

Research report

Deliverable 17 (WP2-17) WORKPACKAGE 2

Outplacement Support For Doctorates In Emerging Areas – OUTDOC

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ABSTRACT:	This report presents the survey results. It briefly presents the project aims, methodology of research, data analysis and results. An additional chapter covers competencies analysis which includes proposed list of skills that should be trained in WP3. The findings of the survey are lastly presented in the final chapter.
Keyword List:	Research, research methodology, questionnaire, data analysis, skills, competences.

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1 PROJECT AIM

Project OUTDOC is aimed at increasing employability of PhDs in emerging sectors. The main outcome of the project will be development of innovative soft skills training that will be tested by PhD student at the partner Universities. Three students per University will also attend a one-month mobility period at partner companies. The aim of this project is to reduce the skills mismatch by developing training according to employers' feedback. For this reason, a survey was conducted amongst employers from multiple European countries on requested skills and perceived skills levels. The data was used to identify why companies do not employ more PhDs and if they are willing to do it in future.

2 BRIEF DESCRIPTION OF WORK PACKAGE 2

Work package 2 is aimed at identifying skills and competencies that are expected by the industry. The survey includes 252 companies from several emerging sectors from multiple European countries. Primarily, our focus was to invite companies from the same countries as the partner institutions come from. This work package includes research, preparation of questionnaire, conducting the survey and data analysis.

The main aim of this survey is to identify skills that improve the employability of PhDs according to the employers' needs. This survey mainly covers transferable skills that can be used by professionals from all sectors considering the training materials will be used by PhDs from emerging and other sectors. In order to create a high-quality tailor-made program, the research is of the utmost importance. The survey was prepared by WP leader University of Maribor with constant feedback from other partner institutions, specifically from private companies that have experience and know the issues when recruiting PhDs.

3 TIMELINE OF RESEARCH ACTIVITIES

Deadlines planned in the action plan have been postponed due to difficulties with attaining enough respondents.

Activity	Initial deadline	New deadline	Status
Questionnaire draft	21/01/2019	/	Done
Finalised questionnaire	31/01/2019	/	Done
Start of the survey	15/2/2019	6/3/2019	Done
End of the survey	17/03/2019	25/7/2019	Done
Translation of qualitative answers	31/03/2019	30/7/2019	Done
Competencies analysis	2/8/2019	/	Done
Finished report	30/04/2019	30/8/2019	Done
Report translation	/	20/9/2019	

Table 1: Overview of project deadlines.

4 METHODOLOGICAL FRAMEWORK

The working methodology was outlined at the beginning of Work package 2 in the deliverable Action plan. Previous studies that have researched skills needs were reviewed. So far, there have been no studies with the same aim, as none of the studies focused on the emerging economic sectors. There have, however, been studies on competencies requested by employers (Ting et al., 2012; Shah & Nair, 2011; Teijeiro et al., 2013; Collet et al., 2015). Several studies chose graduates as their target group instead of doctorate holders (Velasco, 2012; Andrews & Higson, 2008; Suleman, 2018).

Review of previous studies was done with a set of the following keywords that closely resonate this project's goals: skills, competencies, core employee skills, academic vs. industry environments, skills gap, doctoral training programs, transferable skills, competency deficiency, skills mismatch.

This study is focused on soft/transferable skills as these skills can improve the chances of employment in any economic sector. Soft skills are also an important predictor of employability, as research shows (Finch et al., 2013; Lievens & Sackett, 2012).

4.1 Related works

The topic of employability of PhD holders has already been researched in the European Union. Several authors have noticed a skills mismatch, especially the lack of non-academic skills such as commercial thinking, adaptability and ability to translate research results to the public (Jackson, 2007; Borrell-Damian et al., 2010). In the pursuit of better matching acquired skills and job requirements, the debate has shifted from seeing the mismatch as needed to be resolved by the academic sphere to the need for on-the-job training.

Studies have also shown that company size is related to the employment of PhDs; smaller companies do not have funds to employ PhDs and prefer all-round employees instead of PhDs with specialist skills (Morris & Cushlow, 2000; Purcell et al., 2008). A study in Belgium has shown that employers who already employ PhDs value their research skills, scientific knowledge and leadership skills. Those, who do not employ them value technical skills, independence and self-confidence (De Grande et al., 2014).

A similar study in Finland has researched academic engagement and industry-specific competence of doctorate holders. The researchers have used multi-perspective methods to collect versatile data. PhDs were given a questionnaire with open-ended questions and their employers were interviewed. Results show that PhDs were most often hired for their research skills; employers also valued industry-specific knowledge. Other important skills were teaching, analysis, management and interaction skills.

Employers claimed that industry-specific knowledge can be acquired through work experience, but the shortage of this knowledge was also the reason for not employing PhDs with no work experience (Haapakorpi, 2017).

Three European institutions Eurostat, OECD and UNESCO have collected data on the employment of doctorate holders with a pilot study in 2006. A few years later, the study was done in most European countries. It was focused on the difference between acquired and required skills. Data were also compared between sectors of employment. The results show that the level of research skills and personal effectiveness are satisfactory, while there is a lack of management, communication and team skills (Boosten et al., 2010).

