Observatoire de la recherche et des carrières scientifiques

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Recruiting Talents

THEMATIC REPORT #1

June 2022

Gaining insight into transferable skills: Perspectives from doctorate holders and non-academic employers

With the support of

FÉDÉRATION WALLONIE-BRUXELLES

With the support of

Observatory of Research and Scientific Careers - F.R.S.-FNRS

Thanks to funding from the Federation Wallonia-Brussels (FWB), the Observatory of Research and Scientific Careers was created in September 2018. Integrated in the F.R.S.-FNRS, this structure aims, among other things, to track and analyse the careers of researchers in the FWB through surveys and data cross-referencing. In collaboration with the six FWB universities, the Observatory is responsible for developing knowledge on the doctoral and postdoctoral process. It makes recommendations to facilitate the professional transition of PhD holders and optimise the doctoral process in order to meet the expectations of researchers and society. Particular attention is paid to the various obstacles to a scientific career: stereotypes and discrimination related to gender, constraints related to the requirement of international mobility, impact of the pressure to publish early in one's career, etc. The results of surveys and analyses are systematically published on the site: http://www.observatoire.frs-fnrs.be

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To cite this report:

Bebiroglu, N., Dethier, B., & Ameryckx, C. (2022). *Gaining insight into transferable skills training: Perspectives from doctorate holders and non-academic employers*. Observatory Thematic Report Series: Recruiting Talents #1
http://www.observatoire.frs-fnrs.be/_media/report.employers.1.pdf

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GAINING INSIGHT INTO TRANSFERABLE SKILLS:
PERSPECTIVES FROM DOCTORATE HOLDERS AND NON-ACADEMIC EMPLOYERS

Executive Summary

Transferable skills include generic or basic skills, such as communication, which are transferable between contexts, situations, and tasks, as opposed to specialised skills that are discipline-based (Nägele & Stalder, 2017). For doctorate holders, acquiring transferable skills means becoming equipped with the skills one may need inside and outside of academia. In the current report, based on the perspectives of 2,055 doctorate holders (Study 1) and 614 non-academic employers (Study 2), our primary aim is to analyse whether or not the doctorate holders in our sample are equipped with the skills they need once they enter the labour market and to understand how they can be best supported to develop these skills.

1. **Which transferable skills do the doctorate holders perceive they have not acquired but must nevertheless use in their workplace? (Study 1)**

We see that there is a mismatch between the skills that doctorate holders have acquired by the end of their doctoral training and those they must use in the workplace for certain skills, and interestingly, this mismatch is similar for those who work in university and those who work outside of university. Both groups seem to lack skills related to working with others ("collaboration and teamwork skills" and "social skills"), general management skills ("business skills" and "project management skills") and "communication skills". Specifically, in the university sector, we see a more pronounced mismatch in terms of "creativity and innovation" whereas outside the university sector, we see a more pronounced mismatch with regard to "project management". In addition, the patterns of match and mismatch are similar regardless of the research domain of doctorate holders.

2. **Which transferable skills do non-academic employers think should be reinforced in job doctorate holders? (Study 2)**

   - **Expected skills.** The six most important skills employers look for in a candidate for a position that could be occupied by a person with a doctorate or a master's degree, in descending order, are "scientific and technical expertise", "collaboration and teamwork", "creativity and innovation", "project management", "research skills and methods" and "initiative and autonomy".

   - **Satisfaction with doctorate holders' skills.** Non-academic employers seem very satisfied with the technical skills of doctorate holders, including their "scientific and technical expertise" (M = 3.50/4, SD = 0.6 on a scale of 1 = "very dissatisfied" to 4 = "very satisfied"),

their "research skills and methods", (M = 3.34/4, SD = 0.6), and their "critical and analytical thinking" (M = 3.31/4, SD = 0.6). However, they are, on average, less satisfied with their skills in "project management" and "collaboration and teamwork". Interestingly, lower levels of skills satisfaction pertain almost exclusively to the "general management skills" category, such as "business skills", "project management", "team management", etc., which may point to an important gap in the training of doctoral candidates and the acquisition and development of these skills.

3. **What convergences and divergences exist between doctorate holders and non-academic employers in terms of skills acquisition? (Studies 1 & 2)**

The level of satisfaction of non-academic employers reflects the perceived level of acquisition of doctorate holders in terms of "scientific and technical expertise", ranked as high (approximately 3.5) by both groups; "creativity and innovation", ranked average by both groups; and "project management", ranked low (< 3) by both groups. However, compared to employer satisfaction levels, doctorate holders rated themselves more positively in terms of "initiative and autonomy" and "research skills and methods", and more negatively in terms of "collaboration and teamwork".

4. **Which transferable skills should be targeted to best prepare the job transition of early-career researchers? (Studies 1 & 2)**

In view of these results, at the crossroads of the points of view of doctorate holders and non-academic employers, it seems advisable for universities and doctoral schools to pay particular attention, within the framework of their doctoral training programmes, to the development of skills in "collaboration and teamwork" and "project management".

5. **How should early-career researchers be supported in the development of transferable skills? (Studies 1 & 2)**

- **Strengthening collaborations** has received widespread support from non-academic employers and doctorate holders. Indeed, 74.4% of doctorate holders were in favour of universities collaborating more with non-academic sectors and 71.2% of non-academic employers favoured more doctoral theses involving collaboration with other sectors (outside the university sector). Given the importance that non-academic employers place on professional experience outside of academia to hire candidates, there is a need to offer this experience during doctoral or postgraduate training. This could be done in multiple ways:
    - **Internships.** 72.9% of non-academic employers in our sample were in favour of hosting doctoral candidates as interns.
    - **Collaborative doctoral programmes**. 54.6% of non-academic employers were in favour of hiring doctoral candidates in collaboration with a university. This rate was even higher for sectors of professional, scientific, and technical services or information and communication services.

- **Reinforcing transferable-skills training** has received support from non-academic employers and doctorate holders alike. It is important to remember that each university in the Wallonia-Brussels Federation (FWB) already offers a diverse training catalogue (transferable and thematic) available to all their scientific and academic staff. Non-academic employers highlighted the importance of "learning by doing". These types of experiences can make transferable skills less context- and task-specific (Beier, Kim, Saterbak, Leautaud, Bishnoi & Gilberto, 2019) and more "translatable" for doctorate holders. As a result, universities could consider, as part of their transferable skills training programmes, offering a learning approach of this type to familiarise doctoral candidates with what might be expected of them in their future work environment. It is also necessary to inform doctoral candidates about the skills that employers consider important and to encourage them to self-assess their own skills.

- **Giving time to early-career researchers for career development.** Lack of time seems to be a barrier and a concern for doctorate holders in our sample. Given the push at the international level to further shorten doctoral training (e.g., Shaller & Barbier, 2021), their concern that professional development activities may slow the progress of their research and lengthen the time it takes to obtain a degree is understandable. However, time spent on career development activities contributes to researchers' development. Therefore, institutions and doctoral supervisors must inform young researchers of existing training programmes, grant them the time necessary to pursue such training activities and guide/support them in building a career plan.

In short, doctoral training allows doctorate holders to develop a set of skills (disciplinary and transferable) while writing their thesis: from the development of the research project to its design and implementation, up to the communication of results. On the one hand, our results show that the mobilisation of these skills is not limited to the university sector but is transferable to other sectors (public, private, etc.). On the other hand, they emphasise the importance of integrating a set of supports dedicated to the development of transferable skills into the doctoral or postdoctoral programme. This could take the form of courses, project-based learning activities, internships, and collaborations to improve the job transition of doctorate holders in the academic and non-academic labour market.

1. INTRODUCTION

The rise in the number of doctoral candidates and doctorate holders, coupled with reforms of higher education systems in many countries (e.g., Bologna process in Europe) have affected doctoral education (Gokhberg, Shmatko, & Auriol, 2016). Given the increasing numbers of doctorate holders who are entering the non-academic labour market (Hayter & Parker, 2019), scholars have raised the need to transform doctoral education from the training of professors to the training of "science professionals" (Fillery-Travis & Robinson, 2018). In recent years, more structured forms of doctoral programmes have emerged such as doctoral schools (Dance, 2013) and multiple initiatives have been implemented to improve the job transition of doctorate holders, such as improved institutional practices to support the career development of doctorate holders.

These developments have also put the acquisition of transferable skills high on the agenda for institutions and policymakers alike (Kehm, Shin, & Jones, 2018; OECD, 2021). Transferable skills include generic or basic skills, such as communication, which are transferable between contexts, situations, and tasks, as opposed to specialised skills that are discipline-based (Nägele & Stalder, 2017). For doctorate holders, acquiring transferable skills means being equipped with skills one may need inside and outside of academia. Although there is general agreement on the importance of transferable skills, there is still a debate about which transferable skills should be acquired during doctoral education, and how (classroom learning vs. real-life experiences) (Horta, 2010; Mowbray & Halse, 2010).

Our previous reports indicate encouraging results regarding the job transition of doctorate holders in the Wallonia-Brussels Federation (FWB), but also highlight certain challenges they may face (Bebiroglu, Dethier & Ameryckx, 2019, 2020; Dethier, Bebiroglu, & Ameryckx, 2021). In the current report, based on the perspectives of doctorate holders (Study 1) and non-academic employers (Study 2), our primary aim is to analyse whether or not doctorate holders in our sample are equipped with the skills they need once they enter the labour market and to understand how they can be best supported to develop these skills. Specifically, we try to answer the following questions:

1. Which transferable skills should be targeted to best prepare the job transition of early-career researchers?
    a. What skills do doctorate holders perceive they have not acquired but must nevertheless use in their workplace? (Study 1)
    b. What skills do non-academic employers think should be reinforced in doctorate holders? (Study 2)
    c. What are the convergences and divergences that exist between doctorate holders and non-academic employers when it comes to skills acquisition? (Studies 1 & 2)
2. How should early-career researchers be supported to develop transferable skills? (Studies 1& 2.

2. SAMPLE CHARACTERISTICS AND RECRUITMENT

2.1. Study 1 : Doctorate holders' perspective

In Study 1, we used data from the "Future of PhD holders" online survey (Bebiroglu, et al., 2019, 2020), which includes 2,055 doctorate holders (42.8% female) from all six French-speaking universities in Belgium and from all research domains: 45.8% (*n* = 941) from Exact and Natural Sciences (ENS), 31.0% (*n* = 638) from Social Sciences and Humanities (SSH) and 29.9% (*n* = 476) from Life and Health Sciences (LHS). Respondents had an average age of 35.2 years (SD = 6.3) and had received their doctoral degree in the 3.1 years prior to the survey (SD = 1.9). 64.9% were of Belgian nationality and 38.8% were working outside of Belgium at the time of the survey.

To recruit this sample, based on online dissertation databases of the FWB universities (e.g., BICTeL), we generated a list of 4,918 doctoral dissertations that were successfully defended between January 2012 and May 2018 from the six French-speaking universities, and 2,046 primary or secondary dissertation supervisors. We then asked supervisors to transfer an invitation to their former doctoral candidates to participate in our survey. The survey was online between December 2018 and February 2019. If we consider that all doctorate holders identified received an invitation to participate from their supervisors, this equates to an overall response rate of 42.0%. Participation was voluntary and anonymous. All participants provided consent after receiving information about the study. Please refer to our first report (Bebiroglu, et al., 2019) for more details about the sample characteristics and procedure.

2.2. Study 2 : Non-academic employers' perspective

In Study 2, we used data from the "Recruiting Talents" survey, which was online between January and July 2021. The survey includes 614 non-academic employers[1] (29.8% female), from organisations that are mostly based in Wallonia and Brussels (see Appendices for the list of organisations). 89.6% (*n* = 542) of respondents had supervisory responsibilities (e.g., managers, directors, and/or CEOs), with an average of 7.2 years of experience in their organisation. 39.7% (*n* = 240) indicated that they had a doctoral degree and 76.5% (*n* = 414) had staff members with a doctorate working in the organisation.

The 614 non-academic employers worked across 17 different activity sectors[2]. The activity sectors with highest number of participants were as follows: 31.9% in professional, scientific and technical services (e.g., scientific research and development, architectural and engineering activities, technical testing and analysis, legal and accounting activities, or advertising and market research), 18.0% in public administration (e.g., administration of economic and social policy),

[1] Five individuals withheld their consent to participate.
[2] The activity sectors listed come from the NACE Coder classification system. They have been chosen and, where necessary, specified by the participants themselves.

12.4% in manufactured products (e.g., manufacture of food products or manufacture of basic pharmaceutical products and pharmaceutical preparations), 8.8% in information and communication services (e.g., telecommunications or publishing activities), and 5.8% in human health (e.g., hospital activities or residential care).

