job title?

In your opinion, what are the three main competencies (including skills, knowledge, and attributes) this person has?

How many years of experience did this person have when hired?

1. 0 to 2 years
2. 2 to 5 years
3. 5 to 10 years
4. 10 to 20 years
5. More than 20 years
6. I don't know

In your experience, are certain positions in your organization more difficult to fill than others?

1. Yes
2. No

If yes, why?

In your opinion, which area/function represents the biggest recruitment challenge in your organization?

- | | |
|--|----------------------------|
| 1. Research and/or Development
including academic appointment | 7. Marketing |
| 2. Teaching and/or training | 8. Communication |
| 3. Consulting | 9. Finance |
| 4. IT | 10. Production |
| 5. Sales | 11. Administration |
| 6. Executive | 12. Healthcare |
| | 13. Other (please specify) |

To your knowledge, which specific positions are the most difficult to recruit?

What do you think are the three most difficult competencies (including skills, knowledge, and attributes) to find in applicants?

Have you ever hired a PhD holder?

1. Yes
2. No
3. I don't know

What do you think are the 3 competencies (including skills, knowledge, and attributes) that best characterize PhD holders?

Do you have preconceived notions of what competencies PhD holders lack? What are these missing competencies?

Considering the last recruitment of a PhD holder in your organization, what main function/role does this PhD holder occupy?

- | | |
|--|----------------------------|
| 1. Research and/or Development
including academic appointment | 7. Marketing |
| 2. Teaching and/or training | 8. Communication |
| 3. Consulting | 9. Finance |
| 4. IT | 10. Production |
| 5. Sales | 11. Administration |
| 6. Executive | 12. Healthcare |
| | 13. Other (please specify) |

What is their job title?

In what discipline was their PhD research?

1. Arts
2. Administration and Management
3. Anthropology
4. Chemistry
5. Computer Sciences
6. Education
7. Finance
8. Earth Sciences
9. Economics
10. Engineering and technology
11. Geography
12. History
13. Humanities
14. Interdisciplinary Studies
15. Languages and literature
16. Law
17. Management
18. Mathematics and Statistics
19. Medical Sciences / Biology
20. Philosophy
21. Physics
22. Political Sciences
23. Psychology
24. Religious Studies
25. Social Sciences
26. Sociology
27. Space Sciences
28. I don't know

Do you think having a PhD degree was needed to do this job?

1. Not at all
2. Somewhat
3. Moderately
4. Very
5. Absolutely

How many years of experience did this person have outside of their PhD studies before they were hired?

1. 0 to 2 years
2. 2 to 5 years
3. 5 to 10 years
4. 10 to 20 years
5. More than 20 years
6. I don't know

How did you become aware of the person you hired?

1. Job advertisement
2. Internal recruitment
3. Through your network
4. Through a recruitment agency
5. Head hunting (you directly contacted them)
6. Through an event/forum
7. Spontaneous application
8. Already worked with this person
9. Other (please specify)

What competencies did you hire them for? Here is a list of competencies (including skills, knowledge, and attributes) that we collected from PhD holders. Please select all the competencies that apply.