Transferable skills can be used by students at all educational level. Bennett (2002) has conducted a study of over 1000 job advertisements aimed at graduates. In this study, the aim was to research how were the skills requirements determined, whether the firm offers employees training in personal skills and what was the perceived level of personal skills of employees as perceived by managers. 18% of respondents agreed that “today’s graduates commonly possess lower levels of personal skills than are really necessary to do their jobs”.

The skills perceived as the most important were communication, teamwork, IT and organisation. Least important were foreign languages, self-confidence, initiative and numerical skills. Employers evaluated today’s graduates as best at teamwork, analysis, IT and presentation, while the worst at foreign languages, initiative, self-confidence and leadership (Bennett, 2002).

4.2 Measuring instrument

The questionnaire consisted of five main parts. In the first part, we gathered industry data. Companies were asked on the emerging sector and department that they work in. The list of emerging sectors also included the option to add different sector, which was later qualitatively analysed. The list of economic sectors was adjusted from the standard NACE classification.

The next part of the questionnaire was the gathering of company data. We obtained data on location, company name and size, as well as information on current employment of PhDs. Companies that do not currently employ PhDs were given the question on reasons for not employing PhDs. Companies proceeded to question on intention to hire PhDs in future and approximate percentage of PhDs currently employed. The last question in the second part was on positions that PhDs in their company occupy. The list was prepared by assessment of online job advertisements.

The third part inquired on the importance of skills. The list of skills was built after reviewing existing studies. Only skills that have been mentioned by at least two sources were included. The list includes 22 skills from which 10 will be selected after analysis to be trained in the COP programme. The importance of skills was measured with a 5-point Likert scale, as suggested by similar studies (Shah & Nair, 2011; Nabi & Bagley, 1998).

The skills were assigned to five categories:



The next part of the questionnaire measured employers' satisfaction with the perceived skills level of PhDs. The same list of skills and 5-point Likert scale was used as for the previous part.

In the last part, companies were asked on opportunities for professional development that they offer. The final open-ended question gave respondents the possibility to express any thoughts about the questionnaire.

Deliverable: Questionnaire (available on Google Docs)

4.3 Sampling

This study uses a convenience sample. The main reason for this decision was our aim to reach versatile companies from different countries. Link to the questionnaire was attached to e-mail invitation that was sent by each partner and also shared on social media.

4.4 Participants

A total of 252 companies participated in the survey. Majority of participants came from one of the four participating countries (Spain (31,3%), Slovenia (27%), Romania (20,6%) and Germany (15,5%)). Other countries were Belgium, France, United Kingdom, Montenegro, Luxembourg and Austria.

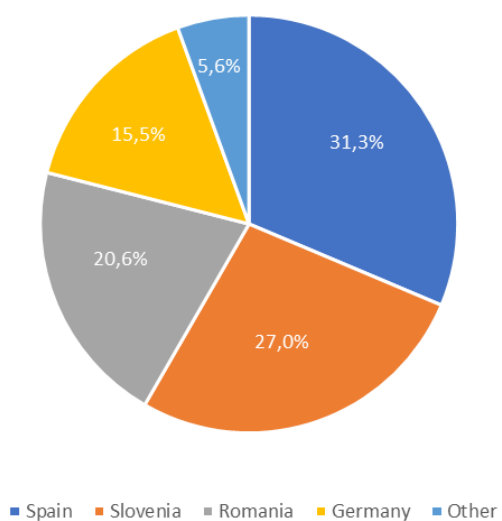


Figure 1. Companies by country.

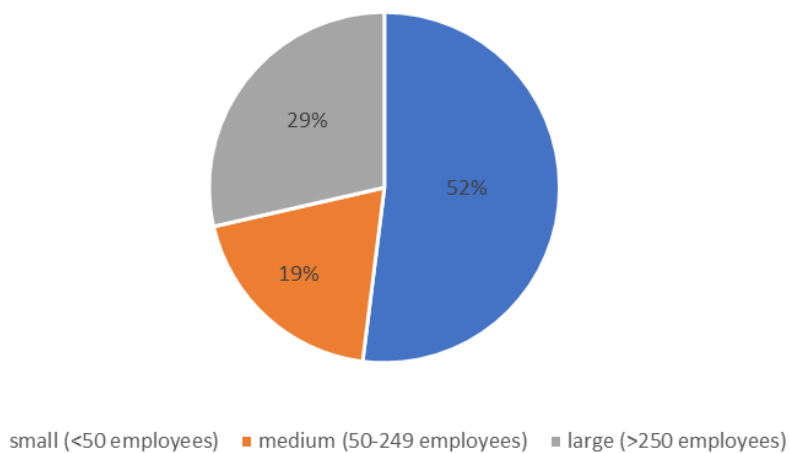


Figure 2. Companies by size.

Below is an overview of participating companies by emerging sectors.