The organisations represented in the sample were mostly autonomous (68.6%). 21.4% of participants worked for an organisation that was part of a multinational group, and 10.0% worked for an organisation that was part of a national group. 38.2% of participants belonged to large organisations (250 or more employees), 23.8% to medium-sized organisations (50 to 249 employees), 25.1% to small organisations (10 to 49 employees), and 12.8% to micro-organisations (1 to 9 employees).

Participants were recruited mostly through job fairs, business associations, business federations, and competitiveness clusters in Wallonia and the Brussels-capital region. We specifically targeted employers who were responsible for recruitment, human resources, skills management, and/or strategic work-force planning and operations management. In other words, those whose duties included recruiting, managing and supervising staff, and the organisation's strategic and operational planning.

We sent personalised email invitations to 2,426 individuals, which included a short description of the study, and a hyperlink to the survey, which directed participants to Alchemer, a secure online data collection software. We received 614 responses, which corresponds to a response rate of 25.3%. Participation was voluntary and anonymous. All participants provided consent after receiving information about the study.

3. WHICH TRANSFERABLE SKILLS SHOULD BE TARGETED TO BEST PREPARE THE JOB TRANSITION OF EARLY-CAREER RESEARCHERS?

To answer our first question, we will first look at the skills mismatch between the skills that doctorate holders perceive they have acquired by the end of their doctoral training and those they must use in their workplace.

3.1. What skills do the doctorate holders perceive they have not acquired but must use in their workplace?

3.1.1. Acquired skills

As we detailed in our previous report (Bebiroglu, et al., 2020), we asked doctorate holders to rank from 1= "not at all" to 5 = "very much" to what extent they had acquired the skills in Table 1 by the end of their doctorate. The skills used in this list mostly came from international studies on doctorate holders (European Science Foundation, 2017; OECD, Mapping Careers and Mobility of Doctorate Holders, Auriol, Schaaper, & Felix, 2012) and reflected five major categories: research skills and technical expertise, general management skills, working with others, personal effectiveness, and communication skills (Table 1).

Table 1. Skills used in the "Future of PhD Holders" study

Research skills and technical expertise
○ Scientific and technical expertise
○ Research skills
○ Critical and analytical thinking
○ Problem-solving skills
General management skills
○ Business skills
○ Project management
Working with others
○ Collaboration and teamwork
○ Social skills and multicultural competency
Personal effectiveness
○ Initiative and autonomy
○ Flexibility and adaptability
○ Creativity and innovation
Communication skills

The majority of doctorate holders indicated that they had acquired (4 or 5) the following: "critical and analytical thinking" (92.4%), "research skills" (91.4%), and "scientific and technical expertise" (90.3%). On the other hand, "business skills" (acquired only by 7.7% of doctorate holders), "social skills and multicultural competency" (acquired by 47.4% of doctorate holders), and "collaboration and teamwork" (acquired by 47.5% of doctorate holders) had the lowest rankings (Figure 1).

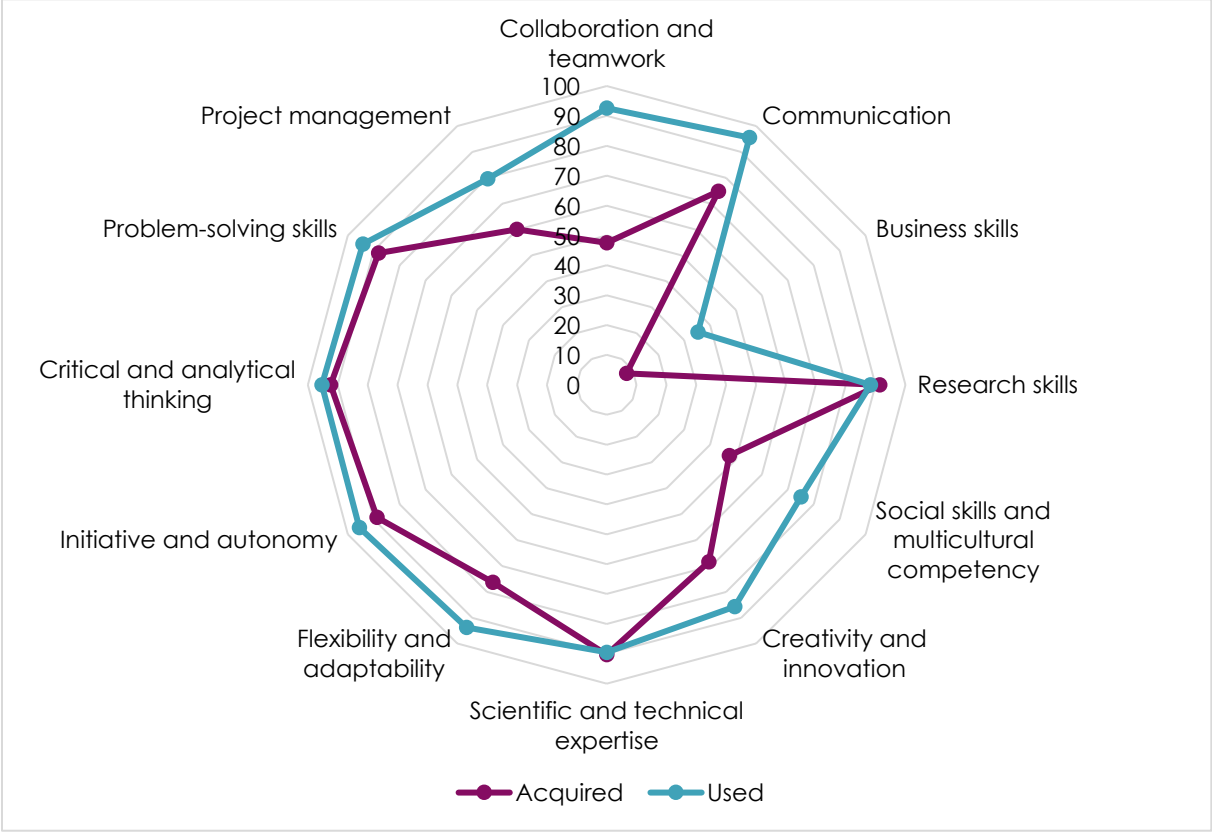
3.1.2. Used skills

We asked the participants who had a job at the time of the survey (*n* = 1,856 participants; 43.3% female), if they were using the skills listed in their workplace. Participants could respond with either "yes" or "no". 95.6% of doctorate holders stated that they used "Initiative and autonomy" and "communication skills" at work. The third most used skill was "critical and analytical thinking" (95.3%) (Figure 1).

3.1.3. Skills mismatch

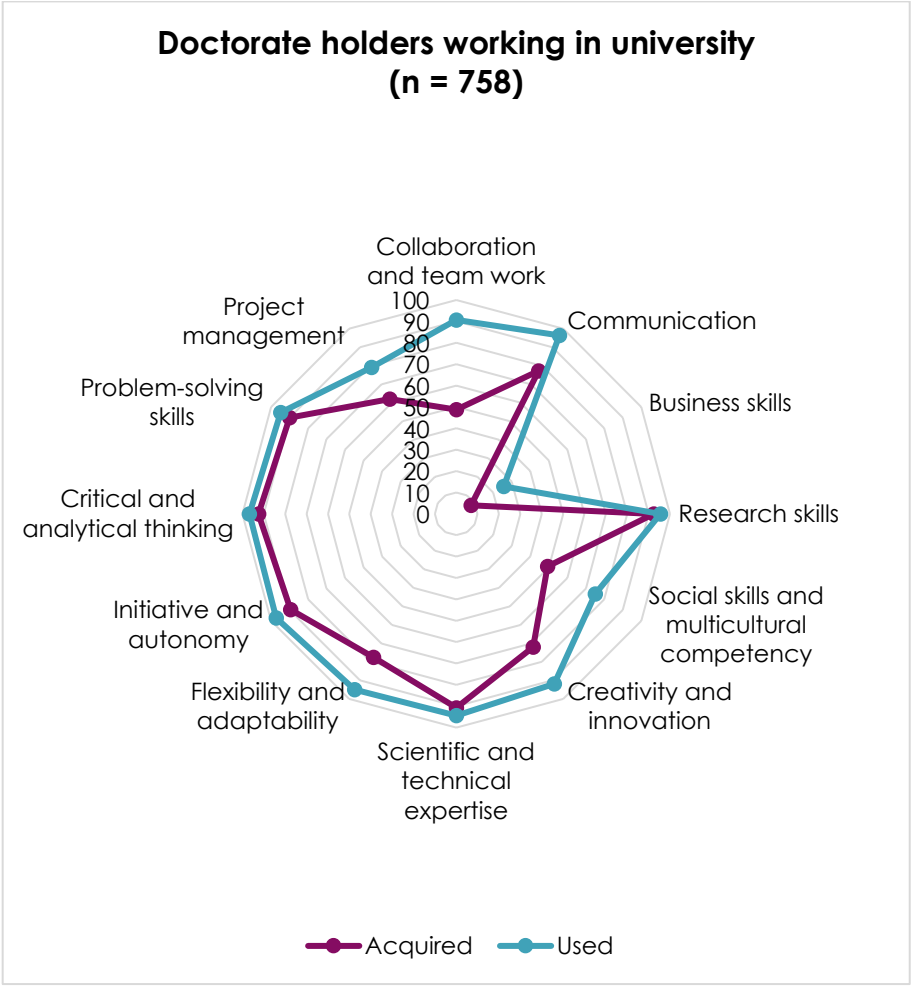
We then paid particular attention to the gap between the skills that doctorate holders claimed to have acquired by the end of their doctoral training, and those they indicated using in their workplace in order to identify whether there was a skills mismatch, and to what extent. When we look at Figure 1, we can identify several gaps, the most important one being "collaboration and teamwork**". 47.5% of doctorate holders say they acquired this skill but 92.6% use it in the workplace**, which equates to a 45.1% difference between the proportion of doctorate holders who acquired the skill by the end of the doctorate and those who use it in the workplace. **In descending order, the four other gaps concern "social skills and multicultural competency" (27.7% difference), "business skills" (27.6% difference), "communication skills" (20.8% difference), and "project management" (19.5% difference)**. Importantly, the match between acquired and used skills by research domain is remarkably similar among doctorate holders whatever their research domain (see Appendices). Doctorate holders from SSH, ENS, and LHS acquire similar sets of skills by the end of their doctorate and use similar sets of skills as part of their job.

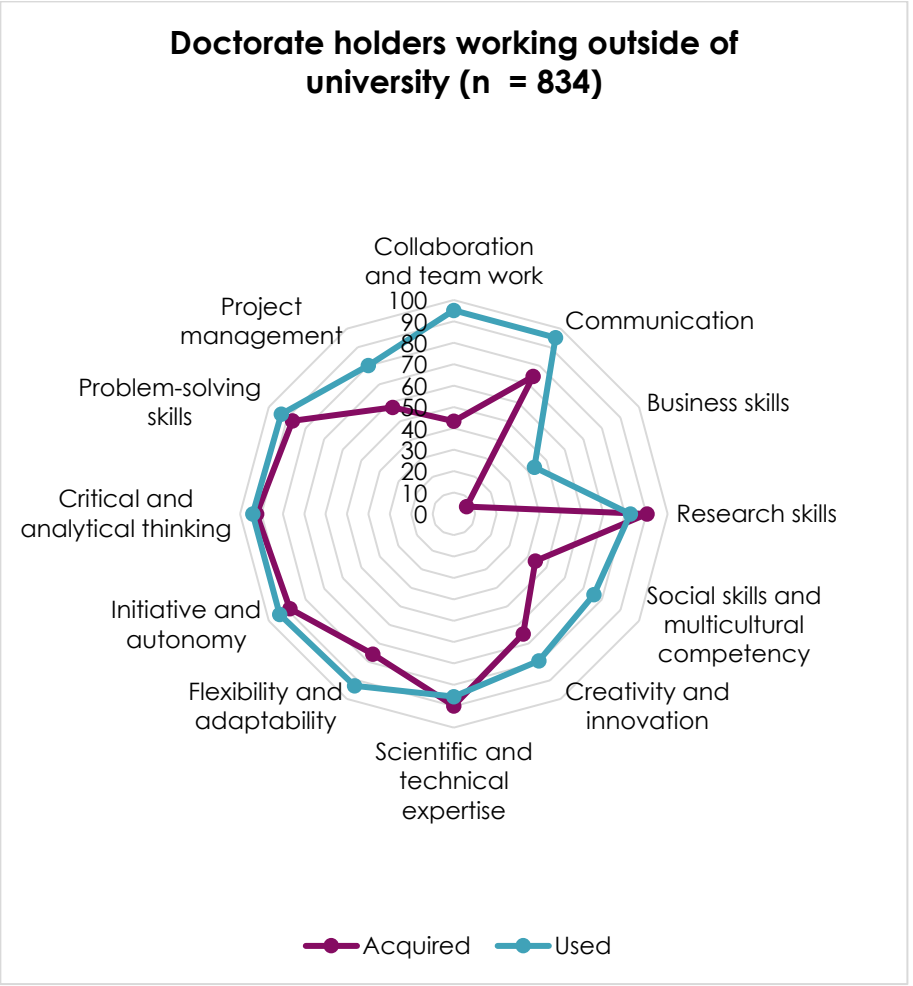
Figure 1. Proportion of doctorate holders who reported having acquired a skill by the end of the doctorate (n = 1,966) and those using it as part of their job (n = 1,836)



We then divided the sample into two between the doctorate holders working in a university setting and those working outside of university. Figure 2 reveals that the patterns of match and mismatch are very similar between these two groups. For doctorate holders who work in the university sector (*n* = 758) and those outside the university sector (*n* = 834), the biggest difference between acquired and used skills is related to "collaboration and teamwork". Regarding the doctorate holders working in the university sector, the four other skills with the highest difference are "social skills and multicultural competency" (25.8% difference), "creativity and innovation" (19.9% difference), "communication" (19.3% difference) and "business skills" (17.6% difference). For those working outside the university sector, the skills with the highest difference are "business skills" (36.7%), "social skills and multicultural competency" (31.6%), "project management" (22.7%), and "communication" (21.0%).

