EPINION

The DTU PhD programme: Results from a survey among PhD graduates and recruiters

Report

Technical University of Denmark

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1. INTRODUCTION

The Technical University of Denmark (DTU) is one of Europe's leading universities and is recognized among companies for their highly competent and knowledgeable graduates. In their PhD programmes, DTU offers research education equal to the world's very best in several fields of engineering, ranging from mathematics, physics and chemical engineering to sustainable energy and life sciences. A key to this success is DTU's constant focus on ensuring the high quality and relevance of its study programmes. This of course also applies to the PhD programme, with 1,332 enrolled PhD students in 2018.

DTU has commissioned this survey of PhD graduates and recruiters in order to ensure the high quality and positive development of its PhD programmes. The survey has been designed to be comparable with an earlier survey among PhD graduates from 2010-2014, which was conducted in 2015. The aim of the survey is to provide insights to develop the PhD programme and, in particular, to facilitate the researchers' transition to the labour market.

The results of the survey are based on a quantitative web-based questionnaire sent to graduates from the PhD programme at DTU from 2015 to 2017. Full answers were obtained from 458 graduates, which constitutes 41% of the total population of 1,106 graduates. When examining background characteristics, the representation of the obtained data is highly satisfactory, although Danish graduates are slightly over-represented at the expense of graduates of other nationalities. Most of the graduates were invited by e-mail and in some cases by a digital postal invitation letter.

Table 1.   Summary of population and obtainment. Gender, graduation year and nationality.

Background characteristics	Population	Population (pct.)	Obtainment	Obtainment (pct.)
Sex				
Man	742	67	288	68
Woman	364	33	138	32
Total	*1,106*	*100*	*426*	*100*
PhD graduation year				
2015	356	32	149	35
2016	399	36	140	33
2017	351	32	137	32
Total	*1,106*	*100*	*426*	*100*
Nationality				
Danish	505	46	236	55
Other	601	54	190	45
Total	*1,106*	*100*	*426*	*100*

Source: Epinion for DTU—Graduate Survey, 2019

In addition to the survey, a study of DTU PhD graduates was conducted among recruiters and day-to-day managers. In this study, 30 companies who recruit graduates from DTU have taken part in qualitative telephone interviews. Furthermore 20 qualitative telephone interviews with PhD graduates from DTU have been conducted.

1.1   READING GUIDE

This subsection will provide a short overview of the chapters in the report. Firstly, the main results from the quantitative survey of graduates and the qualitative study of recruiters and graduates are summarized in **Chapter 2**. **Chapter 3** describes the employment situation of the graduates, including employment rate and type of business and finishes with a look at the different types of competencies that impact the positions of the graduates. **Chapter 4** addresses the graduates' transition to the labour market – their job considerations during their PhD, job seeking, their first job as well as the graduates' and recruiters' general experience with the transition. **Chapter 5** looks at the graduates' acquired competencies from their PhD and the match between acquired competencies and the companies' needs. **Chapter 6** deals with the international dimension of the programmes, including international networks and visits abroad. **Chapter 7** elucidates the graduates' use of career guidance, coaching and leave during their studies, as well as their suggestions for further development of the programmes. **Chapter 8** looks at the experiences with and need for continuing education courses of supplementary training among the graduates. **Chapter 9** addresses the graduates' competencies regarding innovation, entrepreneurship and setting up businesses themselves, and eventually patenting technology, software etc. **Chapter 10** focuses on the graduates' and recruiters' suggestions for improvement of the PhD programmes at DTU, based on the qualitative studies. Lastly, the data collection and analysis methods are described in **Chapter 11**. The questionnaire for the survey and the interview guides for graduates and recruiters are attached as **Appendices 1 and 2.**

The report shows the main results of the quantitative survey in the form of figures, while some additional results are only mentioned in the text. The figures show the results as percentages, i.e. shares of the graduates or the respective subgroups of the graduates. In some cases, the figures may sum up to more than 100% due to the respondents' opportunity to provide more answers to the questions. Generally, all percentages are rounded so they are displayed without decimals. This means that the rounded percentages in the figures and text may sum to more or less than 100%.

This report has the same structure as its 2015 predecessor[1] and is written to be as comparable as possible. Where relevant, the survey results from the 2015 report are added to the figures for easy comparison and interpretation of differences in survey results and development over time. Figure descriptions and analysis also refer to the 2015 report where it is relevant.

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[1] "The DTU PhD programme: Results from a survey among PhD graduates and recruiters" (2015).

The qualitative interviews with recruiters and graduates are predominantly included in the last section of each chapter. Furthermore, quotes and insights from the interviews are also drawn into the analysis of survey results where relevant.

1.2 ORGANIZATION OF PHD STUDIES IN DENMARK

In Denmark only universities can confer the doctoral degree. We have a legal framework for doctoral education (the Ministerial Order on the PhD Programme) which all universities must follow. The PhD study programme corresponds to three years of full-time studies. During the PhD programme, the student is required to:

- Carry out independent research work under supervision (the PhD project)
- Complete PhD courses or similar study elements totalling approx. 30 ECTS points
- Participate in active research environments, including stays at other, mainly foreign, research institutions, private research enterprises etc.
- Gain experience of teaching activities or other form of knowledge dissemination which is related to the student's PhD project
- Complete a PhD thesis on the basis of the PhD project

The PhD degree is awarded in recognition of the recipient having completed a PhD programme as well as having defended a thesis in a satisfactory way. The PhD graduate has documented a capacity to carry out a scientific project involving independent application of the relevant scientific methodology, thereby displaying a research effort at a level corresponding to international standards of PhD degrees within the specific field. Read more at https://www.dtu.dk/english/education/PhD/intro

2. EXECUTIVE SUMMARY

Below is a summary of the main findings from the survey of graduates and qualitative interviews with graduates and recruiters.

2.1 EMPLOYMENT RATES AND THE LABOUR MARKET FOR GRADU-ATES

In general, there is a high demand for specialized knowledge in the labour market. This is reflected in a very high employment rate among PhD graduates. 57% of the graduates are currently employed in the private sector, which is a significantly larger part than what was reported in 2015. Typically, the employment takes place within Denmark (78%) and mainly in the Capital Region of Denmark. Approximately one third of the graduates are employed in large companies with more than 5000 employees. This is a significantly smaller part of graduates than in 2015 since, at that time, more than half of the graduates worked in companies of this size. Instead, the demand for specialized knowledge has increased since 2015 among small and medium sized companies, meaning that a significantly larger part of graduates is now employed in companies of this size.

In relation to the employment, the PhDs are performing a broad variety of tasks. While graduates employed at universities are, in particular, carrying out tasks involving research, data analysis and teaching, graduates employed in the labour market outside universities perform more varied tasks, including research, product development, or innovation and project management.

The interviews with recruiters and graduates show that the various competencies acquired by the graduates determine the positions in which they are employed. An analytical distinction is presented, which discerns between subject matter expertise and method competencies, with variations of specialist, engineer-specific competencies on the one hand and social and individual competencies on the other. The latter are non-engineer specific generalist competencies.

2.2 TRANSITION TO THE LABOUR MARKET

The transition from PhD to labour market is generally considered smooth. The labour market refers to a first job in the public or private sector as well as a job at a university. 67% have already found jobs before they complete their PhD programme. Generally, the PhDs are not too concerned with their future career during the PhD, as less than one third (27%) considered what jobs the PhD degree could lead to during the programme.

The most influential factor concerning their first job is their professional network. This is how half of the graduates (49%) get their first job. This is followed by applying for an advertised job and being headhunted. Generally, graduates perceive their general (80%) and specific competencies (78%) ac-quired through their PhD as important impact factors with regard to their first job. But the strength of

their professional network is considered almost equally important (68%). What matters the least are previous jobs and personal network.

Regarding the graduates' first work place between 2015-2017, the majority (55%) were employed outside the universities (in the private, public or other sector), while 45% started their career at a university. However, by the time the survey was conducted (December 2018 - January 2019) only 30% of the graduates were working as postdoctoral fellows, researchers or assistant professors at DTU or another university. The remaining had found new jobs outside university in the private or public sector. More graduates are employed in small and medium-sized companies compared to the 2015 report. Four out of five graduates report that their first job had been professionally related to their PhD in some or to high degree, which corresponds with a majority saying their first job included research functions as part of the job description.

In the qualitative interviews, recruiters report that there are particular challenges associated with employing PhDs, mostly related to the transition from an academic culture with great flexibility and independence to a work place with greater collaboration, less flexibility and shorter deadlines. That being said, none of the recruiters say the challenges outweigh the potential gains from the subject matter expertise and method competencies that PhDs have obtained. The graduates themselves report that they fear that potential employers think of them as too academic.

2.3   MATCH BETWEEN REQUIRED AND ACQUIRED COMPETENCIES

Most graduates believe that their PhD programme prepared them for their current job either to a high or some degree. Moreover, the majority of graduates believe that, through their PhD programme, they acquired competencies which their colleagues with comparable seniority (but without a PhD degree) do not possess. The graduates are especially pointing to deep theoretical knowledge, strong analytical competencies and research in general as areas where they have acquired superior competencies. Furthermore, most graduates in their first job were employed in positions that required the specialized competencies they acquired through their PhD.