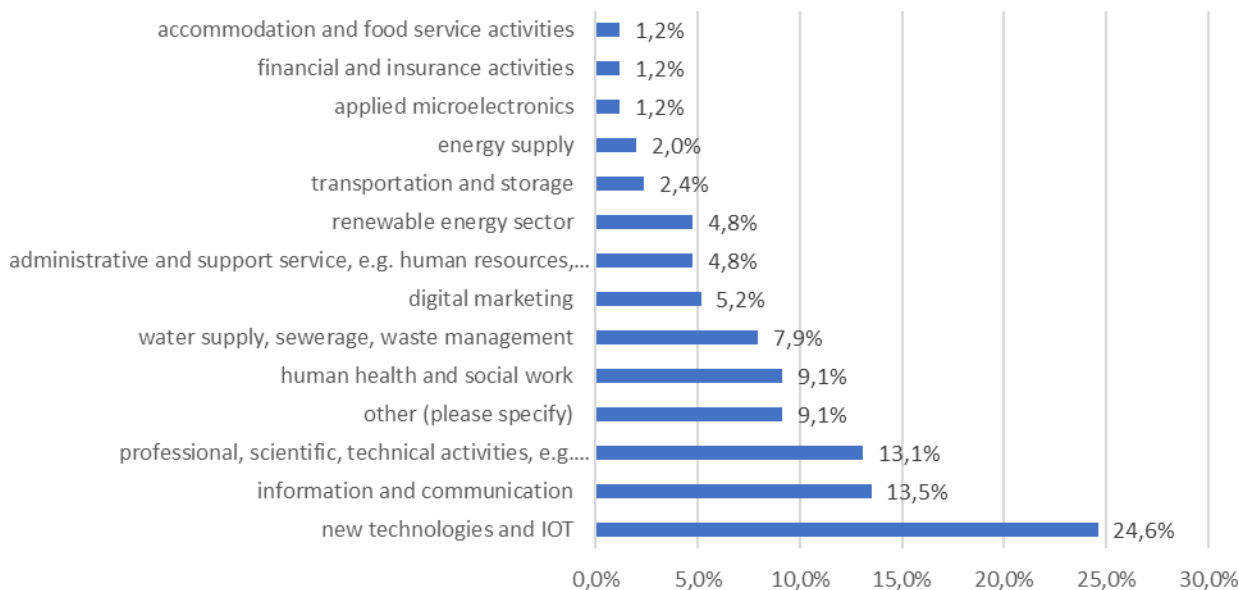


Figure 3. Companies by sectors.

5 DATA COLLECTION AND ANALYSIS

This survey was done amongst companies that work in emerging sectors in several European countries. It was available in English, Spanish, German, Romanian and Slovenian. 732 companies started the survey, but 31 of those left after initial question on GDPR compliance. Additional 99 left during Q1 (emerging sector) and Q2 (company location). Other companies left the survey at the next questions. Complete responses were submitted by 252 companies.

The questionnaire was sent to selected companies by e-mail both to business partners and other companies. The survey was open between 6/3/2019 and 25/7/2019. Only companies from emerging sectors were invited and filtered with Q1 (*Do you work in the following emerging sectors?*). The participants either selected one of the listed sectors or added their own sector.

Data collection was done using Qualtrics survey tool. This tool was also used to prepare data for analysis. All missing data were removed, such as when the respondent closes the survey before answering all questions or when they skipped questions. Data analysis was done using program SPSS v25.

6 RESULTS

RQ1: Which skills do employers perceive as the most and least important in PhDs?

We analysed which skills do employers perceive as the most and least important in order to develop the training according to employers' needs. Skills were ranked by mean value as suggested by similar studies (Teijeiro, 2013; Ting & Ying, 2012).

As shown in Table 2 below, the ten skills with the highest perceived importance are teamwork (M=4,59), willingness to learn (M=4,58), verbal communication (M=4,55), accountability (M=4,53), work ethic (M=4,49), self-motivation and initiative (M=4,48), professionalism (M=4,46), writing skills (M=4,39), problem-solving and decision-making (M=4,38) and organisation (M=4,37). These skills are followed by flexibility and adaptability (M=4,37), foreign languages/English (M=4,32), creativity (M=4,3).

The same table also shows the least important skills, which are negotiation (M=3,88), ability to lead people and delegate work (M=4,03), industry-specific knowledge (M=4,17), research and data analysis (M=4,18), self-confidence and assertiveness (M=4,21), entrepreneurship/innovation mindset (M=4,22), punctuality and time management (M=4,24), time efficiency (M=4,25), ability to present research results to general public (M=4,27) and creativity (M=4,3).

Skills	
1 Teamwork	12 Foreign languages/English
2 Willingness to learn	13 Creativity
3 Verbal communication	14 Presenting research results to the general public
4 Accountability	15 Time efficiency
5 Work ethic	16 Punctuality and time management
6 Self-motivation and initiative	17 Entrepreneurship/innovation mindset
7 Professionalism	18 Self-confidence and assertiveness
8 Writing	19 Research and data analysis
9 Problem-solving and decision-making	20 Industry-specific knowledge
10 Organisation	21 Ability to lead people and delegate work
11 Flexibility and adaptability	22 Negotiation

Table 2. Importance of skills.

RQ2: Do the perceived skills levels meet or exceed employers' expectations?

Employers reported the skills levels that they perceive in PhDs on a scale 1-5 that is shown in Figure 4 below.