Figure 2. Proportion of doctorate holders working in university (n = 758) and outside of university (n = 834) who reported having acquired a skill by the end of the doctorate and using it as part of their job





3.2. What skills do non-academic employers think should be reinforced in doctorate holders?

3.2.1. Expected skills

We asked employers to choose from a list of 20 skills, the 6 skills they considered to be the most important in a candidate for a position that could be occupied by a person with a doctorate or a master's degree. The 20 skills used in this list mostly mirrored the skills we used in the survey of doctorate holders (Study 1). To better reflect the complexity of each skill category, the following changes have been made to the existing list: (1) "team management", "financial management", "commercial awareness and skills", "stress management", and "perseverance" were added to the list, (2) the previously used category of "communication skills" was divided into three: "scientific communication (written and oral)", "scientific outreach" and "language skills (foreign languages)", (3) the previously used category of "social skills and multicultural competency" was divided into two: "social skills" and "multicultural competency (openness and international sensitivity)", (4) further descriptions were added to two skills: "business skills" were described as "the ability to write and implement a business plan" and "research skills and methods" as "the ability to design, plan, and implement a comprehensive research process" .

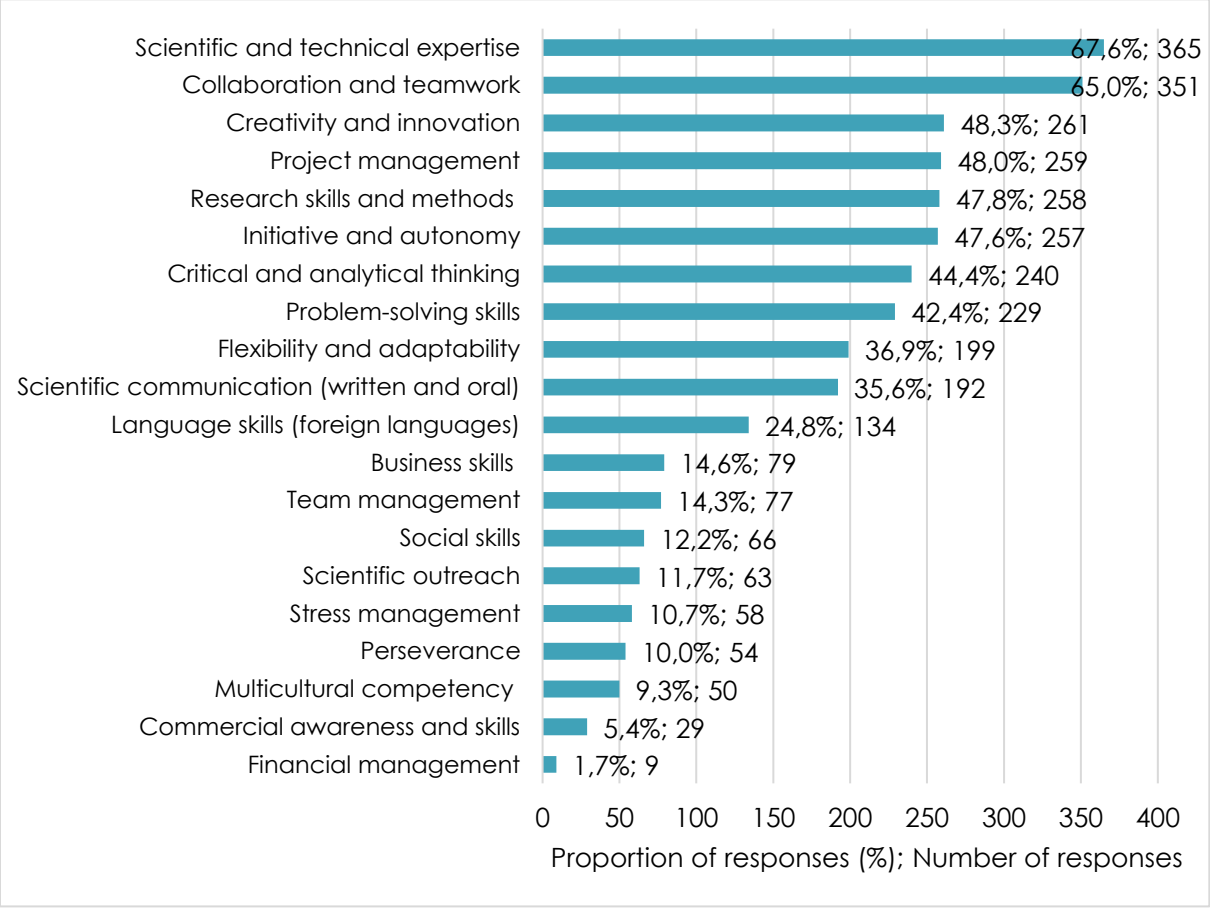
Table 2. Skills used in the "Recruiting Talents" survey

Research skills and technical expertise
○ Scientific and technical expertise
○ Research skills and methods (the ability to design, plan, and implement a comprehensive research process)
○ Critical and analytical thinking
○ Problem-solving skills
General management skills
○ Business skills (the ability to write and implement a business plan)
○ Project management
○ Team management
○ Financial management
○ Commercial awareness and skills
Working with others
○ Collaboration and teamwork
○ Social skills
○ Multicultural competency (openness and international sensitivity)
Personal effectiveness
○ Initiative and autonomy
○ Flexibility and adaptability
○ Creativity and innovation
○ Perseverance
○ Stress management

- **Communication skills**
  - Scientific communication (written and oral)
  - Scientific outreach
  - Language skills (foreign languages)

The six most important skills employers look for in candidates for a position that could be occupied by a doctorate holder or a person with a master's degree were "scientific and technical expertise", "collaboration and teamwork", "creativity and innovation", "project management", "research skills and methods", and "initiative and autonomy".

Figure 3. Answers to the question "What are the six most important skills you look for in candidates for a position that could be occupied by a PhD holder or a person with a master's degree?", among non-academic employers (n = 614)

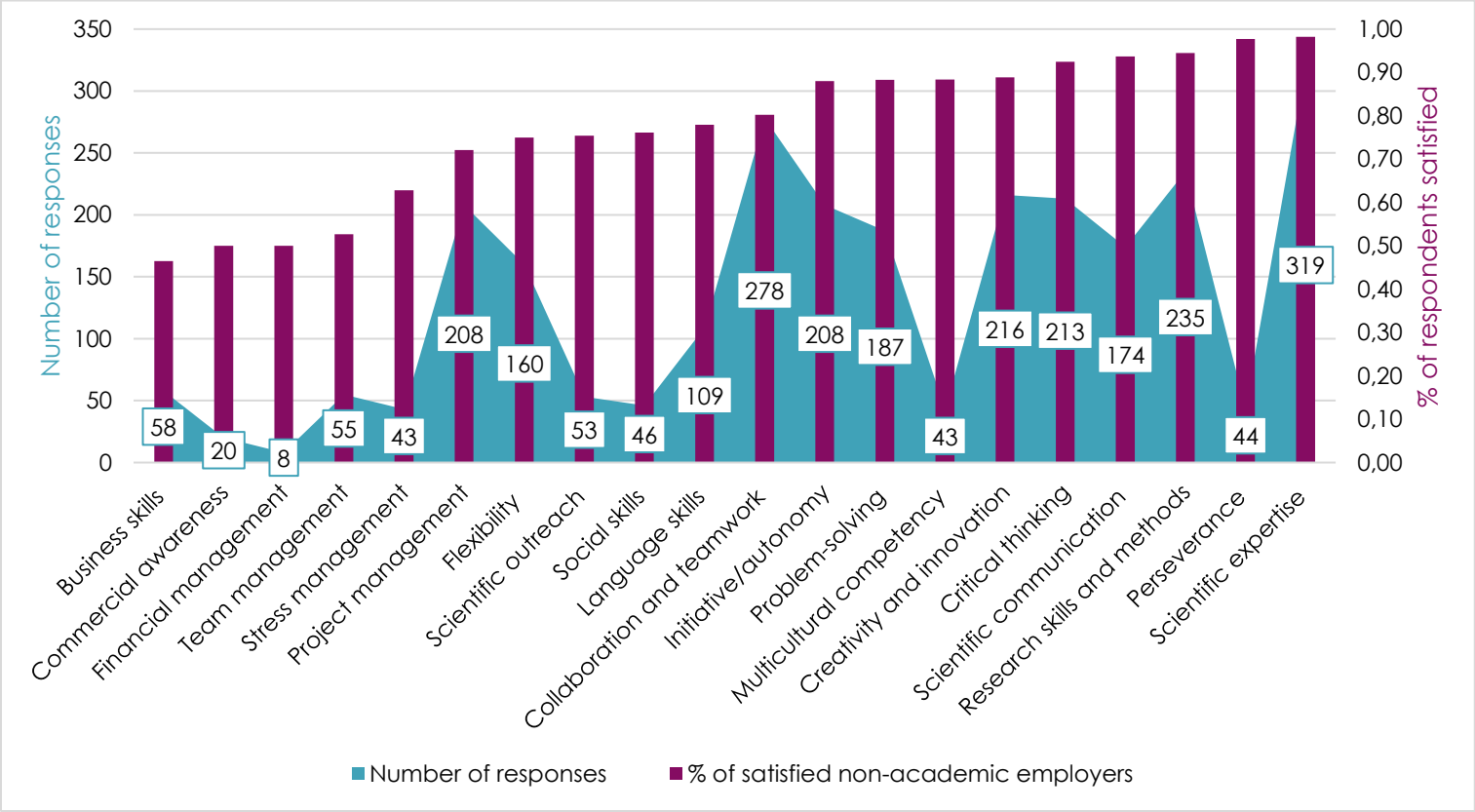


3.2.2. Satisfaction of non-academic employers with doctorate holders' skills

We asked employers who had doctorate holders in their staff, at the time of the survey or in the past, (*n* = 450) to rank from 1= "very dissatisfied" to 4 = "very satisfied" to what extent they were satisfied with the skills of doctorate holders. Each employer ranked only the six skills they had indicated as the most important in the previous question.