Furthermore, the report covers the perceived acquisition and relevance of research, personal and innovation-related abilities. Regarding the former two abilities (research and personal competencies), almost all graduates perceive those as something they have acquired through their PhD programme. In general, these abilities are considered relevant by the graduates, but mostly by graduates employed at universities. Regarding innovation-related abilities the perceptions are more scattered. Significantly less graduates believe they acquired these abilities, and less consider the abilities relevant for their career.

The qualitative interviews with graduates show that they feel the relevance of their competencies is most pronounced when it comes to method competencies. But at the same time the individuality associated with doing a PhD is suspected to impact a lack of competence in collaboration according to the graduates.

Lastly, several recruiters emphasize that though subject matter expertise and method competencies are the determining factors when hiring PhDs, mindset and personality of graduates are still – and perhaps becoming more – critical aspects of recruiting.

2.4   INTERNATIONALIZATION – AT HOME AND ABROAD

Generally, it seems like the graduates at DTU experienced their PhD studies as internationalized. Among other things, this is because most graduates agree or strongly agree that they have experienced DTU as an internationally-oriented university in terms of research environment, have developed an international network and obtained experience in collaborating with people with a different cultural background than their own. At the same time 59% of the graduates have studied abroad or carried out research at a different university during their PhD programme.

The graduates were asked to rank seven international and intercultural competencies according to importance in their current job. In particular, *Written competencies in foreign languages* and *Verbal competencies in foreign languages* were given the highest priority on average, while the largest number of graduates indicated *Knowledge about international research* and *Knowledge about international engineering* as their first priority.

In the interviews, the graduates themselves rarely highlight the stay abroad as a significant factor for their career, and among recruiters, it is mostly interpreted as a bonus that matures the graduate, but it does not by itself lead to acquisition of specific competencies necessary for carrying out the work tasks.

2.5   PROGRAMME SCHEDULING, CAREER GUIDANCE AND LEAVE

Regarding programme scheduling, some graduates have offered suggestions for improvements. In particular, the comments show that career guidance and PhD supervision could be improved and the collaboration with industry could also be better. 24% said that there are relevant competencies and knowledge which could have been better included, and which they did not gain in the course of their studies. Project management appears in particular. Graduates also answered whether any of the knowledge or competencies they acquired in connection with their PhD programme have been irrelevant so far. In total, 13% of the graduates think this, and in particular, they mention subject-specific knowledge.

With respect to career guidance, 44% did not seek career guidance during their PhD programme, and the Danish graduates sought it less. At the same time 13% of the graduates indicated, that they received coaching related to the completion of their PhD education. The graduates' opinions of when students should begin to clarify which competencies are necessary for future jobs vary greatly.

18% of graduates state that they took leave that was neither maternity leave nor parental leave during their PhD programme. 48% of those graduates indicate that they acquired competencies during their leave, which have been relevant. In contrast, 41% answer that they acquired competencies that have

not been relevant. Looking at the competencies they acquired, competencies associated with research are the most common.

In the interviews, recruiters emphasize the importance of a mindset prepared for rapid changes. They have no specific suggestions in terms of content in the PhD programme, but they stress that the personal competencies are important to remember. This resonates with the PhD students, who suggest that better opportunities of collaboration during the PhD could qualify their social competencies.

2.6 SUPPLEMENTARY AND CONTINUING EDUCATION

Approximately one fifth of the graduates have either completed or are currently enrolled in continuing education courses. This type of education is significantly more popular among graduates employed in the public, private or other sector than graduates employed at universities.

Most graduates find continuing education to be either highly or to some degree important for maintaining their value on the labour market, though this perception is mostly pronounced among graduates employed in the public, private or other sector. The perception of continuing education being important applies both to general competencies and more profession-specific competencies.

Typically, the graduates enrol in shorter courses of less than three days, rather than longer, part-time courses. The provider of these courses chosen by the graduates is strongly connected to where they are employed. While graduates employed at universities prefer courses provided by DTU, graduates employed in the public, private or other sector mainly choose private providers or enrol in internal courses provided by the company they are employed in. In general, the graduates are mostly interested in individual non-virtual courses, e-learning or certification.

2.7 INNOVATION AND ENTREPRENEURSHIP

Almost half (45%) of the graduates have collaborated with industry in connection with their PhD projects. Far fewer of the graduates have taken initiative to improve their knowledge about innovation and entrepreneurship, or how they could start their own company. This is reflected in 55% of graduates reporting that they took no initiative to improve their knowledge on innovation and entrepreneurship, and only one fourth of the PhD graduates were aware of DTU's offerings of knowledge regarding starting up own business. Of those who were familiar with DTU's offerings, 40% participated. Generally, the industrial PhDs have more contact to industry and experience with innovation and entrepreneurship.

When looking across the various professional fields, Construction, Management Engineering, Mechanical Engineering and Wind Energy is the most prominent area when it comes to collaboration with industry (60%), whereas Mathematics, Physics and Informatics is the least (30%). Other areas range in between.

The interviews with recruiters reveal that innovation, entrepreneurship and competence in creativity is not a widespread demand, and only a few mention it at all. Those who do, discern creativity from professional and personal competence and emphasize that it is something that the company needs to learn how to appreciate, and it is rarely a concern in itself when recruiting PhDs. Those who actively recruit graduates because of their creativity, do not associate it with something acquired through the PhD programme.

3. THE LABOUR MARKET FOR GRADUATES

This chapter describes the characteristics of the graduates' first employment after obtaining their degree and their current employment regarding sector, region, the size of the workplace and work functions. The chapter also describes the qualities graduates associate with a good job. Finally, four key competencies defining the graduates' job positions are described, resulting from the qualitative interviews with recruiting companies and graduates.

3.1   WHERE ARE GRADUATES EMPLOYED?

Most graduates are employed in the private sector
The unemployment rate among PhD graduates from DTU is low. 96% of the graduates are currently employed, 2% are self-employed while less than 1% of the graduates are enrolled in a new study programme. Finally, less than 2% of the PhD graduates are currently unemployed.

As shown in Figure 1, 57% of the employed PhD graduates are currently employed in the private sector while 10% are employed in the public sector. 20% are employed as postdoctoral fellows, researchers, or assistant professors at DTU, while 10% are employed as postdoctoral fellows, researchers or assistant professors at another institution than DTU either inside or outside Denmark. In general, this pattern is quite similar among Danish graduates and graduates of other nationalities, however significantly more Danish graduates are employed in the private sector (63%) than graduates of other nationalities (52%).

COMPARISON WITH THE 2015 REPORT

Since 2015 the share of PhD graduates employed in the private sector has increased significantly by 10 percentage points (from 47% to 57%). At the same time, the share of graduates employed in the public sector and in postdoctoral positions at DTU and other institutions has decreased by 5 and 4 percentage points, respectively, which does not constitute a significant change.

Figure 1: Where are you employed in your current job?

Where are you employed in your current job?

2015 (n=632)   2019 (n=413)