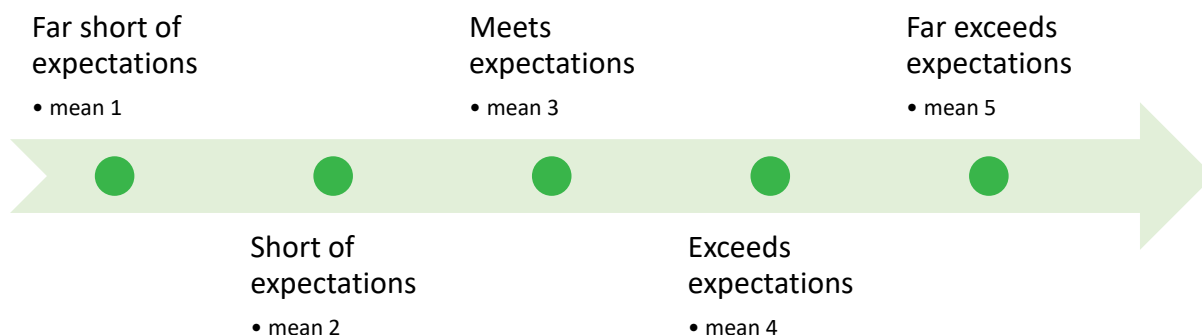


Figure 4. Scale for measuring employers' expectations on skills levels.

In the table below, the skills are ranked by the highest mean value, meaning the skills that were perceived to exceed employers' expectations. Employers expressed the highest satisfaction with willingness to learn (M=3,87), professionalism (M=3,81), industry-specific knowledge (M=3,77), research and data analysis (M=3,77), entrepreneurship/innovation mindset (M=3,77), accountability (M=3,76), work ethic (M=3,76), flexibility and adaptability (M=3,76), creativity (M=3,75), problem-solving and decision-making (M=3,75). Following skills were self-motivation and initiative (M=3,73), foreign language/English skills (M=3,72), self-confidence and assertiveness (M=3,7), ability to present research results to general public (M=3,7), teamwork (M=3,69), writing skills (M=3,69), time efficiency (M=3,69), ability to lead people and delegate work (M=3,68), punctuality and time management (M=3,67), organisation (M=3,66), verbal communication (M=3,63) and negotiation skills (M=3,6).

No.	Skills	Mean	No.	Skills	Mean
1	Willingness to learn	3,87	12	Foreign languages/English	3,72
2	Professionalism	3,81	13	Self-confidence and assertiveness	3,70
3	Industry specific knowledge	3,77	14	Presenting research results to general public	3,70
4	Research and data analysis	3,77	15	Teamwork	3,69
5	Entrepreneurship/innovation mindset	3,77	16	Writing	3,69
6	Accountability	3,76	17	Time efficiency	3,69
7	Work ethic	3,76	18	Ability to lead people and delegate work	3,68
8	Flexibility and adaptability	3,76	19	Punctuality and time management	3,67
9	Creativity	3,75	20	Organisation	3,66
10	Problem-solving and decision-making	3,75	21	Verbal communication	3,63
11	Self-motivation and initiative	3,73	22	Negotiation	3,60

Table 3. Perceived skills levels.

RQ3: Does the perceived level of skills differ from requested skills levels?

We analysed the discrepancy between the perceived and requested skills levels in order to find which skills should be trained. The discrepancy was calculated with a paired sample t-test. As shown in the table below, the largest discrepancy between perceived and required levels is reported for verbal communication skills (-0,92), teamwork skills (-0,89), accountability (-0,77), self-motivation and initiative (-0,76), work ethic (-0,73), organisation (-0,71), willingness to learn and writing skills (-0,7), professionalism (-0,66), problem-solving and decision-making (-0,63), flexibility and adaptability (-0,61), foreign language/English skills (-0,6), ability to present research results to general public (-0,58), punctuality and time management (-0,57), time efficiency (-0,56), creativity (-0,55), self-confidence and assertiveness (-0,51). The lowest discrepancies were shown for negotiation skills (-0,29), ability to lead people and delegate work (-0,35), industry-specific knowledge (-0,4), research and data analysis (-0,41) and entrepreneurship/innovation mindset (-0,46).