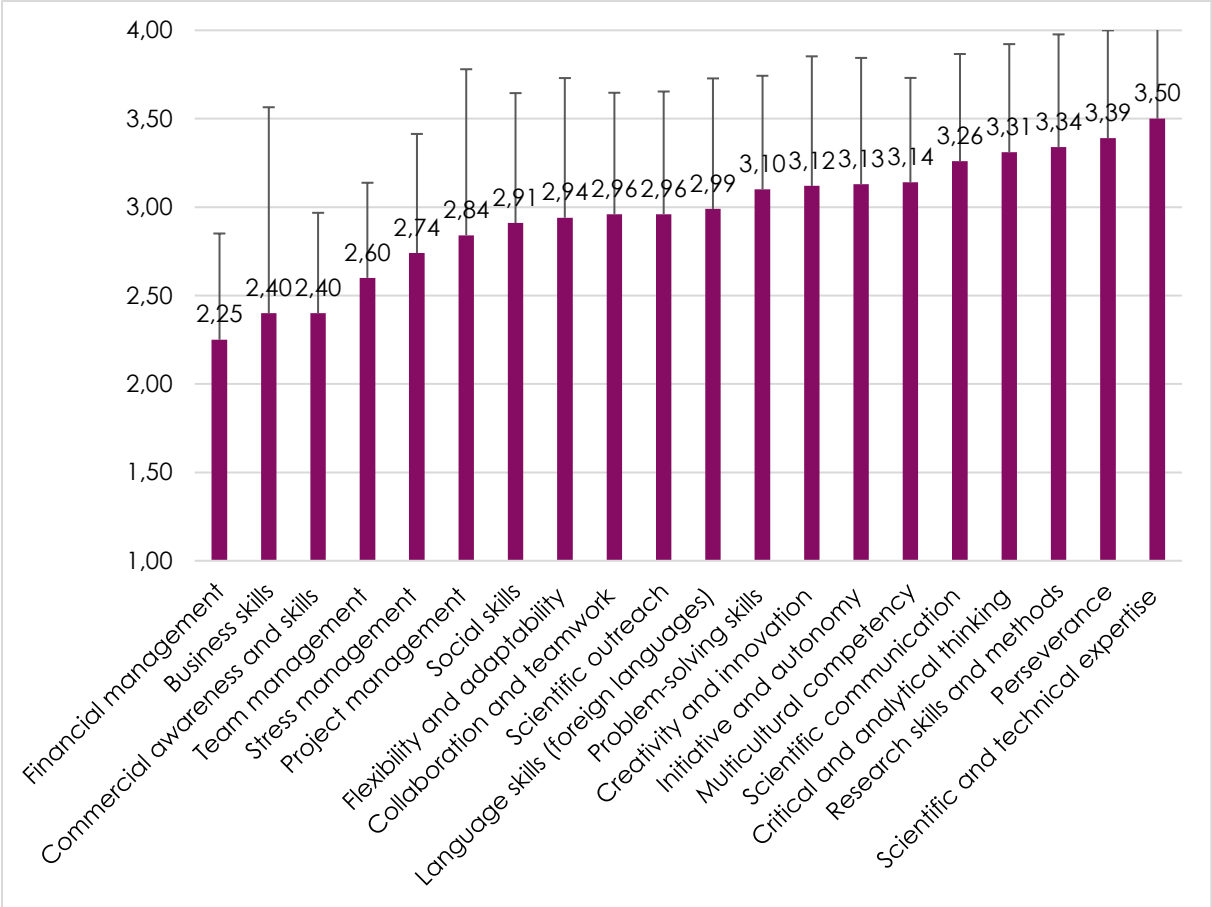
Looking at the proportion of employers who indicated that they were "somewhat satisfied" (= 3) or "very satisfied" (= 4) with a given skill, we realise that most employers who have experience working with doctorate holders are generally satisfied with their skills. Moreover, 98.2% of employers indicated that they were (somewhat or very) satisfied with their "scientific and technical expertise" and 94.5% with their "research skills and methods". Interestingly, almost all skills that non-academic employers were less satisfied with pertain to the general management skills category ("business skills", "project management", "financial management", etc.). Please note that the sample size varies for this question because we had a skip logic in the survey and asked the satisfaction level of employers only for the six skills they had indicated as "most important" in the previous question.

Figure 4. Proportion of non-academic employers with experience working with doctorate holders who indicated that they were somewhat or very satisfied with a given skill



We then calculated the mean employer satisfaction with the skills in question, on a scale of 1 = "very dissatisfied" to 4 = "very satisfied". The mean employer satisfaction was high; 3.12 (*SD* = .45). The figure below demonstrates the mean employer satisfaction for all the skills listed.

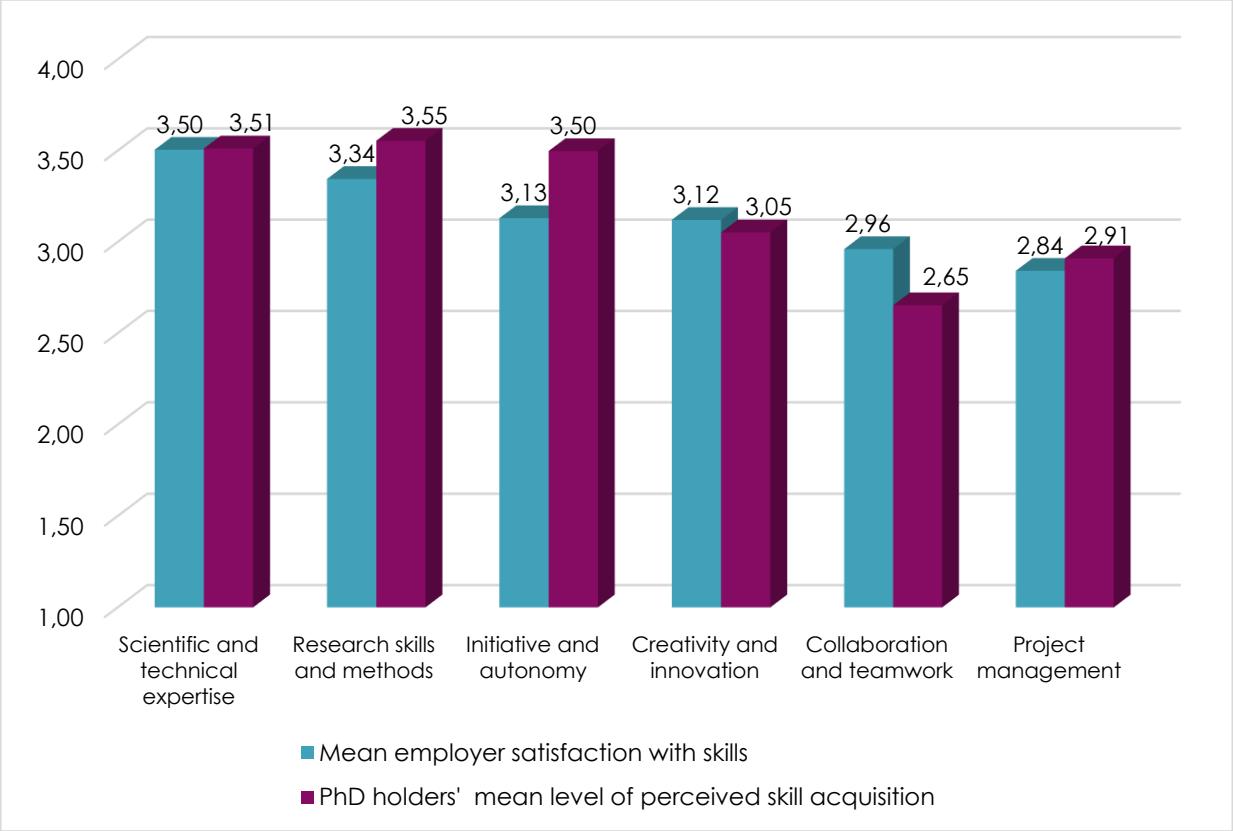
Figure 5. Mean employer satisfaction with a given skill, on a scale of 1= very dissatisfied, to 4= very satisfied (error bar = standard deviation)



3.3. What are the convergences and divergences that exist between doctorate holders and non-academic employers in terms of skills acquisition? (Studies 1 & 2)

In order to better understand the convergences and divergences, we calculated the mean level of perceived skills acquisition by doctorate holders[3] (n = 1,966) and compared this to the mean satisfaction of employers[4] with the six skills identified as being the most sought after by non-academic employers.

Figure 6. Mean employer satisfaction with a given skill and doctorate holders' mean level of perceived skill acquisition, on a scale of 1 to 4



[3] 1,966 of the 2,055 people contacted who answered the questions about skills in the "The Future of PhD holders" survey.

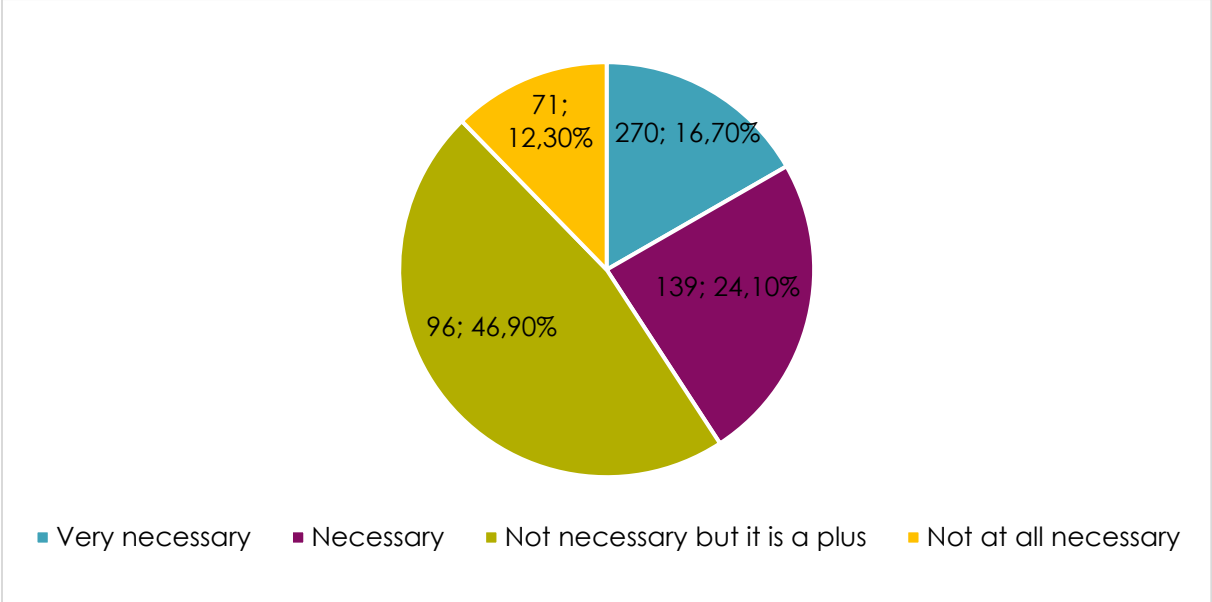
[4] We changed the acquired skills scale from a 5-point Likert scale to a 4-point scale to easily compare it to employers' satisfaction.

Non-academic employers' level of satisfaction reflects doctorate holders' perceived skill acquisition when it comes to "scientific and technical expertise", ranked high (around 3.5) by both, "creativity and innovation", ranked average by both, and "project management", ranked low (< 3) by both. However, in relation to the employers' levels of satisfaction, we observe that doctorate holders ranked themselves higher in terms of "initiative and autonomy" and " research skills and methods", and lower in terms of "collaboration and teamwork".

4. How should early-career researchers be supported in the development of transferable skills?

In the survey, we asked non-academic employers how necessary it was for doctorate holders being hired by their organisation to have professional experience outside of university. Interestingly, only 12.3% of non-academic employers found it "not at all necessary". For a very large majority of them to have professional experience outside of university was either "necessary" or "very necessary", or it was a plus.

Figure 7. Answer of non-academic employers to the question "In your opinion, how necessary is it for PhD holders being hired by your organisation to have professional experience outside of university in general?" (n = 576)



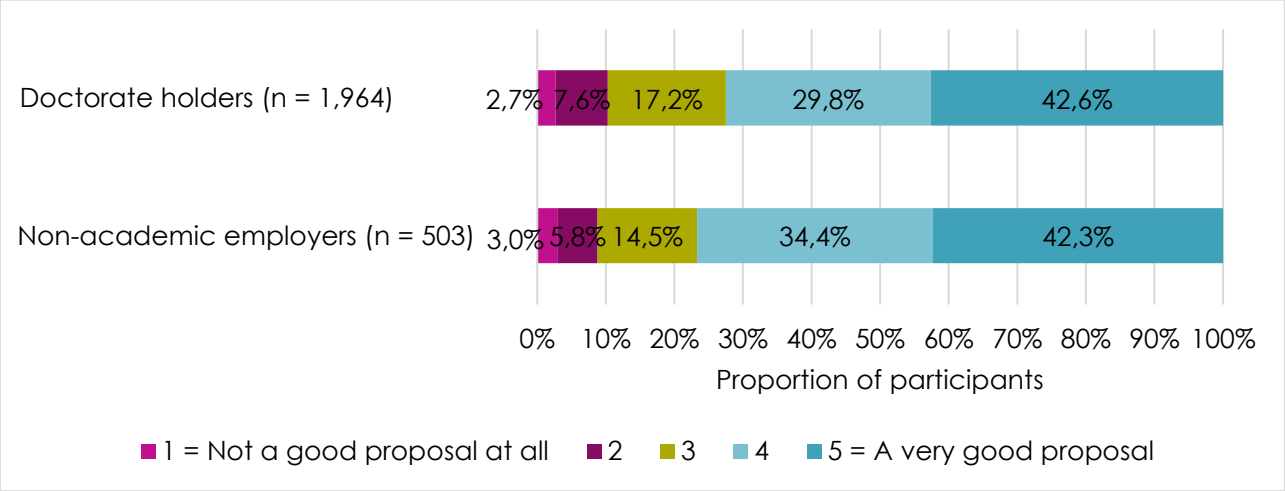
This finding raises the question of how that experience can be provided during doctoral and postdoctoral training. There are several elements coming from the "Future of PhD holders" survey and the "Recruiting Talents" survey which can help us answer the question of how to support doctoral candidates.