- In the private sector
- In the public sector
- As a postdoctoral fellow, researcher or assistant professor at DTU
- As a postdoctoral fellow, researcher or assistant professor at another institution than DTU
- Other
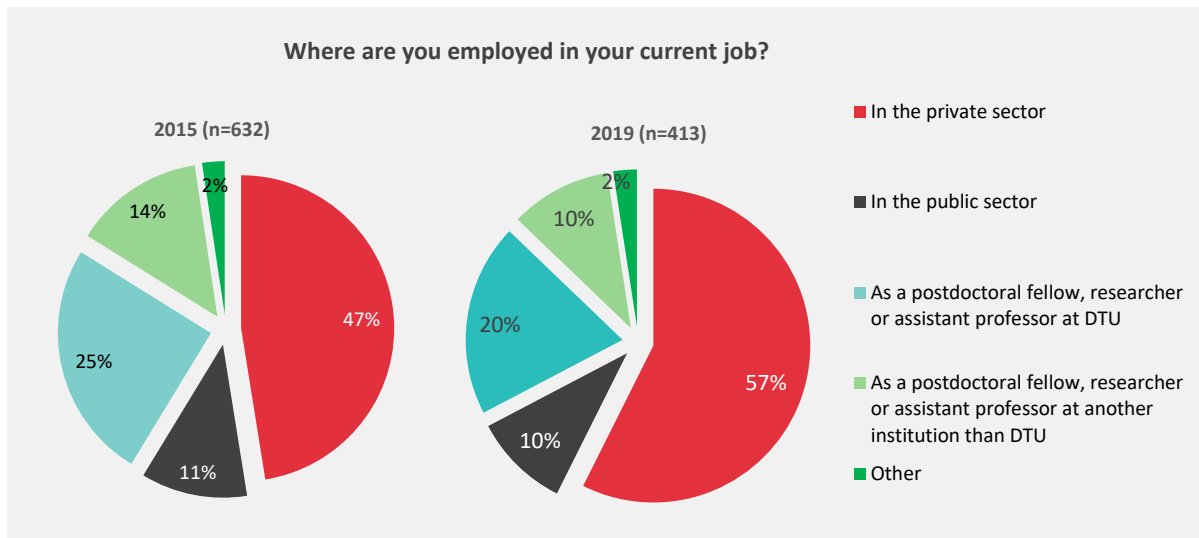
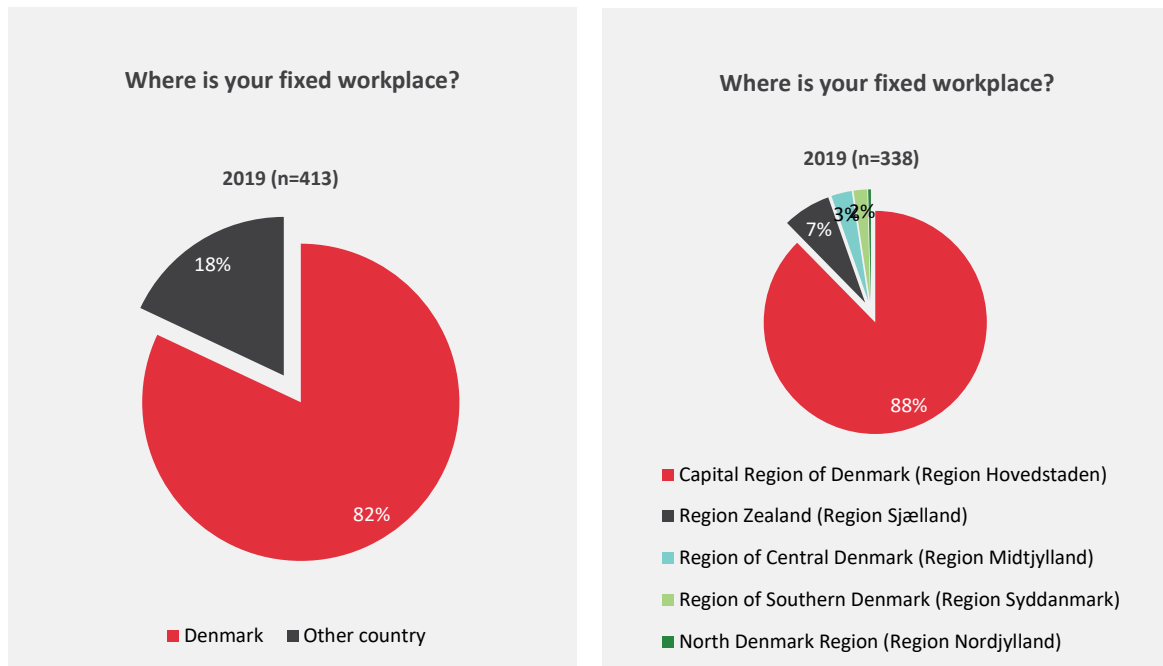Of the PhD graduates employed in the private sector, a little less than half (42%) are employed in the businesses of manufacturing, including manufacturing within the chemical or biotechnological industry. 13% are employed in the consultancy businesses etc., while 12% are employed within information and communication. Like in 2015, these are the three main business areas within the private sector. The rest of the graduates employed within the private sector are scattered across various other businesses, such as within finance and insurance (3%), within electricity, gas, steam, etc. (5%) and within construction (2%).

Graduates find work in Denmark – primarily in the Capital Region

As shown in Figure 2, a large share of the PhD graduates (82%) are currently holding a position in Denmark, while the remaining 18% of the graduates are currently employed outside of Denmark. These results might be biased due to the fact that Danish graduates are over-represented in the total group of respondents. Among PhD graduates holding a position in Denmark, 82% are employed in the private sector, which is a significantly larger proportion than for graduates working outside of Denmark (36%). On the other hand, a significantly larger part of the graduates employed outside of Denmark holds a postdoctoral or research position at a university (35%), compared to graduates employed in Denmark (7%).

Figure 2: Where is your fixed workplace?

Furthermore, Figure 2 shows that PhD graduates employed in Denmark are predominately holding positions in the Capital Region of Denmark (88%). Besides academic positions typically being centred around the capital area, some PhD graduates mention in qualitative interviews the fact that they prefer to work close to DTU and the Capital Region, as they have their family and established their professional network in this area during their PhD studies. 7% of the PhD graduates are employed in Region Zealand, while the remaining 5% are scattered around the Region of Southern, Central and Northern Denmark.

🔍 **COMPARISON WITH THE 2015 REPORT**

The distribution of employment across Denmark in this survey is fairly similar to the distribution of employment in 2015, and there are no statistically significant differences between the two studies.

PhD graduates are primarily employed in large organizations

Approximately one third of the PhD graduates (34%) are employed in companies, institutions or organizations with more than 5,000 employees. An additional 18% are employed in companies, institutions or organizations with 1,001-5,000 employees. Respectively 15% and 26% of the graduates are employed in medium-sized (200-1,000 employees) or small (1-199 employees) companies, institutions or organizations.

In the interviews recruiters in larger companies point to the fact that companies of their size more often have the infrastructure and resources to run departments focused only on research and development (R&D), which are characterized by demanding specialized knowledge like the kind that the PhD graduates have gained through their studies. On the other hand, Figure 3 points to a development towards increased employment of PhD graduates within smaller organizations during the last four years. With increases of 11 and 6 percentage points respectively, employment within small (1-199 employees) and medium-sized (200-1,000 employees) organizations has grown significantly.

Figure 3: How many employees are there in total in the company, institution or organization?

How many employees are there in total in the company, institution or organization?

2015 (n= 632)   2019 (n=323)

1–9   10–49   50–199   200–500   501–1,000   1,001–5,000   More than 5,000   Do not know
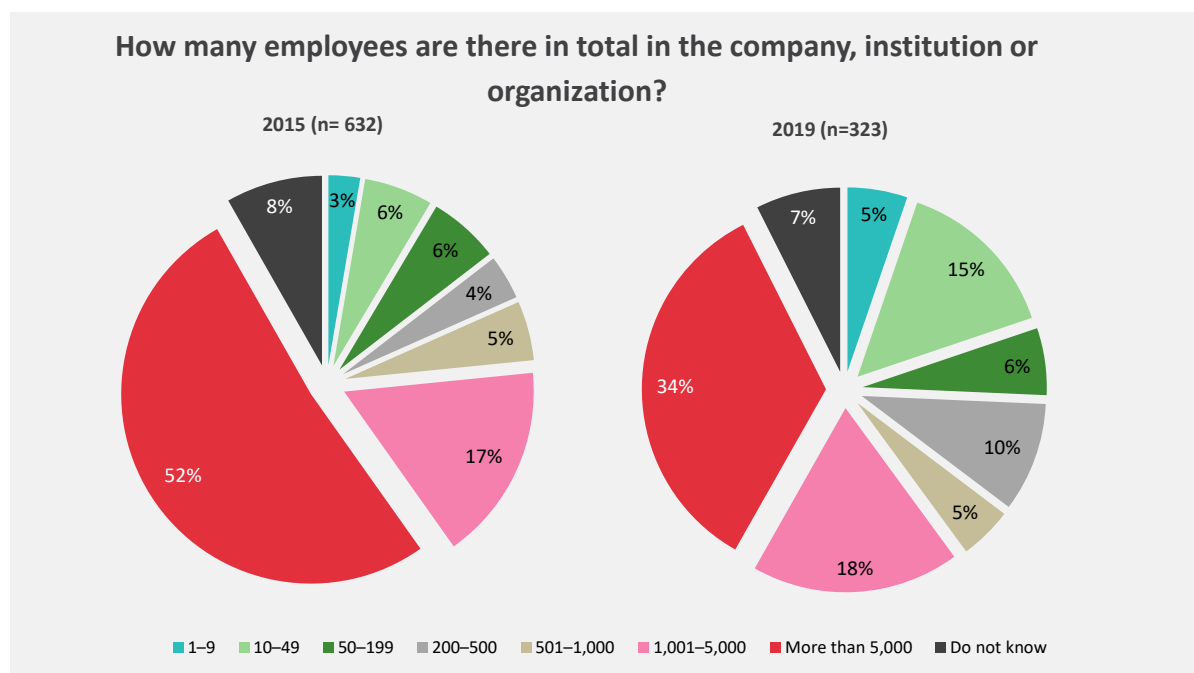
Graduates are primarily engaged with research and analysis tasks

As shown in Figure 4, the graduates are engaged in a variety of tasks at their workplace. By comparison, graduates employed at a university mainly conduct research and teaching, while graduates employed in the private, public or other sector perform more varied tasks including research, product development, or innovation and project management.

In total, 63% of PhD graduates are involved in research tasks. While 93% of PhD graduates working at universities are engaged in research tasks, that share is significantly lower in the private, public or other sector (50%). Besides research, a large part of the PhD graduates is engaged in data analysis (50%), tasks related to their PhD (35%), project management (32%) and documentation (31%). The part of PhD graduates being involved in such tasks is fairly similar across graduates employed at universities or in the private, public or other sector. Furthermore, the task of teaching is important for PhD graduates but significantly more so for those employed at universities (47%) than in the private, public or other sector (16%). On the other hand, significantly more PhD graduates in the private, public

or other sector are engaged in tasks such as product development or innovation (35%) and consultancy (21%) than graduates employed at universities (respectively, 7% and 8%), and these tasks are therefore uncommon for PhD graduates at universities.