- | | |
|--|---------------------------------------|
| 1. Scientific and technical expertise | 38. General knowledge |
| 2. Knowledge of the academic environment | 39. Big picture vision |
| 3. Knowledge of the industrial environment | 40. Foresight |
| 4. Knowledge of regulations | 41. Industrial outlook |
| 5. Ethics | 42. Capacity for innovation |
| 6. Safety concerns | 43. Analytical skills |
| 7. Written communication | 44. Reviewing/Synthesizing |
| 8. Oral communication | 45. Abstract thinking |
| 9. Visual communication | 46. Comprehension |
| 10. Popular scientific communication | 47. Critical thinking |
| 11. Teaching | 48. Problem formulation |
| 12. Pedagogy | 49. Problem-solving |
| 13. Communication tools | 50. Interpretation of results |
| 14. Digital technology / computer science | 51. Team player |
| 15. Scientific monitoring | 52. Networking |
| 16. Research promotion and valorization | 53. Multicultural sensitivity |
| 17. Project initiation | 54. Decision-making |
| 18. Feasibility study | 55. Ability to motivate others |
| 19. Finding funding opportunities | 56. Delegation of responsibilities |
| 20. Planning | 57. Assuming authority |
| 21. Time management | 58. Responsibility |
| 22. Personnel management | 59. Self-reflection |
| 23. Financial management | 60. Research methods |
| 24. Quality management | 61. Rigorous analysis |
| 25. Conflict management | 62. Pragmatic |
| 26. Risk management | 63. Meticulousness |
| 27. Reporting to superiors | 64. Proposal generation |
| 28. Result-oriented | 65. Method of persuasion |
| 29. Written foreign languages | 66. Clarity in thought and expression |
| 30. Oral foreign languages | 67. Open-mindedness |
| 31. Product knowledge | 68. Initiative |
| 32. Understanding of customers' needs | 69. Being observant |
| 33. Finding prospective customers | 70. Discretion |
| 34. Negotiation skills | 71. Concentration |
| 35. Interaction with customers | 72. Efficiency |
| 36. Promoting products | 73. Versatility |
| 37. Administrative management | 74. Ingenuity |
| | 75. Creativity |
| | 76. In-depth thinking |
| | 77. Lucidity |
| | 78. Accuracy |

- | | |
|----------------------------|------------------------------|
| 79. Originality | 101. Modesty |
| 80. Finesse | 102. Curiosity |
| 81. Astuteness | 103. Honesty |
| 82. Correctness | 104. Reliability |
| 83. Autonomy | 105. Charisma |
| 84. Dexterity | 106. Ambition |
| 85. Boldness | 107. Availability for others |
| 86. Independence | 108. Punctuality |
| 87. Attentiveness | 109. Service-oriented |
| 88. Interpersonal skills | 110. Assiduousness |
| 89. Tolerance | 111. Sense of humor |
| 90. Emotional intelligence | 112. Respect of authority |
| 91. Openness to others | 113. Hygiene and safety |
| 92. Perseverance | 114. Maturity |
| 93. Commitment | 115. Sincerity |
| 94. Stress management | 116. Conflict mediation |
| 95. Self-confidence | 117. Self-control |
| 96. Resilience | 118. Vision |
| 97. Patience | 119. Selflessness |
| 98. Empathy | 120. Learning capacity |
| 99. Diplomacy | 121. Adaptability |
| 100. Enthusiasm | |

Are you satisfied with this hire?

1. Very satisfied
2. Satisfied
3. Slightly satisfied
4. Not satisfied

Would you hire a PhD holder again?

Yes

No

Maybe (please explain the reason of your hesitation)

in your opinion, what competencies were missing or not sufficiently developed by the last PhD holder you recruited in your organization? Please select up to 3 competencies among the following.

<<Chosen from the above list of 121 competencies>>

Are there observable differences between a new PhD holder recruit and a non-PhD holder recruit?

1. No
2. Yes

If yes, what are these differences?

Are you looking to hire a PhD currently or in the near future?

1. Yes
2. No
3. I don't know

In your opinion, whose role is it to support PhD holders gaining industry knowledge?

1. Universities
2. Companies hiring them
3. Individuals themselves

For which position might you recruit a PhD holder?

What would be the annual salary for this position in Canadian dollars?

For which area/function might you recruit them?

- | | |
|--|----------------------------|
| 1. Research and/or Development
including academic appointment | 7. Marketing |
| 2. Teaching and/or training | 8. Communication |
| 3. Consulting | 9. Finance |
| 4. IT | 10. Production |
| 5. Sales | 11. Administration |
| 6. Executive | 12. Healthcare |
| | 13. Other (please specify) |

Please provide your email if you would like to receive the results of this study:

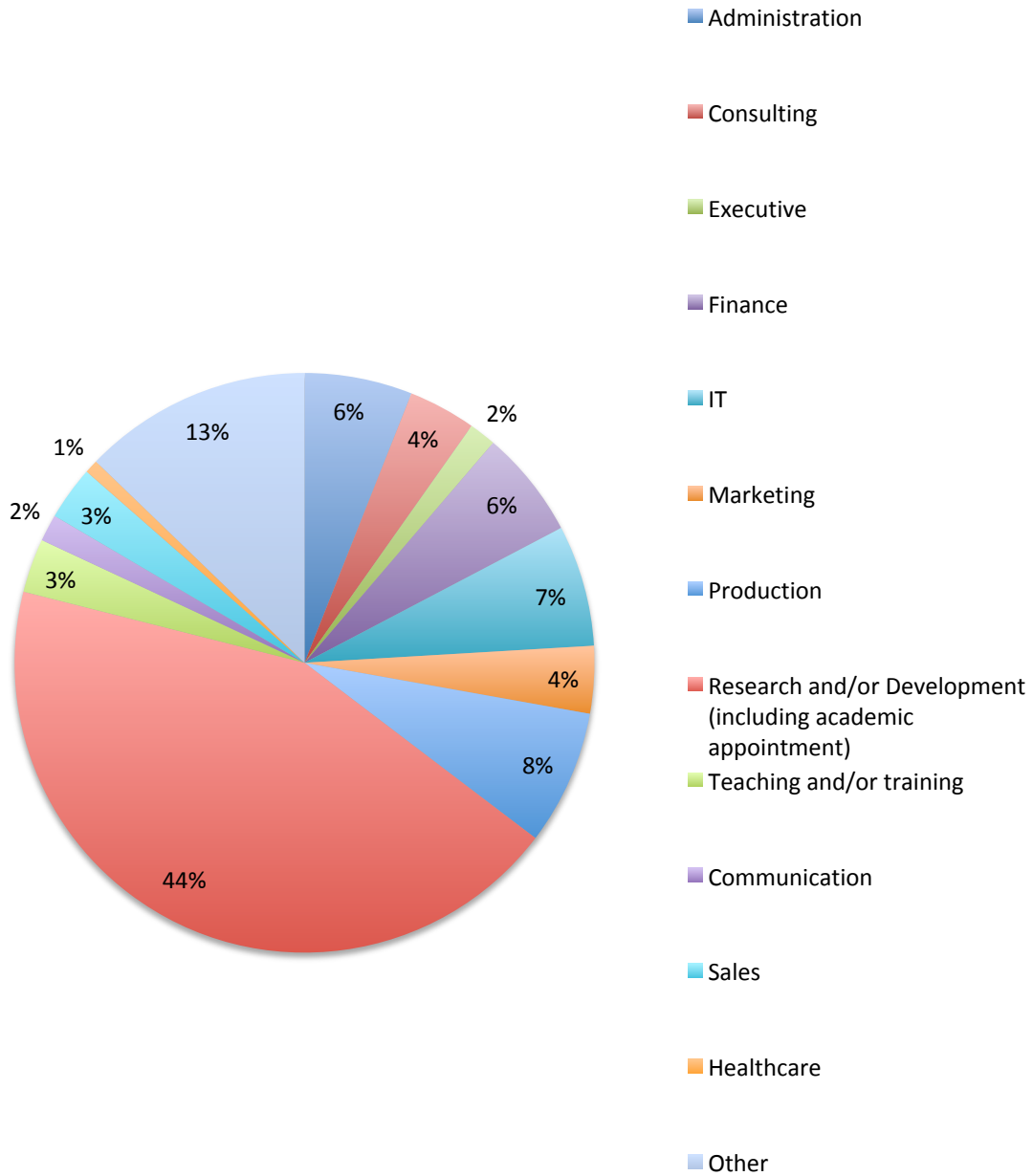
If you are interested in participating in an upcoming focus group: please include your email address here:

Please leave any comments or suggestions you may have about this survey

Appendix G: Roles of General Recent Hires

Figure E1

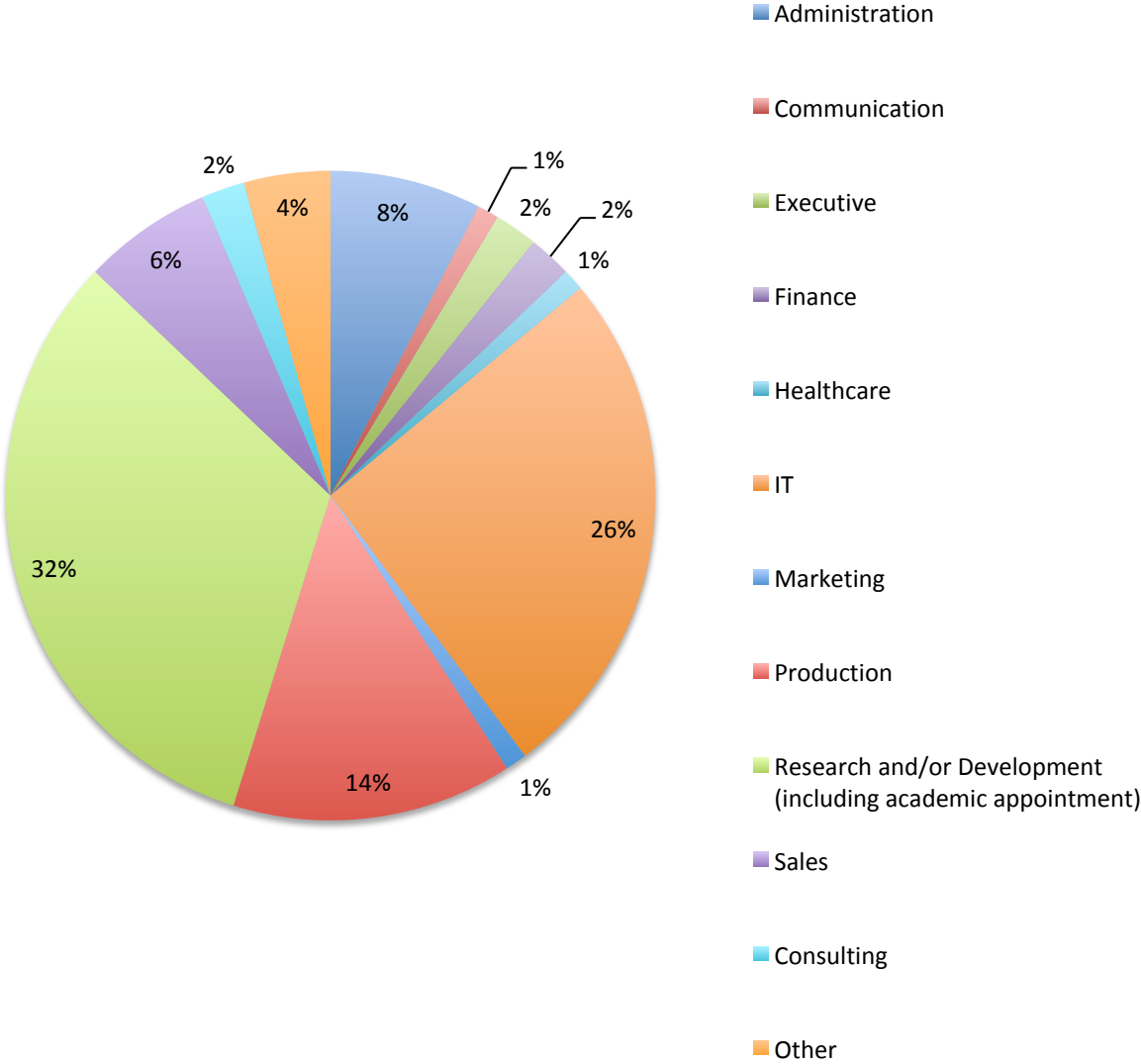
Distribution of roles for general recent hires as reported by employers



Appendix H: Employers' Most Difficult Roles to Fill

Figure H1

Distribution of the most difficult roles to fill as reported by employers



Appendix I: Location of PhDs Employed Outside of Canada

Figure I1

Distribution of location of PhDs employed outside of Canada