4.1. Reinforcing transferable-skills training

The proposal to "reinforce doctoral training on the acquisition of transferable/soft skills (e.g., project management, scientific outreach, creation of spin-offs)" was highly supported by non-academic employers and doctorate holders alike, since 76.7% of non-academic employers and

72.4% of doctorate holders considered it to be a "good" (ranked 4) or "very good" (ranked 5) proposal.

Figure 8. Answers to the question "To what extent do you find the following proposals useful to help improve the job transition of PhD holders? Reinforce doctoral training on transferable/soft skills (e.g., project management, scientific outreach, creation of spin-offs, etc.)"



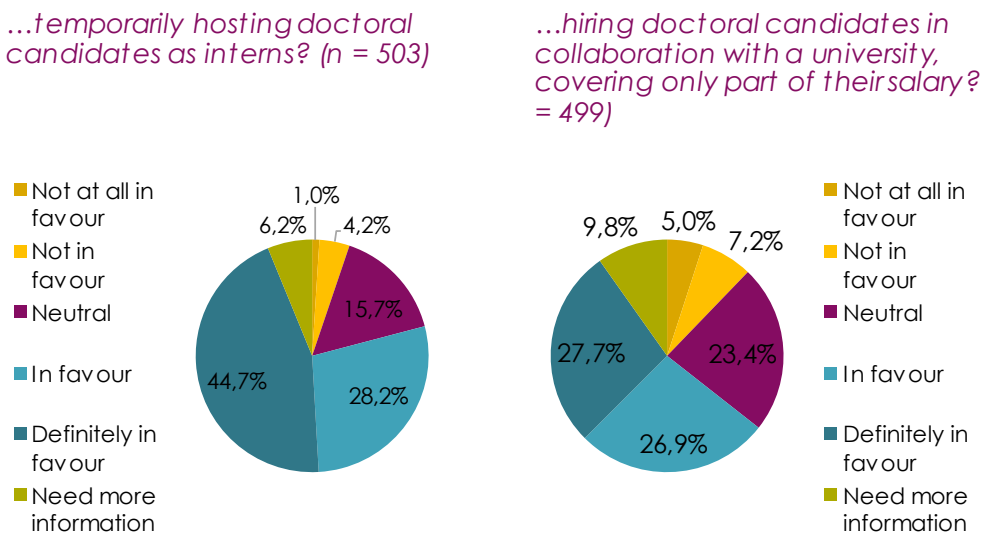
In addition, we wanted to know the opinion of non-academic employers on the usefulness of encouraging the development and/or strengthening of project-based learning[5] activities and research more focused on the real needs of industry in order to improve the job transition of doctorate holders. Most non-academic employers were very supportive of the proposal to "[encourage] project-based learning activities and more applied research focused on the real needs of industry" since 78.6% (*n* = 397) considered it to be a "good" or "very good" proposal.

[5] Project-based learning is a form of learning based on active construction. The learners engage in real-world, meaningful problems and work on solution options with a small group. In these settings, instead of being passive (instructor delivers and students receive), learners become active in investigating questions by proposing explanations, discussing ideas, and challenging the ideas of others. They engage in a goal-oriented process of inquiry, knowledge acquisition, and problem solving. They thus develop a high degree of responsibility and autonomy (Brundiers & Wiek, 2013; Krajcik & Blumenfeld, 2006). Compared to lecture-based direct instructions, project-based learning has advantages when it comes to the acquisition of skills such as collaboration, initiative and autonomy, problem-solving and critical and creative thinking (Guo, Saab, Post, & Admiraal, 2020; Lee, Huh, & Reigeluth, 2015). In addition, it may improve the motivation of learners, their level of satisfaction and their career aspirations (Beier, Kim, Saterbak, Leautaud, Bishnoi, & Gilberto, 2019; Helle, Tynjälä, Olkinuora, & Lonka, 2007).

4.2. Encouraging internships and collaborative doctoral programmes[6]

Most non-academic employers in our sample were very positive about the proposal to host trainees during their doctorate and to participate in collaborative doctoral programmes. As can be seen in Figure 9, 72.9% were "in favour" or "definitely in favour" of hosting doctoral candidates as interns and 54.6% of hiring them in collaboration with a university.

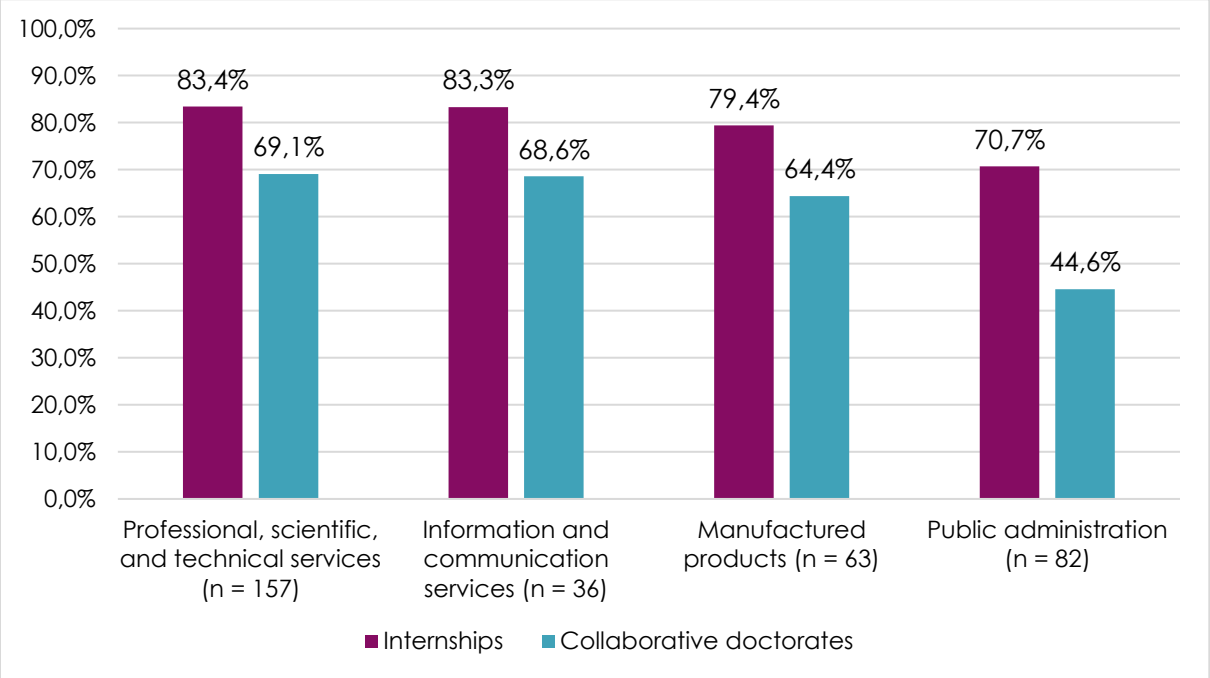
Figure 9. Answers of non-academic employers to the questions "Is your organisation in favour of…."



Looking specifically at the employers' sector of employment[7], we realise that the proportion of employers who are "in favour" or "definitely in favour" of the temporary hosting of a doctoral student as part of an internship goes as high as 83.4% among those who work in the sector of professional, scientific, and technical services, and 83.3% in information and communication services.

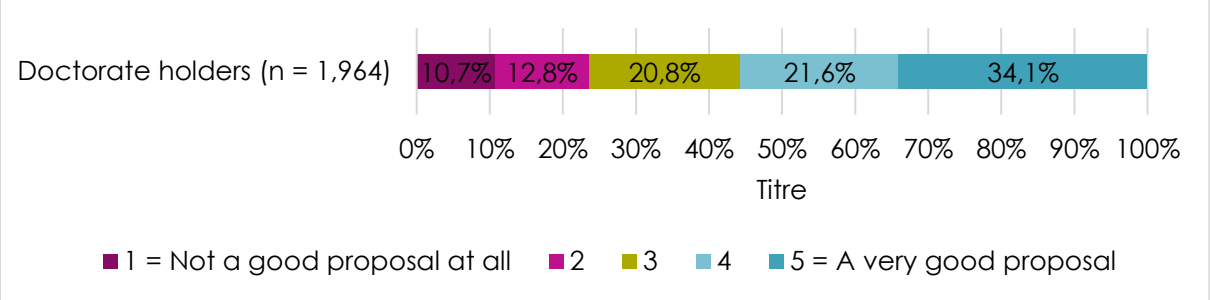
[6] Collaborative doctoral programme is a generic term that we use in this paper to describe doctoral degrees for which an organization from a non-academic sector (e.g., industry, public sector, etc.), hires doctoral candidates by covering part of their salary.
[7] We focused only on four sectors of employment with the highest number of employers.

Figure 10. Proportion of non-academic employers who are "in favour" or "definitely in favour" of internships and collaborative doctoral programmes, by sector of employment



As Figure 11 shows, 55.7% of doctorate holders considered internships to be a "good" or "very good" proposal.

Figure 11. Answers of doctorate holders to the question "To what extent do you find the following proposals useful to help improve the job transition of PhD holders? Doing an internship during the doctoral training to gain professional experience outside academia"



The reason behind a lower rate of support from doctorate holders for this proposal could be related to their lack of time. As one doctorate holder in our sample wrote:

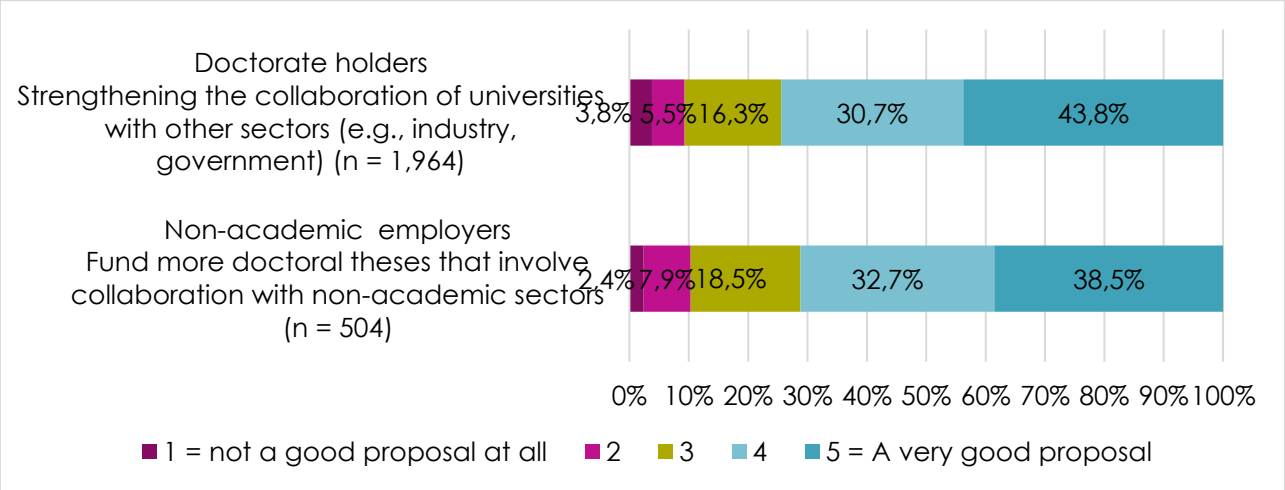
> "Offering post-PhD guidance would be more relevant, because while we're studying, we have to focus 100% on our research. I really can't see, given the pressure I was already under to manage my research, at what point I could have jammed in work

experience in a company or some form of non-academic collaboration." (Anonymous PhD holder, p. 12, Dethier, et al., 2021). [8]

4.3. Strengthening collaborations

Our results show that non-academic employers and doctorate holders alike are in favour of strengthening collaborations. 71.2% of non-academic employers in our sample considered the proposal of "funding more doctoral theses that involve collaboration with non-academic sectors" to be a "good" or "very good" proposal. This rate was 74.4% for doctorate holders.

Figure 12. Answers to the question "To what extent do you find the following proposals useful to help improve the job transition of PhD holders?"