Besides project management, relatively few graduates carry out tasks that are more general. For instance, few carry out administration tasks including accounting and secretariat functions (5%), human resources (2%), sales, marketing and advertising (3%), and service, including customer service (2%).

COMPARISON WITH THE 2015 REPORT

In comparison with 2015, the distribution of work tasks is generally similar, but one difference is prominent. The share of PhD graduates carrying out research tasks is significantly lower in 2019 than in 2015, as it has decreased by 15 percentage points mainly because fewer graduates within the private, public and other sector carry out research.

Figure 4: Which work tasks do you carry out in the workplace?

Which work tasks do you carry out in the workplace in 2019? (N=399)

■ University ■ Public / private / other ■ Total

Work task	University	Public / private / other	Total
Research	93%	50%	63%
Data analysis	41%	54%	50%
Tasks specifically related to your PhD studies (such as food quality and safety, construction etc.)	31%	37%	35%
Project management	25%	34%	32%
Documentation	18%	36%	31%
Product development or innovation	7%	35%	27%
Teaching	47%	16%	25%
Planning	17%	28%	25%
Consultancy	8%	21%	17%
Information technology tasks	3%	15%	12%
Management or organization	6%	12%	10%
Chemical analysis	8%	10%	9%
Production	1%	11%	8%
Administration (including accounting and secretariat functions)	7%	3%	4%
Information	3%	4%	4%
Sales, marketing or advertising	1%	5%	4%
Service (including customer service)	0%		4%
Middle or executive management	2%	3%	
Human resources	1%	2%	2%
Other	3%	6%	5%

Note: Percentages add up to more than 100% since respondents were allowed to provide more than one answer.

3.2   WHAT DO GRADUATES ASSOCIATE WITH A GOOD JOB?

Professional challenges and a good mental environment contribute to a good job
In addition to examining how and what the graduates are working with, the graduates were also asked which qualities they perceive as important in a good job.

As can be seen from Figure 5, nearly all graduates consider professional challenges either very important or somewhat important (96%). Similarly, most graduates perceive good mental working environment (95%), high professional standards among colleagues (93%), and work/life balance (91%) either very important or somewhat important.

Besides the above-mentioned qualities, 88% of the graduates point to the possibility of influencing decision-making processes and 85% to good human resource policies as very important or somewhat important.
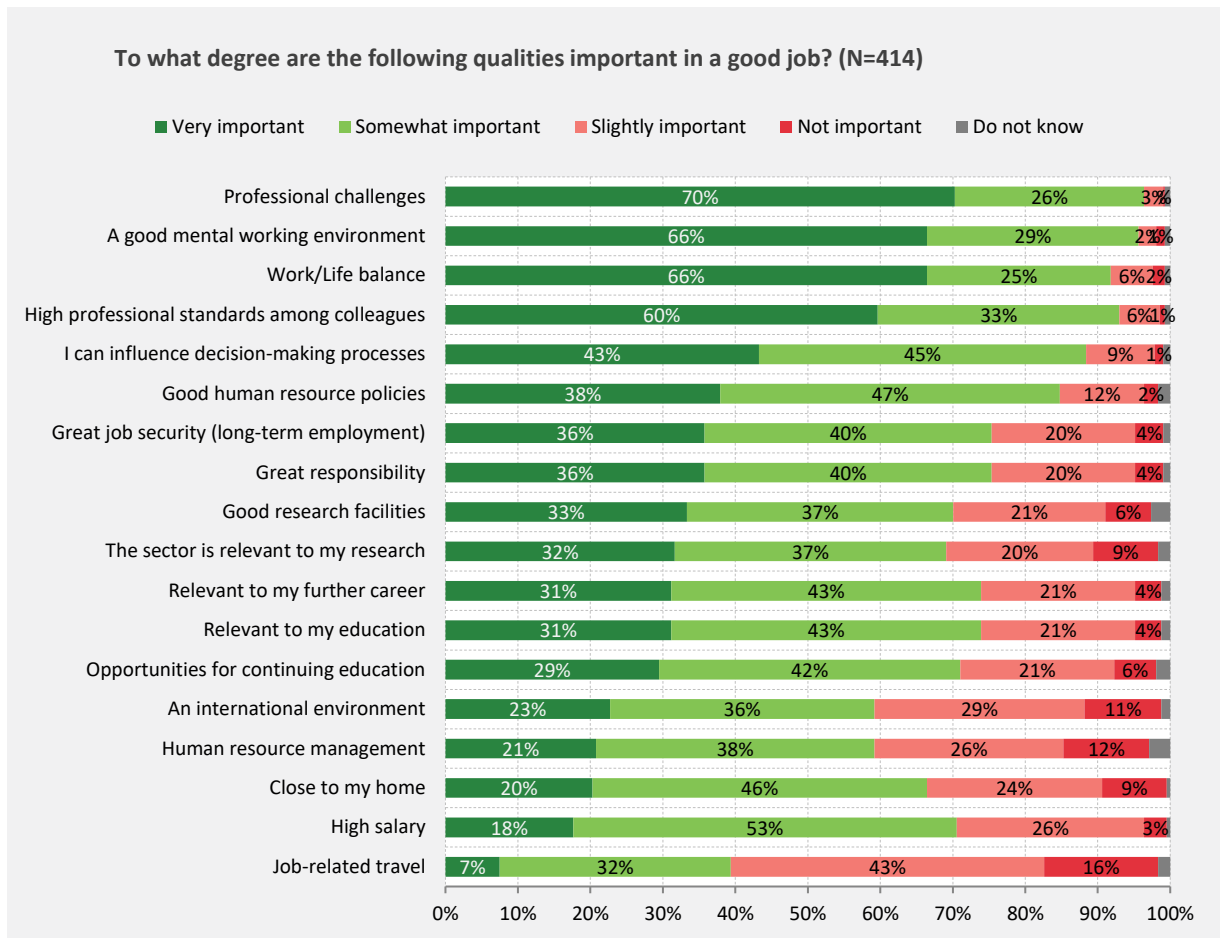

COMPARISON WITH THE 2015 REPORT

Comparing with 2015 the perception of professional challenges, mental environment, high standards among colleagues, and work/life balance is almost identical, meaning that what is considered most important in a job has not changed during the last four years. However, the possibility of influencing decision making, and good HR policies have become slightly, though not significantly, more important for the graduates since 2015.

The PhD graduates consider job-related travel the least important quality, as only 7% consider it very important and 32% somewhat important. Other qualities considered less important include high salary, close to home, human resource management, and international environment. The same four qualities were also considered the least important for graduates in 2015.

Figure 5: To what degree are the following qualities important in a good job?

To what degree are the following qualities important in a good job? (N=414)

■ Very important ■ Somewhat important ■ Slightly important ■ Not important ■ Do not know

Quality	Very important	Somewhat important	Slightly important	Not important
Professional challenges	70%	26%	3%	
A good mental working environment	66%	29%	2% 1%	
Work/Life balance	66%	25%	6% 2%	
High professional standards among colleagues	60%	33%	6% 1%	
I can influence decision-making processes	43%	45%	9%	1%
Good human resource policies	38%	47%	12%	2%
Great job security (long-term employment)	36%	40%	20%	4%
Great responsibility	36%	40%	20%	4%
Good research facilities	33%	37%	21%	6%
The sector is relevant to my research	32%	37%	20%	9%
Relevant to my further career	31%	43%	21%	4%
Relevant to my education	31%	43%	21%	4%
Opportunities for continuing education	29%	42%	21%	6%
An international environment	23%	36%	29%	11%
Human resource management	21%	38%	26%	12%
Close to my home	20%	46%	24%	9%
High salary	18%	53%	26%	3%
Job-related travel	7%	32%	43%	16%

Most graduates have had no or few different jobs before and after the PhD programme

The survey shows that half the PhD graduates have had no (49%) or less than one year (24%) of relevant job experience after receiving their MSc degree and before beginning their PhD programme. 15% of the graduates have had 1-2 years of relevant job experience and 12% have had three years or more. Thus, most graduates have enrolled in the PhD programme immediately or shortly after their MSc degree.

Furthermore, the majority of graduates have had few different jobs after receiving their PhD degree. Nearly half (48%) of the graduates have only had the job they are currently holding. 37% have had one job before they started their current job, 12% have had two jobs before, while 2% have had three or more jobs.

> 🔍 **COMPARISON WITH THE 2015 REPORT**
>
> Compared to 2015 the graduates tend to have held fewer jobs before their present job. The group of graduates having had three or more jobs before their present job has decreased significantly from 16% to 2%.