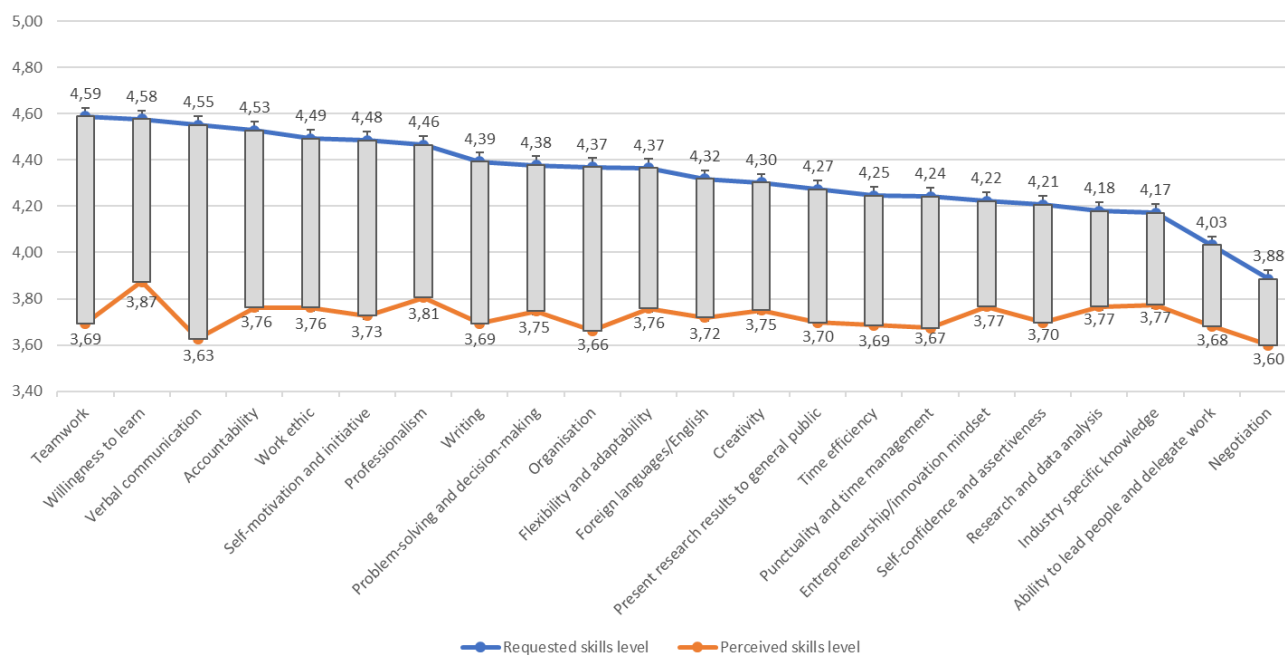


Figure 5. Discrepancies between perceived and requested skills levels.

We also analysed if any of the skills that employers highly value are also perceived as exceeding their expectations. Results show there are five skills that are among ten most requested skills that also far exceed employers' expectations. The highest discrepancy between both has been reported for accountability (-0,77), which means this skill needs to be trained even though its current perceived levels exceed employers' expectations. Following skills are work ethic (-0,73), willingness to learn (-0,7), professionalism (-0,66) and problem-solving and decision-making (-0,63).

RQ4. What is the effect of the following variables on the current employment of PhDs?

a) Company size

Respondents gave their answer in free form in the range between 0 and 100%. Data was later categorized into five categories: no PhDs employed, 1-10%, 11-30%, 31-60%, 61-100%.

As seen in the table below, small companies are the most likely not to employ any PhDs (41,2%) in comparison to medium-sized (16,3%) and large companies (11,1%). Large companies most often employ between 1 and 10% of employees with a PhD in comparison to 64,3% of medium-sized and 34,4% of small companies. Companies that employ 11-30% of PhDs are most often small (12,2%), less often large (11,1%) or medium-sized (4,1%). Percentage of companies that employ higher percentage of PhDs are fairly smaller at 6,1% of medium-sized, 5,6% of large and 4,6% of small companies employing between 31 and 60%. More than 61% of PhDs are most often employed in small companies (7,6%), medium-sized (6,1%) and least often in large companies (1,4%).

Percentage of PhDs employed	Company size		
	Small	Medium	Large
No PhDs	41,2%	16,3%	11,1%
1-10%	34,4%	67,3%	70,8%
11-30%	12,2%	4,1%	11,1%
31-60%	4,6%	6,1%	5,6%
61-100%	7,6%	6,1%	1,4%

Table 4. Effect of company size on the current employment of PhDs.

Results show a statistically significant relation between company size and current employment of PhDs ($p=0.000$). Additionally, results indicate a positive correlation between both variables, $r=0.326$, $N=252$, $p=0.000$.

b) Emerging sectors

We also analysed which sectors most often employ PhDs. As seen in figure below, 20,5% of those companies work in sector new technologies and Internet of things (IoT), followed by professional, scientific, technical activities, e.g. advertising, market research (15,4%), other sectors (12,8%), information and communication sector (11,5%), human health and social work (11,5%). Fewer companies work in water supply, sewerage, waste management (6,4%), renewable energy sector (5,8%), administrative and support service, e.g. human resources, travel agency activities (5,1%),

transportation and storage (3,2%), energy supply (2,6%), digital marketing (1,9%), applied microelectronics (1,9%) or financial and insurance activities (1,3%).