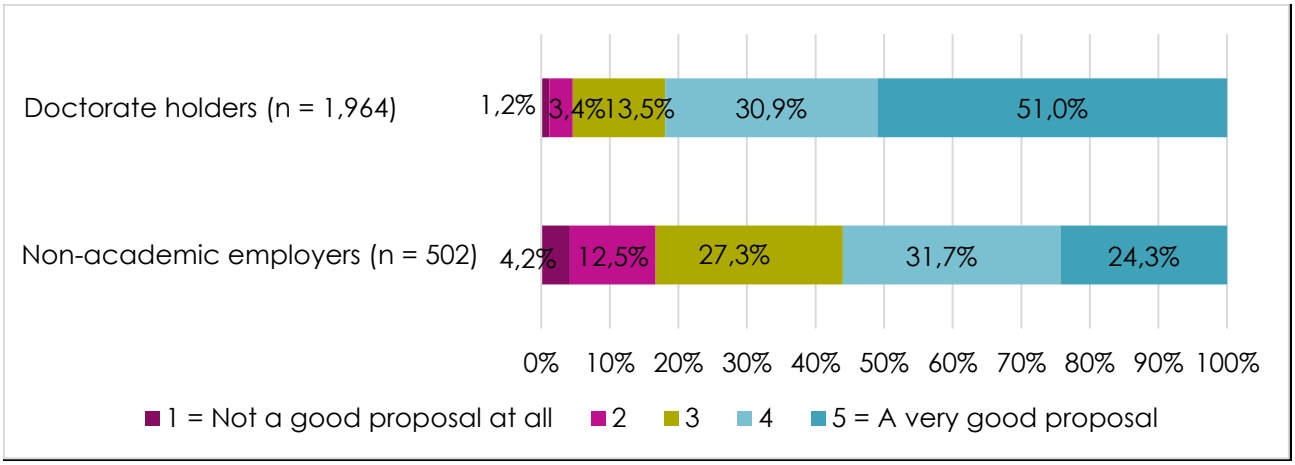


4.4. Promoting doctorate holders' acquired skills and the added value of a doctorate among non-academic employers

The proposal to "promote doctorate holders' skills and the added value of PhD among non-academic employers" was the proposal that received the highest support from doctorate holders as 81.9% of them considered it to be a "good" or "very good" proposal.

[8] The following excerpts are from responses to open-ended questions in the "Future of PhD holders" survey, the analysis of which has been reported previously (Dethier et al., 2021).

Figure 13. Answers to the question "To what extent do you find the following proposals useful to help improve the job transition of PhD holders? Promoting doctorate holders' acquired skills and the added value of PhD"



The doctorate holders in our sample also raised the need to better communicate the added value of a doctorate to non-academic employers in their written responses.

> "Companies also need to have a better understanding of the profession of the researcher (PhD student/postdoc), then they would understand the added value of hiring a young PhD holder. Better information about the skills of PhDs needs to be disseminated to companies." (Anonymous PhD holder, p. 11, Dethier, et al., 2021)

Some even mentioned the "fear" that some non-academic employers may have that doctorate holders could get bored, not fit into the teams, and end up leaving their jobs.

> "Reduce the fear of professionals/future employers that we are going to leave or get bored in our work, [and provide] a better view of what having a PhD means (such as real work experience) for companies." (Anonymous PhD holder, p. 10, Dethier, et al., 2021)

Doctorate holders therefore consider it important, in order to fight these misconceptions, to inform non-academic employers about the skills acquired during the doctorate and the added value of a doctorate. Interestingly, this was the proposal that had the least support from non-academic employers, with 56.0% ranking it as "4" or "5".

5. General Discussion

Doctorate holders are considered to play a strategic role in the promotion of innovation ecosystems. Therefore, it is particularly important for them to be equipped with skills which they may later apply in their work environment. Based on insights coming from both doctorate holders and employers, our findings provide valuable information on which skills can be enhanced and in what form, and how to help with the job transition of doctorate holders.

- **Which transferable skills should be targeted to best prepare the job transition of early-career researchers?**

According to doctorate holders. Findings from Study 1 point to the mismatch that exists between acquired skills and used skills especially regarding working with others ("collaboration and teamwork" skills and "social skills and multicultural competency") and general management skills ("business skills" and "project management"), in line with previous findings (e.g., De Grande, 2009; DocEnhance, 2021).

When we divided the sample into two, doctorate holders who work inside and outside of the university sector, our aim was to understand the divergent skills needs of each group. While one would expect differences between people who left the university sector and those who stayed in the same sector (for example, fewer differences in the skills acquired and used in terms of "collaboration and teamwork" for doctorate holders working in the academic sector, given that they remained in the same work context), the patterns of match and mismatch between acquired and used skills are actually very similar for both groups. Indeed, both groups seem to mainly lack skills related to working with others ("collaboration and teamwork" and "social skills"), general management skills ("business skills" and "project management") and "communication skills". In the same way, the correspondence between the skills acquired by the end of the doctorate and those used in the work environment is very similar, regardless of the research domains of the doctorate holders.

These findings have two implications. Firstly, transferable-skills training is not important only for doctorate holders who wish to leave the university sector. It is, in fact, just as important for those who pursue their careers in academia. Secondly, training in transferable skills is of similar importance for all doctoral graduates, regardless of their research domain. As a result, it may not be necessary to prepare separate training experiences for doctoral candidates based on the career path that they are envisioning or their research domain.

According to non-academic employers. Findings from Study 2 indicate that the most important skill non-academic employers look for in a candidate for a position that could be occupied by a person with a doctorate or a master's degree is "scientific and technical expertise". The second most important skill for them is "collaboration and teamwork", which demonstrates the importance for employers of having employees who can fit in and work together with others. However, 47.5% of doctorate holders in our sample claimed to have acquired "collaboration and teamwork" skills,

the third least acquired skill by doctorate holders. Finally, having "project management" skills would seem, for employers, almost as important as having "research skills and methods". 60.1% of doctorate holders in our sample claimed to have acquired "project management" skills by the end of their doctorate, and the satisfaction levels of non-academic employers echoed this deficiency. More than a quarter of non-academic employers were dissatisfied by the "project management" skills of doctorate holders.

In view of these results, at the crossroads of the points of view of doctorate holders and non-academic employers, we recommend that universities and doctoral schools pay particular attention, within the framework of their doctoral training programmes, to developing the skills of "collaboration and teamwork" and "project management".

- How should early-career researchers be supported to develop transferable skills?

Professional experience outside of university seems to be a very important factor for non-academic employers. Indeed, 88% of them consider that this element is either "necessary», «very necessary" or "a plus" when hiring a doctorate holder. Universities can provide this experience while doctoral candidates and postdoctoral researchers are still in training through **internships** and **collaborative doctoral programmes**.

74% of employers in our survey were in favour of temporarily hosting doctoral candidates as interns. Recent evidence suggests that real-life work experiences during the doctorate improve the employability of doctoral candidates once they enter the labour market (Mortier, Bebiroglu, Teelken, Van der Weijden, & McAlpine, 2022; Mortier, Levecque, & Wille, 2021), develop their skills and professional network, and increase knowledge transfer between universities and non-academic sectors (Santos, Veloso, & Urze, 2020). In addition, these experiences may play an important role in reducing the level of "organisational cultural shock" doctorate holders may experience once they enter the non-academic labour market (Skakni, Inouye, & McAlpine, 2021). Therefore, internships during the doctorate may be considered.

In addition, 55% of non-academic employers in our sample were in favour of hiring doctoral candidates in collaboration with a university. The evaluation of existing collaborative doctoral programmes such as *Cifre* (*Conventions industrielles de formation par la recherche*) in France highlights its positive impact for employers (increased R&D workforce, benefit from R&D skills as well as the infrastructure of a research laboratory) and doctorate holders (wage premium and higher probability of having a permanent contract three years after obtaining their doctorate compared to non-Cifre doctorate holders who are engineers) (Guillouzouic & Malgouyres, 2020). The existing funding schemes such as "Win4Doc" could be broadened to include more sectors, including the public sector, and candidates from all domains, including those from Social Sciences and Humanities, and to fund a greater number of doctoral candidates (e.g. in the Brussels-Capital region, the "Applied PhD" programme, which includes the public sector and is open to candidates from all research domains, funds an average of 7 doctorates per year, divided between Flemish and French-speaking universities and the region's higher education institutions outside university). Other funding schemes could also be implemented.

Another proposal that received high levels of support from both groups was "**strengthening collaborations**". In addition to internships and collaborative doctorates, many events and programmes, such as, job fairs, laboratory visits for non-academic employers, company visits for doctoral candidates or meetings where doctoral candidates or doctorate holders pitch their research projects or start-up ideas can be organized by universities. The recent inter-university program "Team Mentorship" is a very welcome initiative in this respect that builds mutual awareness between the actors of the business world and young scientists. The doctorate holders in our sample raised the need to better communicate the added value of a doctorate to non-academic employers in their written responses. In addition, "promoting doctorate holders' acquired skills and the added value of a doctorate among non-academic employers" was the proposal that received the highest support among doctorate holders. Organizing events where doctoral or postdoctoral candidates meet and exchange with non-academic employers will give them the opportunity to demonstrate their skills and the added value of the doctorate.

Reinforcing transferable-skills training has received support from non-academic employers and doctorate holders alike. It is important to remember that each FWB university already offers a diverse training catalogue (transferable and thematic) available to all their scientific and academic staff. Importantly, non-academic employers highlighted the importance of "learning by doing" in the form of project-based learning or applied research focused on the real needs of employers. The positive response to this proposal reveals the importance that non-academic employers place on the ability to apply knowledge in a given context, and to identify and solve concrete problems within the work environment. "Learning by doing" can make transferable skills less context- and task-specific (Beier, Kim, Saterbak, Leautaud, Bishnoi & Gilberto, 2019) and more "translatable" for doctorate holders. As a result, universities could consider, as part of their transferable skills training programmes, offering a learning approach of this type in order to familiarise doctoral candidates, regardless of their involvement in basic research or applied research, to what might be expected of them in their future working environment. It is also necessary to inform doctoral candidates about the skills that employers consider important and to encourage them to self-assess their own skills. As such, significant resources have been made available within the framework of the inter-university PhDs@Work project, such as the brochure "Yes I can! Assessing my doctoral skills".

Lack of time seems to be a barrier and a concern for doctorate holders in our sample. Given the push at international level to further shorten doctoral training (e.g., Shaller & Barbier, 2021), their concern that professional development activities may slow the progress of their research and lengthen the time it takes to obtain a doctorate is understandable. However, in a meta-analysis covering ten academic institutions in the United States, data comparing doctoral candidates who participated in career and professional development activities (e.g., workshops, site visits, internships, etc.) to those who did not, revealed that participation in such activities does not result in a significant increase in the time taken to obtain a degree or in a decrease in research productivity (Brandt, Varvayanis, Baas, Bolgioni-Smith, Alder, Petrie, ... & Layton, 2020). Therefore, as was highlighted by a recent publication by the OECD (p. 47, OECD,2021) and the Marie Skłodowska-Curie Programme (Individual Scholarship (MSCA-IF)), institutions and doctoral

supervisors must inform early-career researchers of existing training courses, grant them the time necessary to pursue such training activities and guide/support them in building a career plan.

Finally, doctoral training allows doctorate holders to develop a set of skills (disciplinary and transferable) while writing their thesis: from the development of the research project to its design and implementation until the communication of results. On the one hand, our results show that the mobilisation of these skills is not limited to the university sector but is transferable to other sectors (public, private, etc.). On the other hand, they emphasise the importance of integrating a set of supports dedicated to the development of transferable skills into the doctoral or postdoctoral programme. This could take the form of courses, project-based learning activities, internships, and collaborations to improve the job transition of doctorate holders to the academic and non-academic labour market.

6. REFERENCES

Auriol, L., Schaaper, M. et Felix, B. (2012). *Mapping careers and mobility of doctorate holders: Draft guidelines, model questionnaire and indicators* – Third Edition (OECD Science, Technology and Industry Working Papers, 7). https://doi.org/10.1787/5k4dnq2h4n5c-en

Bao, Y., Kehm, B. M., & Ma, Y. (2018). From product to process. The reform of doctoral education in Europe and China. *Studies in Higher Education*, *43*(3), 524-541.

Bebiroglu, N., Dethier, B., & Ameryckx, C. (May, 2019). *The Future of PhD Holders: Employment status of PhD holders in the Federation Wallonia-Brussels.* Observatory Thematic Report Series #1http://www.observatoire.frs-fnrs.be/docs/REPORT%20EMPLOYMENT%20ENG_FINAL.pdf

Bebiroglu, N., Dethier, B., & Ameryckx, C. (January, 2020). *The Future of PhD Holders: Education job match among PhD Holders in the Federation Wallonia-Brussels*. Observatory Thematic Report Series #1, Volume 2: http://www.observatoire.frsfnrs.be/docs/REPORT_EMPLOYMENT_VOL2_ENG.pdf

Beier, M. E., Kim, M. H., Saterbak, A., Leautaud, V., Bishnoi, S., & Gilberto, J. M. (2019). The effect of authentic project-based learning on attitudes and career aspirations in STEM. *Journal of Research in Science Teaching*, 56(1), 3-23.

Brandt, P., Varvayanis, S. S., Baas, T., Bolgioni-Smith, A., Alder, J., Petrie, K. A., ... & Layton, R. (2020). Measuring effects of trainee professional development on research productivity: A cross-institutional meta-analysis. *bioRxiv*. https://doi.org/10.1101/2020.09.28.316422

Brundiers, K., & Wiek, A. (2013). Do we teach what we preach? An international comparison of problem-and project-based learning courses in sustainability. *Sustainability*, 5(4), 1725-1746.