A comparison of number of jobs and year of graduation shows a significant tendency to earlier year groups having had more different jobs than later year groups. 65% of the graduates completing their degree in 2017 have only had their present job, which is a significantly larger part than graduates who completing their degree in 2015 (33%). On average, the graduates completing their degree in 2015 and 2016 have had 1 job before their present job, while graduates completing their degree in 2017 have only had their present job. The tendency is not surprising, as graduates who finished in 2015 have spent more time on the labour market.

3.3 FOUR TYPES OF COMPETENCIES IMPACT THE GRADUATES' POSITIONS

One of the findings in the 2015 report was that the interviews with recruiters showed that there were differences between the graduates' functions in their jobs and thus the required competencies. On the basis of the interviews, a typology of competence profiles was developed to shed light on those differences. The typology discerned between generalist and specialist competencies, on the one hand, and engineer and research competencies on the other.

To some extent, the same pattern is confirmed among the 30 recruiters interviewed for this 2019-report, however, combined with the 20 qualitative interviews with graduates, **there is reason to revise and refine the competence typology.** Especially with regard to the relationship between being a generalist and specialist. Rather than discerning between generalist and specialist skills, **the graduates and recruiters in the interviews either emphasize expert knowledge within that particular field of research or the graduates' skills at methods. Those two also define the kinds of jobs they get**.

Professional and engineer-specific competencies
The overall pattern is, not surprisingly, that the most important aspect is the graduates' specialist engineer competencies. However, those can be divided into two:
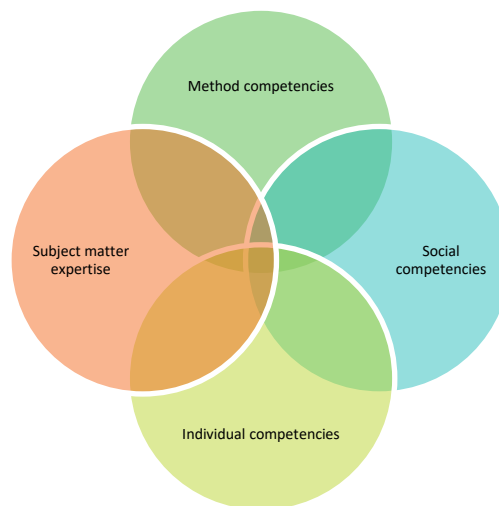
- Subject matter expertise
- Method competencies.

Subject matter competencies predominantly concern the expert knowledge that graduates have gained through working scientifically within the narrow subject of their thesis. On the other hand, other recruiters and graduates report that rather it is a particular method that has determining value in their work. Subject matter expertise and method competencies are of course not mutually exclu-

sive, and as in the 2015-typology, those categories are analytical **and most informants across recruiters and graduates highlight that they never exclusively focus on one dimension of the engineer competencies.**

Thus, based on the interviews, we can conclude that **the engineer-specific value and competencies of graduates can be divided into subject matter experts and method experts**, whereas the generalist competencies are personal traits which can be divided into being either individually-bound or relational and social. In Figure 6, each kind is more thoroughly described with examples from the interviews.

Figure 6 Four kinds of competencies identified in interviews with recruiters and graduates that impact job positions

To some extent, the subject matter expert is identical with what was called 'engineering specialist', while the method expert is synonymous with the 'research specialist' from the 2015 report. Although methods and subject expertise are always united in scientific practices, each can be an asset for the employer by itself and define the position that the graduate obtains within the organization.

🔍 **COMPARISON WITH THE 2015 REPORT**

The 2015 report typology discerned between generalists and specialists, and research and engineer competencies. Across the interviews with graduates in 2019, being a specialist is a trademark of PhDs, and hence the category of generalists is not consistent with their experience and statements. Instead, the specialist can be divided into either subject matter expertise or method competencies. However, the more generic competencies have not disappeared but are referred to in terms of personality and can be divided into either individually-bound (e.g. independence in work) or social competencies (e.g. collaboration).

Subject matter experts: The graduates who are hired because of their knowledge within a particular field are often hired because recruiters report that, apart from needing employees who can work effectively in terms of deadlines and budgets, there is value in having subject experts who can shed light on new aspects or challenges and shift client interest in a direction that they were not aware of themselves. **Accordingly, the subject matter expert is often synonymous with positions where graduates take on an advisory role or are responsible for the development of new products and services**. A recruiter says:

> **Recruiter, private company:** "Previously, the most important thing was to complete a project in time and within the budget. However, now specific engineer knowledge competencies are more important to us. Adding new knowledge to a project about how the client can become more hygienic and effective in their production really matters. It takes great professional knowledge."

Other employees highlight subject matter expertise as a key to research and development of new products and services. The subject matter expertise is tightly connected to the topic of the graduates' thesis. For about half of the interviewed employers, the topic of the thesis and thus the graduates' subject matter expertise is the determinant factor for recruitment. This confirms the tendency from the 2015 report.

Method competencies: Other graduates are hired in positions where they excel because of their in-depth knowledge of and competencies with specific methods. One graduate e.g. describes how his thesis was about brain imagining (fMRI), but he is now working in a bank with predictions in finance. The connecting thread through his career path has been his methodological competencies in machine learning and pattern recognition. As subject matter experts, graduates who are hired because of their method competencies contribute in research and development (R&D). But whereas subject matter experts more often act in the 'front line' e.g. with direct customer relations, **recruiters more often mention graduates employed because of their method competencies in relation to work in the 'backend' of the company involving analytical tasks and internal work processes**. A recruiter describes how they also value and highlight methods as a key factor:

> **Recruiter, private consultancy:** "The candidate doesn't need to know of geospatiality, but if he knows how to compute with big image matrices and find various features in them, we will go for him"

Personal and non-engineer-specific competencies
On the other hand, recruiters and graduates alike also recognize the importance of non-engineer specific competencies characterizing the jobs they get. From the interviews to kinds of personal competencies emerge:

- Individual competencies
- Social competencies

Those are described below.

Individual competencies: Both graduates and recruiters highlight doctoral graduates' ability to work independently with a subject. **PhDs do not demand as much introduction to the professional content and they quickly 'adopt' and take ownership of the tasks**. Those key features are defined as individual competencies, as they refer to the relation between the content of the work and worker. Another key individual competence is the ability to quickly review a new topic. Those who highlight the importance of individual competencies most often hire doctoral graduates for research and development positions.

> **Recruiter, small private company:** We prefer doctoral graduates rather than masters because they have done independent work and know about and can cope with the frustration that will arise during work.

Social competencies: Complementary to individual competencies there is another kind of non-engineering-specific set of competencies, namely social competencies. **Social competencies are important in cases where graduates work intensively with different people – colleagues, customers etc**. Specific work tasks are e.g. knowledge dissemination, collaboration, project management, sales and leadership. Recruiters explicitly say that the engineer-specific competencies, whether subject matter expertise or methods, are the most important, but that they need to be complemented by both social and individual competencies:

> **Recruiter, public institution:** Of the softer competencies, empathy is important. To be able to act with colleagues who are not professionally as good. You can forget that you're the spearhead, and you can steamroll others. When it comes to professional challenges it is great to have specialized knowledge, but when you have to communicate it to colleagues, it can be problematic.

There is no evident pattern of whether recruiters prefer PhDs from DTU to other institutions. Most do not discern between which university PhDs are from. Those who do, are mainly employers and recruiters who are from DTU themselves or small companies where everyone knows about each colleague's background. That being said, some associate specific competencies with DTU:

> **Recruiter, public institution:** I think those from DTU are good at constructing things. Those from University of Copenhagen know more about why things work as they do. It works very well when we put them together in teams. They support each other's work.

However, it is important to keep in mind that most of them stress that **they do not have enough knowledge or experience to clearly demarcate what DTU is particularly good at compared to others, and they doubt to what extent differences are due to university, personality or subject of the thesis**.

In the following chapters of the report, the qualitatively-based analysis will refer back to this typology and develop it further with nuances.

4. TRANSITION TO THE LABOUR MARKET

This chapter examines the graduates' transition to the labour market. It is examined how they get their first job, within which sector, and which factors were the most decisive in getting the first job. The graduates' considerations before, during and after graduation are also analysed. Finally, the chapter describes the views of the recruiting companies on the graduates' transition to the labour market.

4.1 JOB SEEKING AND EMPLOYMENT

Graduates experience a relatively easy transition to the labour market
The graduates' transition to the labour market is – as was the case in the 2015 report – relatively easy. As shown in Figure 7, 46% of the graduates were hired before submitting their PhD thesis and a further 22% before the PhD defence. Only 2% of the graduates were without a job for more than 12 months. As shown in Figure 7 below, this was also the case in 2015, and the picture has not changed significantly.