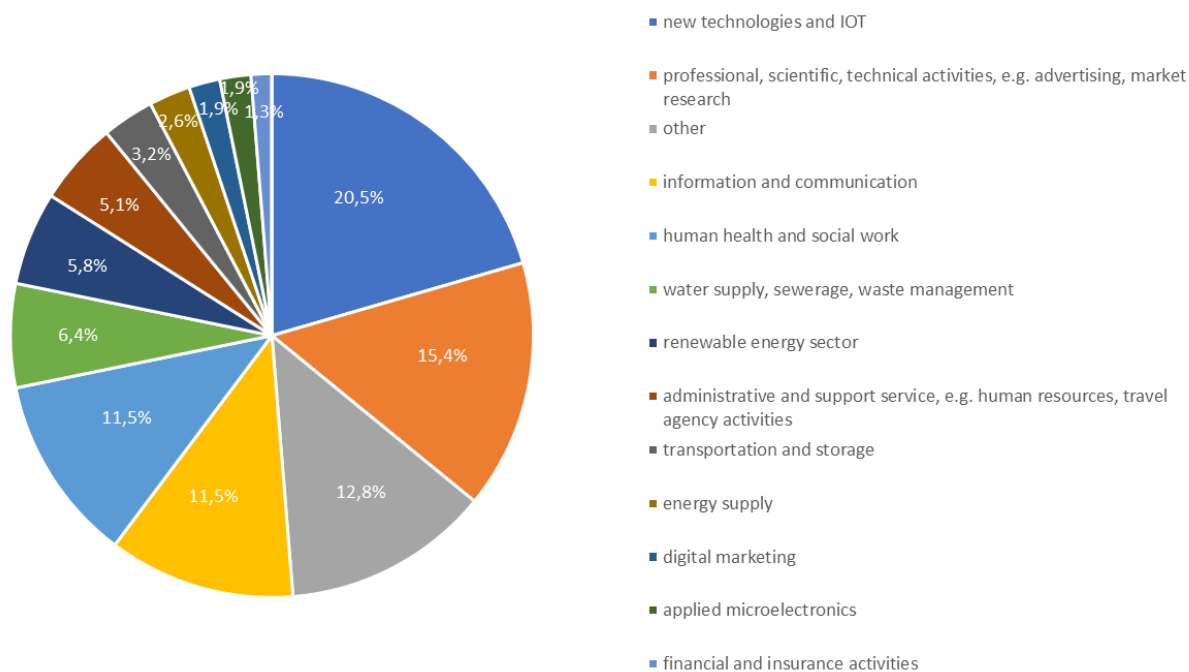


Figure 6. Employment of PhDs by sector.

RQ5. What is the effect of the following variables on the intention to hire PhDs?

b) Current employment of PhDs

Majority of those who expressed the intention to employ more PhDs already employs them. Majority employs between 1 and 10% (67,5% of companies), less often 11-30% (17,9% of companies). Majority of companies that do not plan to hire more PhDs also currently employs PhDs, most often between 1 and 10% (72,7% of companies). However, a great share of them employs more than 61% of PhDs (15,2% of companies, which is in line with one of the comments at Q7 (reasons against the employment of PhDs). One company noted that they cannot hire more PhDs as their team already consists of mostly PhDs.

Intention to hire PhDs		
Employs PhDs	Yes	No
0%	1,6%	0,0%
1-10%	67,5%	72,7%
11-30%	17,9%	6,1%
31-60%	6,5%	6,1%
61-100%	6,5%	15,2%

Table 5. Current employment of PhDs and intention to hire them.

c) Company size

As seen in the table below, majority of companies that expressed intention to hire PhDs in future are large (39,8%), followed by small (37,4%) and medium-sized companies (22,8%). Companies that do not plan to hire PhDs are mostly small companies (48,5%), less often large (33,3%) or medium-sized (18,2%). The analysis shows weak negative correlation between both variables ($r=-0.081$), meaning the intention to hire PhDs slightly decreases with company size.

Table 6. Effect of company size on the Intention to hire PhDs.

		Company size		
		small (<50 employees)	medium (50-249 employees)	large (>250 employees)
Intention to hire PhDs	Yes	37,4%	22,8%	39,8%
	No	48,5%	18,2%	33,3%
	Total	39,7%	21,8%	38,5%

RQ6. What positions do PhDs occupy in the industry?

PhDs in the participating companies most often work as managers (40,2%), either general or department managers, followed by researchers (21,3%). Other positions are specialists (14,5%), consultants (8,6%), analysts (7,1%) or other positions, such as technicians (8,3%).

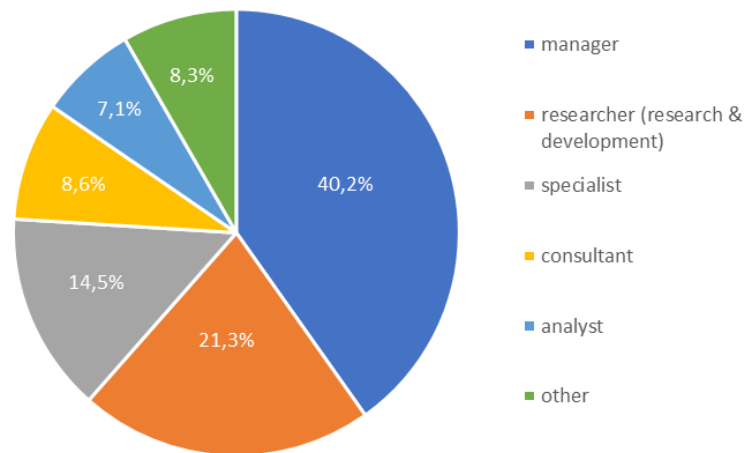


Figure 7. Positions of PhDs in the industry.

RQ7: What are the reasons for not employing PhDs?

The main reason for not employing PhDs was their training and professional skills not being related to the company activities (40%), followed by expectations for too high salary (20%), lack of work experience (12,5%), while some companies do not usually hire university graduates (6,3%).

21,3% of companies reported other than the listed reasons for not employing PhDs. Majority of them has experienced that no PhDs applied to open positions (6%) or they see no additional value in employing a PhD in comparison to other graduates (6%). One company noted that PhDs who get employed in their industry, do not plan to stay at the same company long-term or they want to occupy higher positions very soon. Other reasons against employment of PhDs were failure to recognize advantages of employing PhDs, lack of their time management and business-related skills and need for multidisciplinary employees instead of highly specialized ones. One company also noted that PhDs would probably not be satisfied with employer’s work expectations in a small company as research and development are less common departments.