Dethier, B., Bebiroglu, N., & Ameryckx, C. (June, 2021). *The Future of PhD Holders. Their suggestions for improving job transition after the doctorate*. Observatory Thematic Report Series #1, Volume 3: www.observatoire.frs-fnrs.be/_media/report.employment.vol3.ENG.pdf.

Dance, A. (2013) Graduate students: structured study. Nature 493 :259–261. doi:10.1038/nj7431-259a.

De Grande, H. (2009). Ready or not: different views about transferable skills of doctoral candidates in Flanders. *Higher Education, Partnership, Innovation*, 51-61.

De Grande, H., De Boyser, K., Vandevelde, K. and Van Rossem, R. (2011). The skills mismatch: What doctoral candidates and employers consider important, *ECOOM Briefs*, Vol 2011, No. 4, pp 1-4

De Grande, H., De Boyser, K., Vandevelde, K., & Van Rossem, R. (2014). From academia to industry: are doctorate holders ready? *Journal of the Knowledge Economy*, 5(3), 538-561.

DocEnhance (2021). *Enhancing skills intelligence and integration into existing PhD programmes by providing transferable skills training through an open online platform*. D7.1 1st Policy Brief https://docenhance.eu/wordpress/wp-content/uploads/2021/06/DocEnhance_D7.1-1st-policy-brief-1.pdf

European Science Foundation (2017). 2017 *Career Tracking Survey of Doctorate Holders: Project Report*. Strasbourg

European University Association. (March, 2021). LEARNING & TEACHING PAPER #13. Meeting skills and employability demands: Thematic Peer Group Report, Brussels, Belgium. https://eua.eu/downloads/publications/eua%20tpg%20report_meeting%20skills%20and%20employability%20demands.pdf

Fillery-Travis, A., & Robinson, L. (2018). Making the familiar strange–a research pedagogy for practice. *Studies in Higher Education*, *43*(5), 841-853.

Gokhberg, L., Shmatko, N., & Auriol, L. (2016). *Rethinking the doctoral degrees in the changing labor market context*. In In L. Gokhberg, N. Shmatko, & K. Auriol (Eds.), The Science and Technology Labor Force (pp. 1-7). Switzerland: Springer International.

Guo, P., Saab, N., Post, L. S., & Admiraal, W. (2020). A review of project-based learning in higher education: Student outcomes and measures. *International Journal of Educational Research*, 102, 101586.

Guillouzouic, A., & Malgouyres, C. (2020). Évaluation des effets du dispositif CIFRE sur les entreprises et les doctorants participants (No. halshs-03079780). HAL. https://www.entreprises.gouv.fr/files/files/en-pratique/etudes-et-statistiques/etudes/evaluation-dispositif-cifre-rapport-final-octobre-2020.pdf

Horta, H. (2020). PhD Students' Self-Perception of Skills Acquired During Their PhD and Plans for Their Postdoctoral Careers: A Joint Analysis of Doctoral Students at Three Flagship Universities in Asia. In *Structural and Institutional Transformations in Doctoral Education* (pp. 275-323). Palgrave Macmillan, Cham.

Hayter, C.S., & Parker M.A. (2019). Factors that influence the transition of university postdocs to non-academic scientific careers: An exploratory study. *Research Policy*, 48, 3, 556-570. DOI: https://doi.org/10.1016/j.respol.2018.09. 009

Helle, L., Tynjälä, P., Olkinuora, E., & Lonka, K. (2007). 'Ain't nothin'like the real thing'. Motivation and study processes on a work-based project course in information systems design. British *Journal of Educational Psychology*, 77(2), 397-411.

Kehm, B. M., Shin, J. C., & Jones, G. A. (2018). Conclusion: Doctoral Education and Training–A Global Convergence?. In *Doctoral education for the knowledge society* (pp. 237-255). Springer, Cham.

Krajcik, J. S., & Blumenfeld, P. (2006). Project-based learning. In R. K. Sawyer (Ed.), The Cambridge handbook of the learning sciences (pp.317–334). New York: Cambridge

Lee, D., Huh, Y., & Reigeluth, C. M. (2015). Collaboration, intragroup conflict, and social skills in project-based learning. *Instructional Science*, 43(5), 561-590.

Mortier, A., Bebiroglu, N., Teelken, C., Van der Weijden, I., & McAlpine, L. (2022). *Rethinking doctoral education for careers within and beyond the academy*. EUA Council for Doctoral Education: The Doctoral Debate. https://eua-cde.org/the-doctoral-debate/278-rethinking-doctoral-education-for-careers-within-and-beyond-the-academy.html

Mortier, A., Levecque, K., & Wille, L. (2021, September 6-9*). Reimagining research collaborations*. [Paper presentation]. European Conference on Educational Research, Geneva, Switzerland (online). https://eera-ecer.de/ecer-programmes/conference/26/contribution/50747/

Mowbray, S. & Halse, C. (2010) The purpose of the PhD: theorizing the skills acquired by students. *Higher Education Research & Development*, 29:6, 653-664, DOI:10.1080/07294360.2010.487199

Santos, P., Veloso, L., & Urze, P. (2020). Students matter: the role of doctoral students in university–industry collaborations. *Higher Education Research & Development*, 1-16. DOI: 10.1080/07294360.2020.1814702

Schaller, M. D., & Barbier, M. (2021). FastTrack, a strategy to shorten time to degree. FASEB bioAdvances, 3(7), 482–489. https://doi.org/10.1096/fba.2020-00144

Skakni, I., Inouye, K., & McAlpine, L. (2021). PhD holders entering nonacademic workplaces: organisational culture shock, *Studies in Higher Education*, DOI: 10.1080/03075079.2021.1876650

van der Weijden, I., de Gelder, E., Teelken, C., & Thunnissen, M. (2017). *Which grass is greener? Personal stories from PhDs about their careers within and outside of academia.* https://scholarlypublications.universiteitleiden.nl/handle/1887/59447

OECD (2021). *Reducing the precarity of academic research careers*. OECD Science, Technology and Industry Policy Papers, n° 113, Éditions OCDE, Paris, https://doi.org/10.1787/0f8bd468-en.

7. APPENDICES

7.1. Figures illustrating the correspondence between acquired and used skills

Figure 1. Proportion of PhD holders who reported having acquired a skill by the end of the doctorate and using it as part of their job in Life and Health Sciences

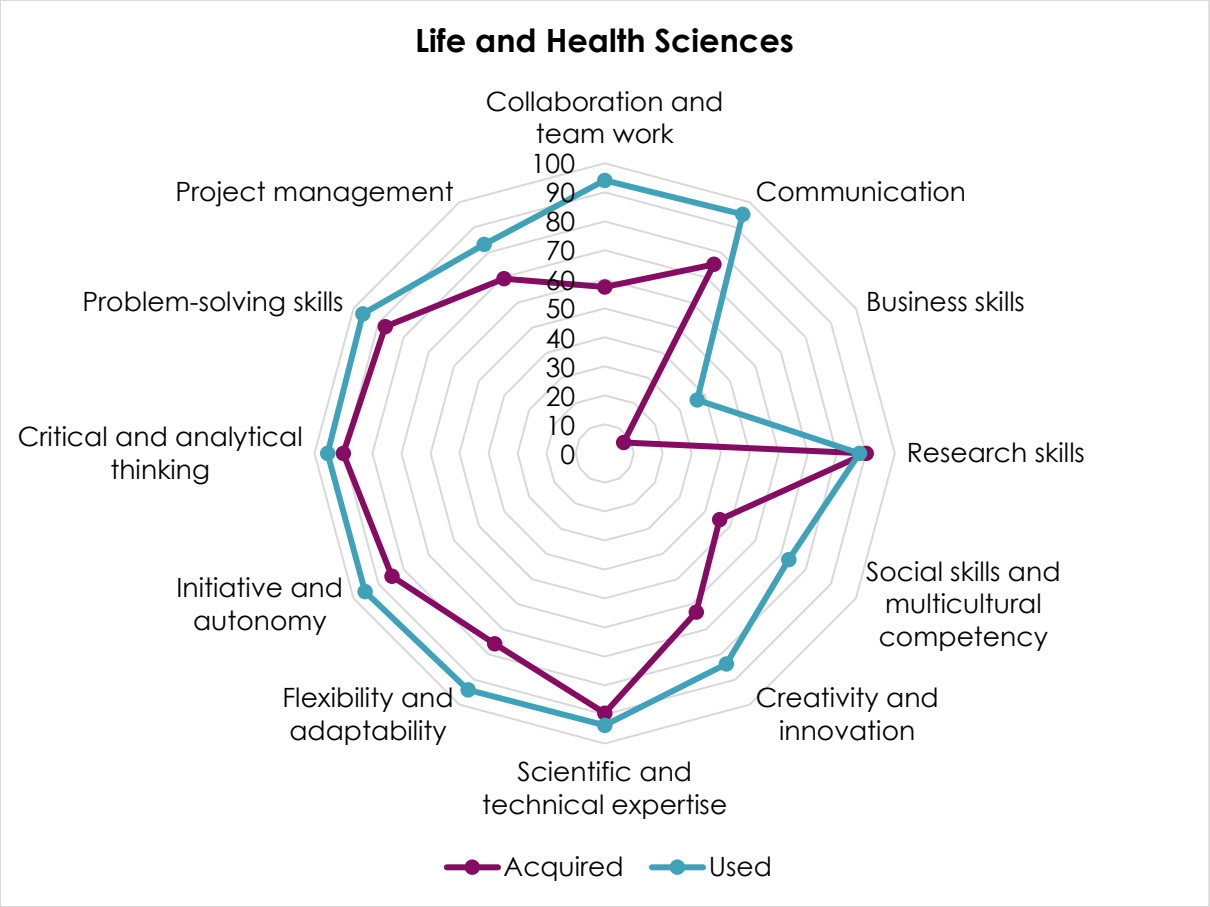


Figure 2. Proportion of PhD holders who reported having acquired a skill by the end of the doctorate and using it as part of their job in Exact and Natural Sciences