Figure 7: How much time elapsed between the time you submitted your thesis until you were hired for your first job (i.e. signed an employment contract)?
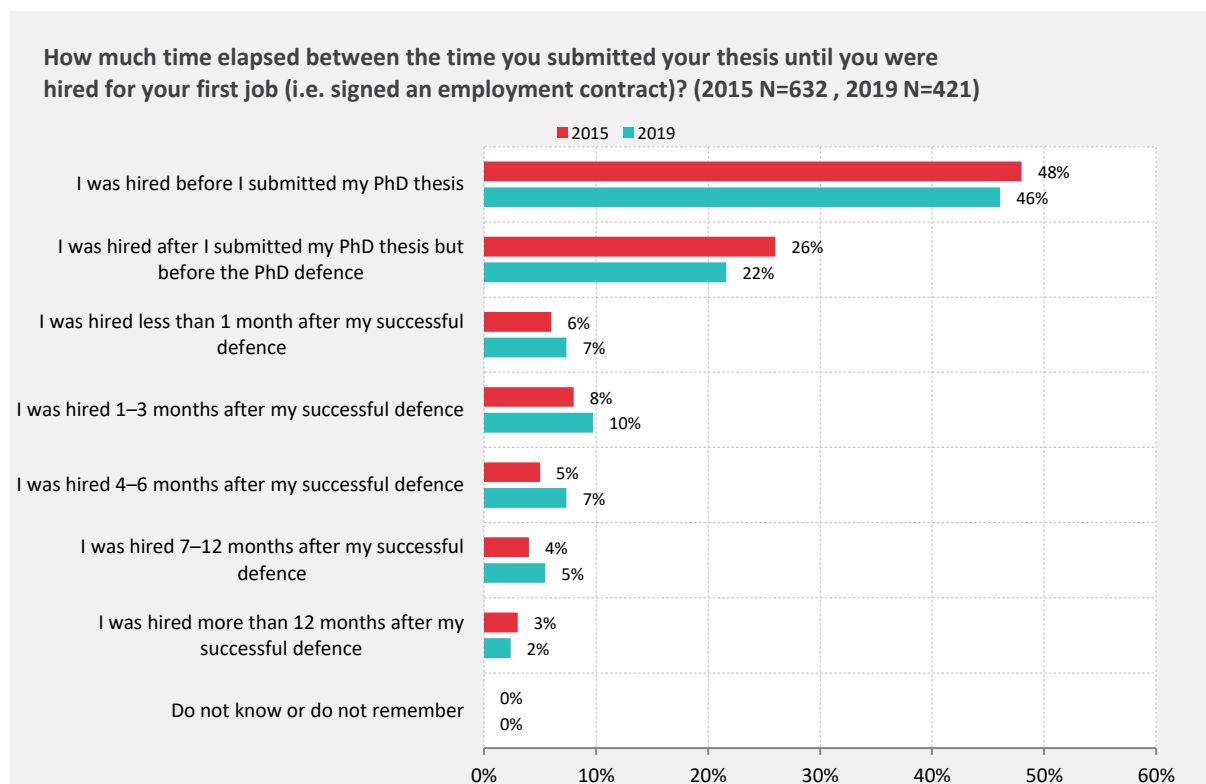
The graduates in general seek jobs early, and that might be part of the reason for the short time elapsed between graduation and signing a contract. 42% of the graduates applied for a job before they submitted their PhD thesis, and a further 21% applied for a job before defending their PhD. Only 2% of the graduates did not apply for a job until more than three months after their defence.

Additionally, 28% did not apply for a job at all. In most of these cases, the reason is that graduates were headhunted for a job (22%) while others set up their own business, continued at the same workplace (for example, in continuation of an Industrial PhD), started on a new study programme or are not yet actively seeking employment.

🔍 **COMPARISON WITH THE 2015 REPORT**

These tendencies are in general similar to what was reported in 2015. In 2015, 70% were seeking jobs before defending their PhD thesis and 74% of the graduates were hired before defending their PhD. However, there is a minor, though significant, reduction from 2015 to 2019 both for seeking jobs (-8 percentage points) and signing contracts before defending the PhD (-7 percentage points).

4.2 JOB CONSIDERATIONS DURING THE PHD PROGRAMME

Job considerations do not have a large impact on how the PhD is organized

Most graduates think seriously about what the PhD can lead to in the future. Not surprisingly, graduates' considerations about what their PhD will lead them to increase during the PhD programme. As shown in Figure 8, 20% of the PhD students thought to a high degree about what the PhD education would lead to before beginning the PhD programme. This increases to 27% during the PhD programme. Right before submitting the PhD, 51% of the graduates considered to a high degree what the PhD degree should lead to and, after submission the number increased to 58%. The degree to which the graduates consider their future opportunities relating to their PhD degree has not changed significantly since 2015.

Figure 8: To what degree did you consider which job or jobs your PhD education would lead to at the following times?

To what degree did you consider which job or jobs your PhD education would lead to at the following times? (2019 N=438)
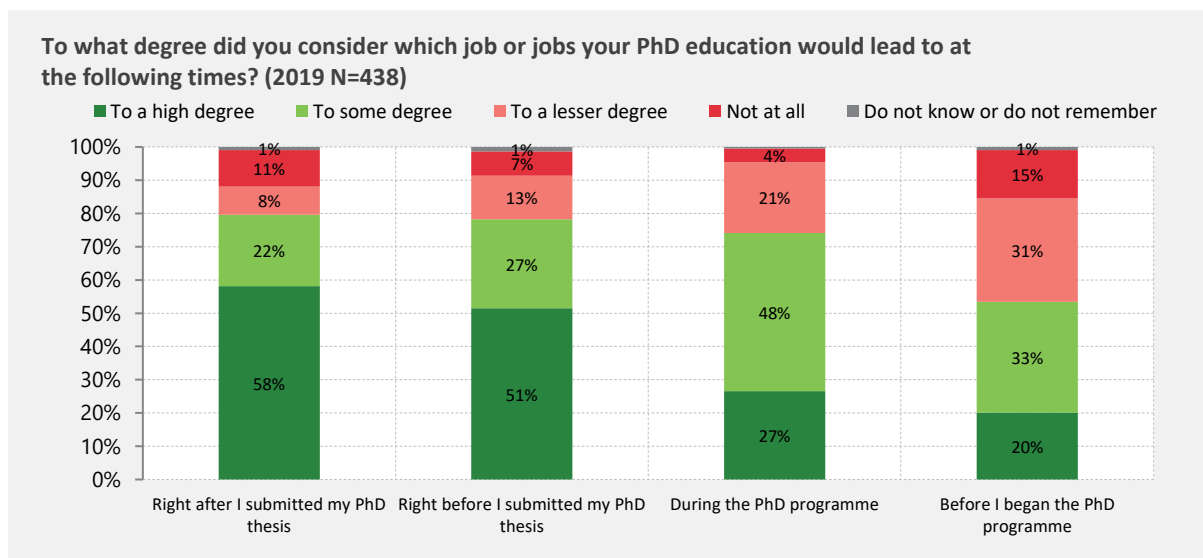
Even though graduates have serious considerations about their future job, these considerations do not have a large impact on their choices of courses or how they organize their PhD. 76% of the graduates answered that considerations about future jobs had no or only little influence on their choice of courses. Only for 7% of the graduates the future employment considerations had a serious impact on the choice of courses.
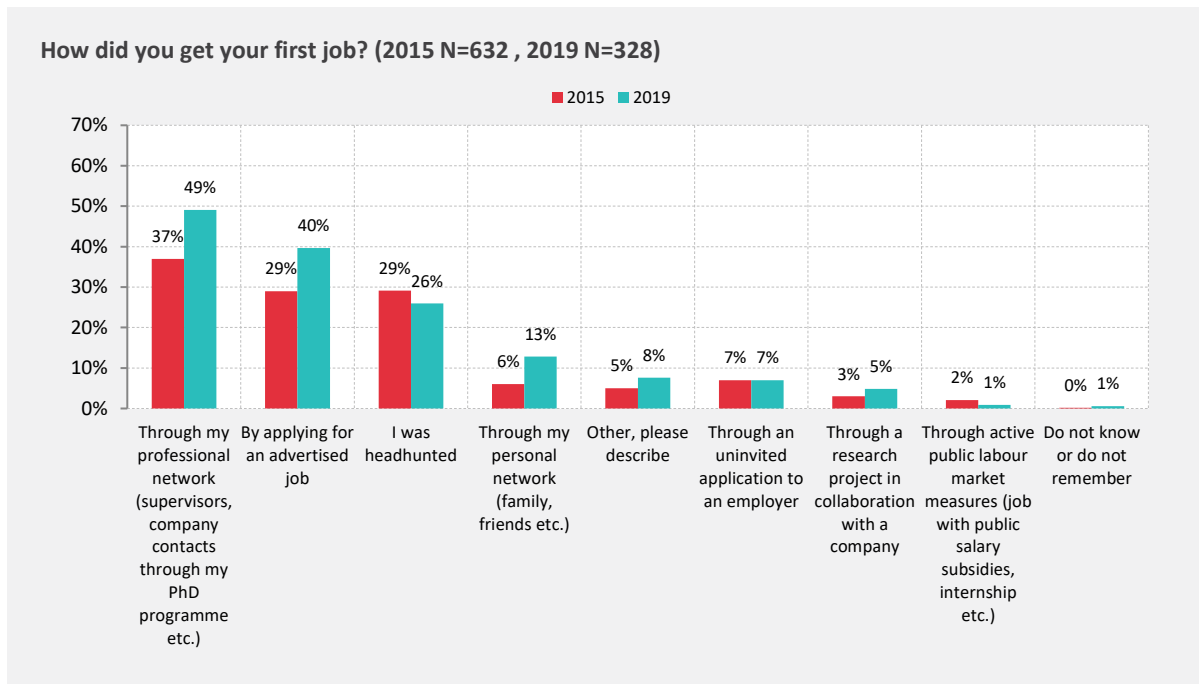
> ### 🔍 COMPARISON WITH 2015 REPORT
>
> These tendencies are very similar to what was reported in 2015, but with a slight change. In the 2015 results, considerations about future jobs had no or only little influence on choice of courses for 70% of the graduates (compared to 76% in the 2019 study). This is a statistically significant difference between the two studies.