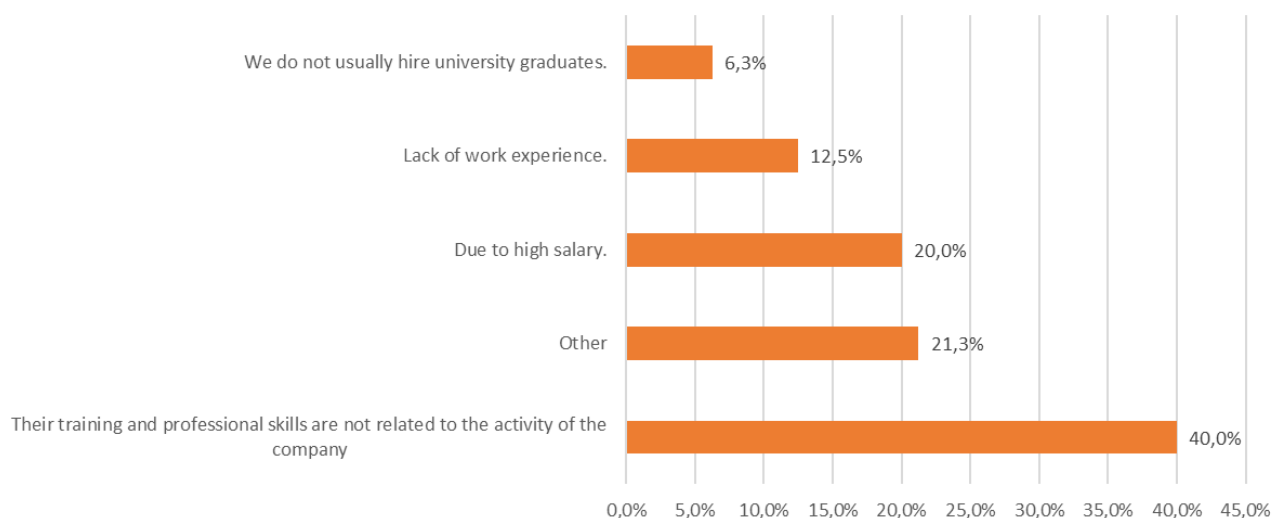


Figure 8. Reasons for not employing PhDs.

Opportunities for professional development

As the main outcome of this project will be a training program for soft skills, employers were asked about their opportunities for professional development. Soft skills courses were the most often mentioned at 19,3% of companies offering them, closely followed by ICT courses (17,7%). Other common opportunities are support for participation at national conferences (15,8%), mentoring (15,2%), foreign languages courses (14,7%) and support for participation at international conferences (12,5%). Other opportunities were job-specific training, networking events or training by proposal. 1,7% of companies do not offer any trainings.

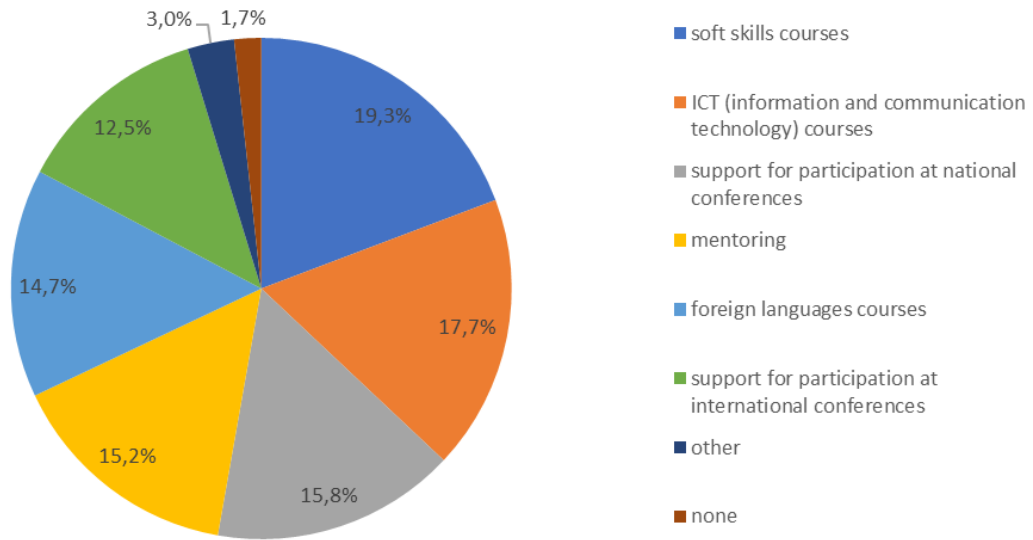
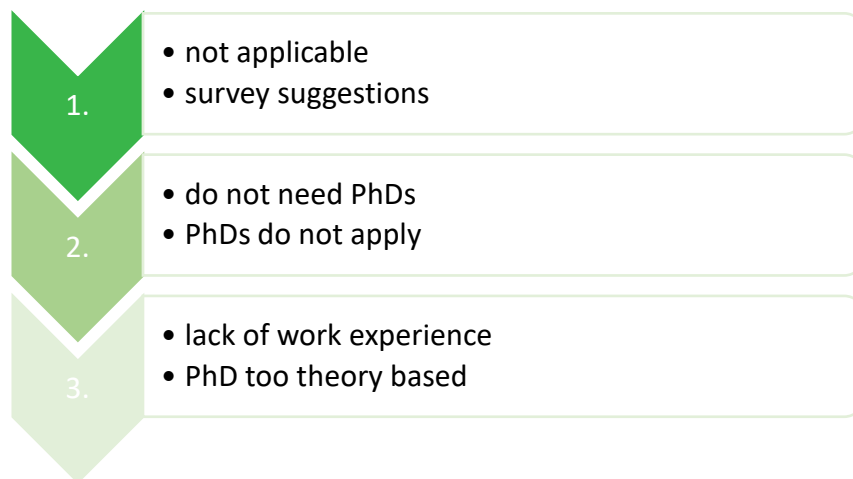


Figure 9. Opportunities for professional development.