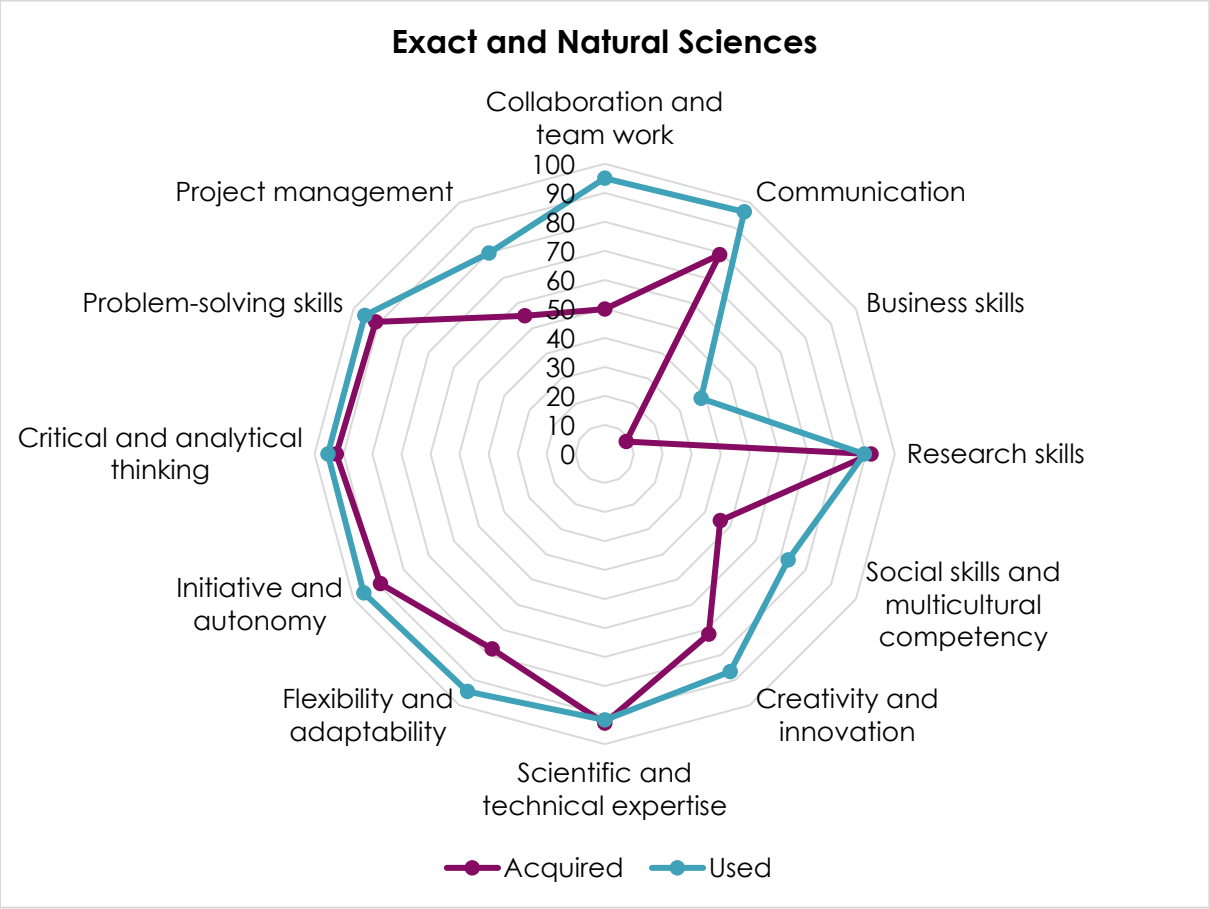
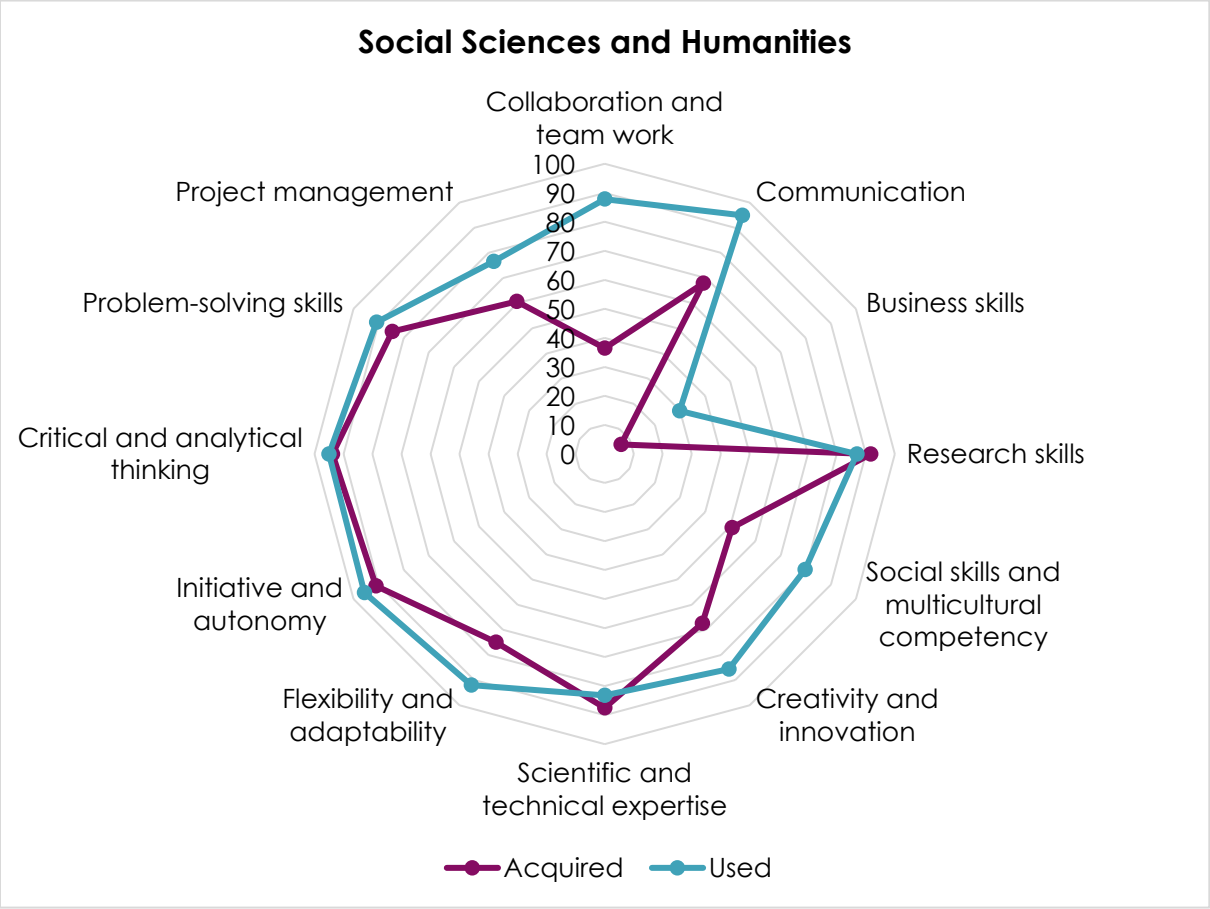


Figure 3. Proportion of PhD holders who reported having acquired a skill by the end of the doctorate and using it as part of their job in Social Sciences and Humanities



7.2. List of organisations

The "Recruiting Talents" study was made possible thanks to the participation of the following organisations:

2Valorise	Enzybel	OPEN ENGINEERING
3B the fibreglass company	Eonix	ORDIGES
3D-Side	Epics Tx	Orthopédie Toussaint S.A.
AAC	ERTMS Solutions srl	OTW
AB InBev	eSpheres S.A.	PDC*line Pharma
Académie de recherche et d'enseignement supérieur	ETEX	Penbox
ACIC sa	ETNIC	PFIZER
AGC Glass Europe	EURA NOVA	Perspective.brussels
AGC Technovation Centre	Euro Heat Pipes sa	pi Lifescience Consultancy
Agence du Numérique	Eurogentec	Pirotech
Agence Wallonne pour la Sécurité Routière (AWSR)	EZ cargo	Port autonome de Namur
Agence Wallonne à l'Exportation et aux Investissements étrangers	EUROTERMINAL SA	Polypeptide Group
Agence wallonne du Patrimoine - SPW - DG TLPE	Farm	PREFER
Air liquide	Farnell Electronics Components	Prelude
ALCYON Belux	Feronyl	Promethera Therapeutics
Altaneos	Fluxys Belgium	PROPAC
AMIA Systems	FOD Werkgelegenheid arbeid en sociaal overleg	Proximus
AMOS SA	Fondation rurale de Wallonie	Putman Group
Analis	Fondytest	Qover
AP	Fost Plus	QUALIblood
AppTweak	Freemind Consulting Group	Quality Assistance S.A.
Aquatic Science	FRW	Quality by Design
Archives de l'Etat	Full Services	Quimesis SRL
ARES	Fund+ SA	Radiomics SA
Artechno	FWB	Raincode
Aseptic Technologies SA	Gabi Smartcare	Randstad Belgium
ASIT biotech	Gantrex	RBINS
Astek	Generycs	REALCO

AstraZeneca	Gerresheimer	RESA
Atlas Copco Airpower	GIM	Retraite auparavant SITEREM SA
A-ULaB	GSK	Revatech
Avery Dennison Materials Belgium	Hays	Revatis
AVIQ	HEARTKINETICS SRL	RLM Consulting
AWEX	Hedera22	RMI/KMI
B12 Consulting	HELHA	Rommel Consulting Partners
Banque nationale de Belgique	HELMo	Royal Institute for Cultural Heritage (KIK-IRPA)
BDLS	HeX	S.A.B.C.A.
Beci	Holcim Belgique SA	Safran Aero Boosters
Bibliothèque royale de Belgique	Hudson	Sagacify
Bio-sourcing	IBA - Ion Beam Applications	Sagita
Biowin	IBM	SAMBRINVEST
Bioxodes SA	IBSA	sciensano
Bit and Byte SRL	ICOSA EUROPE	SCKCEN
BIZSON sa	ID2Move	Secoya Technologies
Blacklight Analytics	IDDI S.A.	Securex
BLSI	IDEA - Direction Infrastructures Economiques et Facility Management	SEE telecom
BMDC	IDRABEL sprl	Service public de Wallonie - Direction de la Gestion hydrologique
BOSA-Recrutement et Développement (ex-Selor)	IFREMER	Service Public de Wallonie - DTIC
Botalys sa	Imcyse	Sherwin Williams
Brussels Airport Company	imec vzw	Siemens
Bruxelles Mobilite	infrabel	Smals
BSolutions	InhaTarget Therapeutics	Sobelcomp
bsTORM	Innovation Sprint	Societe Wallonne des Aeroports Sa
BUUR Pos	Institut royal d'Aéronomie Spatiale de Belgique (IASB)	Sogepa
CALYOS	Institut Royal des Sciences Naturelles de Belgique	Solvay SA
Canaero	Institut Royal du Patrimoine Artistique	SONACA S.A.
Cargill R&D Centre Europe BV	INTERWORKS	Sopura - Kersia

Caritas International	intoPIX	SOWAER
Carmeuse	Intuitim	Sowalfin Transmission
Catalent	Ion Beam Applications sa	Space Applications Sevices
CEBEDEAU ASBL	IPALLE	Spectralys Biotech
CegeSoma (Algemeen Rijksarchief en Rijksarchief in de Provincia«n)	IPG	SPF
CELABOR	IRE	SPF Affaires étrangères
Celyad Oncology	IRE IRE-Elit	SPF Economie, P.M.E., Classes moyennes et Energie
Cenaero	IRM	SPF Emploi, Travail et Concertation Sociale
Cenergie	iTeos Belgium SA	SPF Finances
Centexbel	Ittention	SPF Intérieur
CentralApp	IWEPS	SPF Mobilité et Transports
Centre de Recherche Métallurgique (CRMgroup)	Janssen Pharmaceutica	SPF Sante Publique, Sécurité de la Chaine Alimentaire et Environnement
Centre Recherche Routière	JEMA	SPF Stratégie et Appui
Centre régional d'aide aux communes	JOHN COCKERILL	SPM Mobilité et Infrastructures
Centre Terre et Pierre	Kaneka Eurogentec	SPRB Service public régional de Bruxelles
Centre wallon de Recherches Agronomiques	KEGT	SPRB-equal.brussels
CER Groupe	KIK-IRPA	SPW
Cerhum	KiOmed Pharma	SPW ARNE
CERTECH	Knauf N. & B. SCS	SPW - BLTIC
CESE Wallonie	LABIRIS	SPW énergie Wallonie - Belgium
CETIC	Lambda-X SA	SPW EER
CILE	Lambiotte & Cie S.A.	SPW Infrasports
CILYX	LANNUTTI SA	SPW Logement - DEQL
CMMI	LASEA	SPW Mobilité et Infrastructures
CO2logic	Le Forem	SRIW
Colruyt Group	Lhoist	SSG (Europe) Distribution Center SA
Commission wallonne pour l'energie	Loyens & Loeff	Statbel
Confo Therapeutics	LUR.Co International BVBA-SPRL	StepUp Consulting
Consultys Benelux	Lys Medical	Stone Assistance sprl
Coris BioConcept	M3 Systems Belgium	StratiCELL SA

Covivins SA	Magotteaux International	SWDE, La Société wallonne des eaux
CRA-W	Marichal Ketin	SYNGULON
Cream Consulting	Materia Nova	Takeda
CRIBC	McKesson	Technord
CRIC-OCCN	MDS-IMAGING SRL	Telix Pharmaceuticals
CRM Group	Mecar	Tempo-Team
CSTC	Meet My Job	Thales Alenia Space in Belgium
Dassault Systemes	Meurice R&D	TheraVet SA
Data Minded	Micromega Dynamics sa	Tistech
DC ENVIRONMENT SA	Mielabelo	Total Petrochemicals Feluy
de Duve Institute	Mirmex Motor	Total Research and Technology Feluy
Deloitte	Mithra Pharmaceuticals SA	TOTAL S.E.
Delphi Genetics SA	MK Engineering	Tractebel Engineering s.a.
DENDROGENIX	MSD	Trasis SA
Desimone	Multitel	Ubidata
DETHIER ARCHITECTURES	MULTITRA	UCB Biopharma
Diagenode	Musee Royal de l'Afrique Centrale	umicore
DIASource ImmunoAssays SA	MyCellHub	urbike SC
DM BioMed Development	Nanocyl SA	Utile games srl
Domobios sa	neos interim management	V2i
Dow Silicones Belgium	Newpharma	Vanheede environmental LOgistics
DSi	Nika Cleanroom	Viridaxis
D-tek s.a.	NLMK Clabecq	Vitrociset Belgium
Duferco Wallonie SA	Nokia	Wallonie-Bruxelles international
Dumoulin Aero	Novo Nordisk	Walloon Agricultural Research Centre
e-biom	NRB s.a.	WaPT
ECSOR	N-SIDE	WBI
eFarmz	NUCLEIS SA	WILMET Group
Efficy	NUMECA international	Wooclap
ELIOSYS	NVISO	WOOD.BE
Ellion SRL	Observatoire des politiques culturelles	xFIVE SRL
Engie Laborelec	Observatoire royal de Belgique	yields.io
Entra	OCAS NV	ZenTech

Entraide par le Travail asbl - Entra	OncoDNA	ZORGI
Entreprise des Technologies Numériques de l'Information et de la Communication (ETNIC)	OneLife sa	