4.3   THE FIRST JOB AFTER GRADUATION

Networks – and especially professional ones – lead to a first job to a higher degree than in 2015
Both in 2015 and in 2019, the survey investigated how the graduates found their first job. Figure 9 below shows that in 2019 the majority (62%) of the graduates found their first job through networks, either their professional (49%) or personal network (13%). This is a significant increase of 19 percentage points from the 2015 report, where only 43% of the graduates found a job through their network (37% via professional network and 6% via personal network). 40% of the graduates from the 2019 results got their job by applying to an advertised job, while only 29% of the graduates from the 2015 results got their job in that way. Finally, around every fourth (26%) graduate was headhunted to their first job.

Figure 9: How did you get your first job?

How did you get your first job? (2015 N=632 , 2019 N=328)

■ 2015 ■ 2019

Note: Percentages add up to more than 100% since respondents were allowed to give more than one answer.

🔍 **COMPARISON WITH THE 2015 REPORT**

Compared with the 2015 report, there have been some significant changes to how graduates get their first job. The number of graduates getting their first job through their network has increased by 19 percentage points, while employment through applications for advertised jobs has increased by 11 percentage points.

The surveys also examined which factors, according to the graduates themselves, were contributory when the graduates were selected for their first job. As can be seen from Figure 10, 80% of the graduates answered that general PhD competencies have been of some or great importance when being selected for the first job. Furthermore, almost as many graduates (78%) find that competencies specific to the PhD graduate's field of research were of some importance or great importance. Thirdly, for most graduates (68%), the professional networks were of great or some importance. 48% of the graduates answered that the reputation of the PhD programme at DTU was of great or some importance. There have not been any remarkable changes compared to the 2015 results.

Figure 10: How important were the following factors for you being hired for your first job?

How important were the following factors for you being hired for your first job?
(2015 N=644 , 2019 N=420)

■ Very important ■ Somewhat important ■ Slightly important ■ Not important ■ Do not know
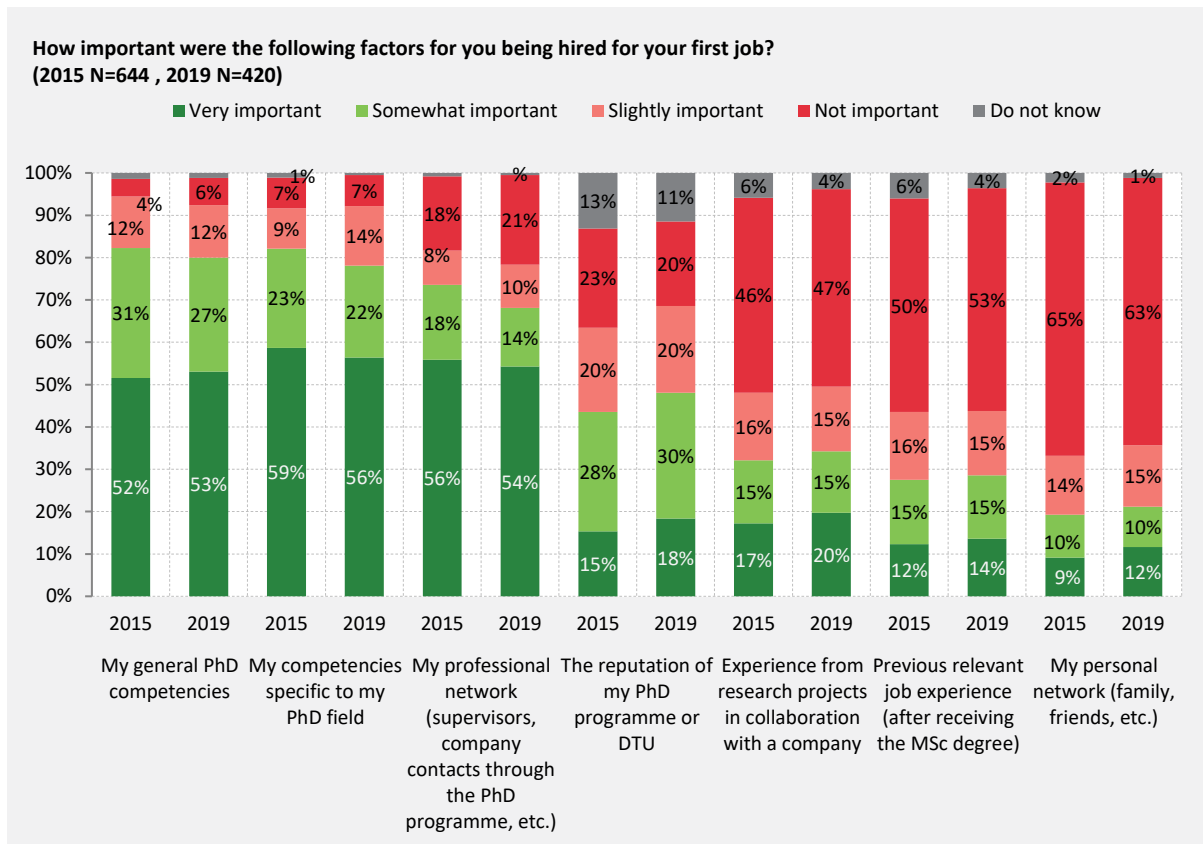
The first job is typically outside the university and mostly in the private or public sector

Figure 11 shows where the graduates were employed in their first job and where they are employed now in their current job for both 2015 and 2019.

First, Figure 11 shows that the majority (55%) got employed outside the universities, in the private, public or other sector, when they started their first job in 2015-2017, while 45% started their career at a university. Currently 70% of the graduates from 2015-2017 are working in the private, public or other sector, while only 30% of the graduates work as a postdoctoral fellow, researcher or assistant professor at DTU or another university. Since the number of employments in positions relevant for PhDs (postdoc or assistant professor) has increased at DTU from 196 to 238 from 2015-2017[2], there is no reason to believe that this is due to the lack of available positions. The explanation may rather be found in the PhDs' own drive for seeking jobs outside university.

Of the 45% who began their career at a university, 63% are currently employed at a university, while 37% are currently employed in the private, public or other sector. Nearly all graduates who started

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[2]https://ufm.dk/forskning-og-innovation/statistik-og-analyser/forskere-ved-universiteterne/forskerrekruttering-pa-universiteterne-2015_2017.pdf page 6.

their career outside the university are still employed in the private, public or other sector (97%). Only 4% of the graduates who started in the private, public or other sector are now employed at DTU or another university.

Figure 11: Where were you employed in your first job / Where are you employed in your current job?

Where are you employed in your current job? / Where was your fixed workplace in your first job? (2015 N=632, 2019 N=418)

■ University 2015 ■ Private/ Public/ Other 2015 ■ University 2019 ■ Private/ Public/ Other 2019

First job: University 2015 53%, Private/Public/Other 2015 47%, University 2019 45%, Private/Public/Other 2019 55%

Current job: University 2015 39%, Private/Public/Other 2015 61%, University 2019 30%, Private/Public/Other 2019 70%

🔍 **COMPARISON WITH 2015 REPORT**

There has been a shift in results from 2015 to 2019 regarding the graduates' first employment. In 2015, the majority started their career at a university (53%), whereas in 2019 significantly fewer (45%) signed their first contract with a university. Regarding current jobs, it is also clear that a significantly larger part of the PhD students chose the private, public or other sector in 2019 (70%) compared to PhD students in these sectors in 2015 (61%).

The surveys show that the pattern of employment among graduates has been relatively stable since 2010, except for 2015.

Figure 12 shows that on average 39% of the graduates were employed at DTU in their first job, whereas on average 40% were employed in the private sector in the period 2010-2017. Only 2015 shows a variation, where 49% of the graduates began their career in the private sector and only 29% of the graduates had their first job at DTU. However, the difference is not significant.

Figure 12: Where were you employed in your first job?

Where were you employed in your first job?