Additional comments by employers

At the last question, employers had the opportunity to express their opinion on the topic and/or propose changes to the survey. Most comments were not applicable (“No comment.”) to the results. Others had survey suggestions, such as which skills should be added (empathy, emotional skills, social intelligence skills). One employer expressed the wish to get the questionnaire to be used in their recruiting process. A number of companies do not want to hire PhDs as their knowledge is not needed—many stated that PhDs are overvalued, and they do not bring additional value to the company. Others had issues finding ambitious PhDs who would apply to their positions, especially in IT, where majority is employed before going to pursue PhD. Two companies suggested a possible cause could also be lack of research and development departments in companies which discourages PhDs from applying to

those positions. Several employers pointed out the lack of experience that they see in PhDs, while also adding that they are seen as newcomers to the industry despite having a PhD.



7 COMPETENCIES ANALYSIS

The list of skills that will be trained is not yet decided. Below is the table that was presented at the Skype meeting on 27/8/2019 with University of Maribor’s proposal on the set of skills.

During the analysis, two skills were removed from the list as both are not soft skills rather hard skills (foreign languages/English and industry-specific knowledge). However, list of important skills and perceived skills levels still include them as both give insights into employers’ requirements and perception.

Skills	Discrepancy	Comments
Verbal communication	-0,92	
Teamwork	-0,89	
Accountability	-0,77	
Self-motivation and initiative	-0,76	
Work ethic	-0,73	
Organisation	-0,71	
Willingness to learn	-0,70	
Writing	-0,70	
Professionalism	-0,66	
Problem-solving and decision-making	-0,63	
Flexibility and adaptability	-0,61	
Foreign languages/English	-0,60	Not a soft skill
Present research results to the general public	-0,58	
Punctuality and time management	-0,57	
Time efficiency	-0,56	
Creativity	-0,55	
Self-confidence and assertiveness	-0,51	
Entrepreneurship/innovation mindset	-0,46	
Research and data analysis	-0,41	
Industry-specific knowledge	-0,40	Not a soft skill
Ability to lead people and delegate work	-0,35	
Negotiation	-0,29	

Table 7. Competencies analysis - the discrepancy between skills.

Skills
1 Verbal communication
2 Teamwork
3 Accountability (joined with work ethic)
4 Self-motivation
5 Organisation (joined with punctuality/time efficiency)
6 Writing
7 Problem-solving and decision-making
8 Flexibility
9 Ability to present results to the general public
10 Creativity

Table 8. The proposal by University of Maribor.

8 CONCLUSION

Survey results indicate that employers' expectations are higher than perceived skills levels for all skills. Discrepancies vary between the skills, but none are critically high as the maximum difference in required and perceived skills levels in verbal communication are less than one point. It is important to note that the majority of skills with high discrepancy is also highly requested (employers see them as extremely important). Due to this, these skills will be trained with the Comprehensive Outplacement Program that will be produced in the next work package.

Our findings show similarities with previous research. Employers perceive lack of entrepreneurship/innovation mindset, adaptability and ability to translate research results to the general public as previously observed by Jackson (2007) and Borrell-Damian et al. (2010).

On the other hand, it is important to note that not all participating companies employ PhDs. Researchers in a similar Belgian study have noticed a difference in the reported importance of skills that differed between those who employed PhDs and those who did not. These skills were the ability to lead people and delegate work, industry-specific knowledge and research and data analysis (De Grande et al., 2014). In this study, employers who already employ PhDs attribute lower importance to ability to lead people (3,97) in comparison to those who do not employ PhDs (4,14). The same applies to research and data analysis (4,24 for those who employ them and 4,07 for those who do not). Regarding industry-specific knowledge, difference between employers is small (0,02). Analysis of perceived skills levels shows significant discrepancy between employers. Those who employ PhDs on average perceive higher skills levels than those who do not, most notably research and data analysis (3,86 vs. 3,61). Similarly, industry-specific knowledge is perceived as higher by those who employ PhDs (3,85 vs. 3,66). The discrepancy in perceived ability to lead people and delegate work is small (3,72 for those who employ and 3,61 for those who do not).

Regarding company size, our findings align to those by Morris and Cushlow (2000) and Purcell et al. (2008). They found that smaller companies do not employ PhDs due to a lack of funds. Small companies from our study also employ PhDs less often than larger companies (41,2% of small companies in comparison to medium-sized (16,3%) and large companies (11,1%)).

Survey findings show that PhDs exceed employers' expectations in many skills while also lacking in others. The main reason against the employment of PhDs was found to be that their training and professional skills are not related to the activity of the company. As not many employers are dissatisfied with the perceived skills levels, it seems that the lack of soft skills is not the main reason

for insufficient employment of PhDs in emerging sectors. Another common reason was high salaries which is related to previously mentioned issue of small companies that want to hire PhDs but are unable to do it due to lack of funds for both employment and research and development departments.

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