- In the private sector
- In the public sector
- As a postdoctoral fellow, researcher or assistant professor at DTU
- As a postdoctoral fellow, researcher or assistant professor at another institution than DTU
- Other

Year	Private	Public	Postdoc DTU	Postdoc other	Other
2010 (n=128)	43%	8%	34%	13%	2%
2011 (n=113)	36%	10%	43%	10%	1%
2012 (n=120)	30%	8%	43%	17%	3%
2013 (n=127)	39%	6%	43%	11%	2%
2014 (n=144)	40%	9%	40%	10%	1%
2015 (n=134)	49%	10%	29%	9%	2%
2016 (n=126)	43%	6%	38%	12%	1%
2017 (n=126)	40%	8%	40%	8%	3%

Whether or not graduates collaborate with private companies during their PhD, the programme (e.g. industrial PhD) still has a strong influence on their first jobs. The 2019 survey contains 35 graduates with an industrial PhD, which corresponds to 8% of the graduates. The industrial PhD graduates are those graduates who have been financed as industrial PhD or Industrial PhD, VTU. The remaining 391 graduates (92%) have been labelled as nonindustrial PhD graduates.

The number of graduates who found their first job in the private sector is significantly higher among those who have an industrial PhD than those who have a nonindustrial PhD. 85% of the graduates with an industrial PhD sign their first contract with the private sector, while only 41% of graduates with a nonindustrial PhD do the same. On the other hand, 49% of the graduates who have a nonindustrial PhD are employed at a university as their first job, which is significantly higher than for industrial PhD graduates, where only 9% of industrial PhD graduates are employed at a university.

The majority of graduates are working in the Capital Region of Denmark
Many graduates have changed jobs from one sector to another. On the other hand, mobility is not that great in geographical terms or from small to large companies. Of all graduates, 87% found their first job in the Capital Region of Denmark. Proportionally, 88% of the graduates are currently working in the Capital Region of Denmark. 18% of the graduates are working abroad in their current job, whereas 24% worked abroad in their first job.

A bigger part of graduates is working in smaller or medium-sized companies compared to 2015
49% of the PhD graduates found their first jobs in workplaces with more than 1,000 employees, while 27% were employed for the first time in small or medium-sized companies with fewer than 200

employees. By comparison, 52% are employed in their current jobs in workplaces with more than 1,000 employees, and 26% in workplaces with fewer than 200 employees.

Compared to 2015, a larger part of the graduates is working or has been working in smaller or medium-sized companies with fewer than 200 employees. In the 2015 report, 21% of the graduates were employed for the first time in small or medium-sized companies with fewer than 200 employees, while 19% of the graduates in 2015 were currently working in workplaces with fewer than 200 employees.

COMPARISON WITH THE 2015 REPORT

When it comes to size of companies that graduates are employed in, there has been a minor, but significant, increase of 7 percentage points of PhD graduates working in smaller or medium-sized companies in 2019 compared to the 2015 report.

The first job function is still primarily within research
As was the case for many in their present jobs, many graduates carried out research functions (67%), data analysis (42%), tasks directly associated with the field of research for their PhD (32%) or teaching (27%) in their first jobs. On the other hand, there were relatively few with jobs in administration (3%), HR (1%), information (2%), sales and marketing (3%), service (4%) and production (6%). All in all, these results confirm the results from the 2015 report.

There is a strong connection between the education and the first job
Figure 13 shows that 62% of the graduates answered that there was a strong connection between their PhD and their first job. A further 20% answered that there was some connection. Only 7% answered that there was no professional connection at all, and one third of these (9 graduates) had chosen the job specifically because it had no connection with the PhD.

The main part of the graduates who did not at all experience a professional relation between their PhD education and their first job were hired in the private sector (11%), while only 1% of the graduates who were employed at a university did not experience a professional relation between the education and the first job.

Furthermore, there seems to be a pattern between when the graduate was hired in the first job and the experience of a professional relation between PhD education and first job. For those graduates who were hired before submitting their PhD thesis or before the PhD defence only 3% and 4% of the graduated did not at all experience a professional relation their PhD education and their first job. On the contrary, 23% of the graduates who were hired 7 months after their defence did not at all experience a professional relation, and 11% of the graduates hired more than 12 months after their defence did not experience a professional relation between PhD education and their first job. This can indicate that it might not be an intention when graduates do not experience a strong connection between education and the first job.

Figure 13: To what degree were your PhD education and your first job related professionally?

To what degree were your PhD education and your first job related professionally?

■ To a high degree ■ To some degree ■ To a lesser degree ■ Not at all ■ Do not know or do not remember

2019 (n=412)	62%	20%	11%	7%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
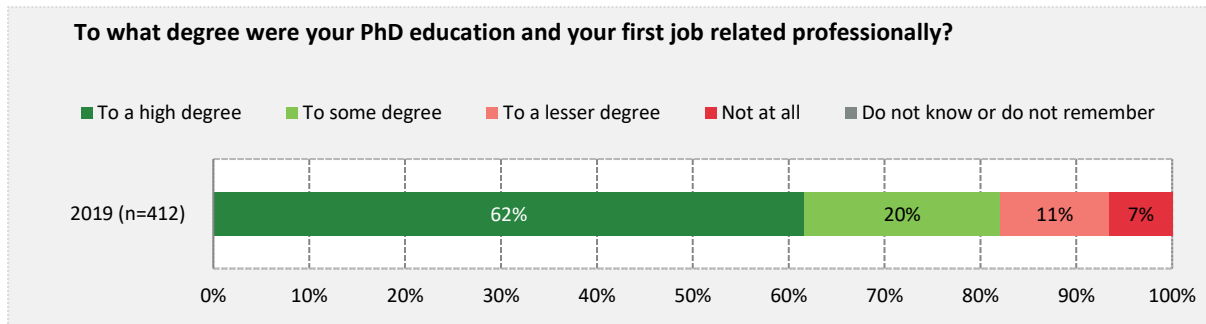
4.4 QUALITATIVE EXPERIENCES WITH TRANSITION FROM ACADEMIA TO THE LABOUR MARKET

What constitutes challenges in transition

Both graduates and recruiters have been asked about their experience with the transition from PhD to the labour market. Among the recruiters most of them report that they have experienced challenges hiring PhDs, and the most recurring theme is that three out of four highlight that the academic culture and university work life presents a challenge in the graduates' approaches and expectations to their new work outside university. However, it is important to emphasize that none of the interviewed recruiters consider the challenges as a barrier to recruiting PhDs.

Several of the recruiters and employers **highlight the transition as a challenge which is often revealed through specific attributes and attitudes of PhDs**, where their background in academic culture conflict with the new work environment. The themes that emerge across sectors and company sizes are exemplified below with quotes from recruiters:

Compromises	"You can feel that they've spend a long time at the university. […]. As a PhD you have to compromise your professional pride." (recruiter, public institution).
Delivery and sales	"If you've been at university for 4-5 years its hard to move from the academic environment and go deliver for a customer" (recruiter, private company).
Tempo	"After eight years with research at uni, it's hard to move into guidance and consultancy, because there is always a customer who expects it to be done in 3-4 weeks" (recruiter, private company)
Collaboration	"The degree of meticulousness and perfection. With a publication everything has to be perfect, but in the company it's better to share your thing before you're done with it." (manager, private company)
Being practical	"You cannot just sit and calculate on theoretical things." (manager, private company)
Flexibility	"It's primarily about getting accustomed from the flexibility of a PhD study to a more fixed work context in a company." (recruiter, private company).

Although most recruiters recognize and, spontaneously, highlight the transition as a challenge when employing PhDs, **none of them sees it as a concern that outweighs the value contribution of PhDs gained either from their subject matter expertise or method competencies**. Several of the recruiters speak about their strategies for specifically 'boarding' PhDs. Those are not official strategies, but pre-cautions recruiters and day-to-day managers take. Examples of this include that, in the beginning, they give them fewer tasks, allow them to work in depth and try to adapt the tasks to the thirst for customer relations and sales expressed by the PhD. A recruiter says:

Recruiter, private company: Usually we have an ongoing dialogue with the PhD about it. It's a rude awakening, but usually we take our time to cope with it. Otherwise we try to protect them, so that they get a successful experience from the start.

When mirroring the dominant perception of recruiters in the expressions from the graduates about the move from PhD to new work, an interesting pattern emerges: **Graduates "fear" that employers think of them as too academic.** When asked out how they experienced the transition period from DTU to their new job, many of the graduates explicitly address the pitfall that potential employers may regard the fact that they have a PhD as a hindrance to be considered relevant candidates for certain positions, because they perceive them as too academic:

Graduate: At several places they didn't really believe that I came with a PhD and really wanted the job they offered. They imagined that as PhD I want to be a researcher, and when applying for that job it's just something temporary until there was funding for research.

The career path of a graduate

Some of the findings and developments described and illustrated in the figures above are confirmed among the graduates that have been interviewed. Below is an example of such a journey, and it gives the opportunity to understand what motivates the PhDs to make the decisions they do and how it relates to their PhD. The narrative draws primarily on one graduate, though points and aspects are synthesized with insight and contributions from other interviews to ensure a high degree of detail and that the highlights mirror patterns in paths that are similar across PhDs.

Carreer not given much thought during PhD

"I expected good job possibilities in the future, but I didn't give much thought to it"

Desire for something more practical at the end of PhD

"I wanted something more practical, and I started looking on LinkedIn and so on at the end of my PhD."

Temporary position at DTU after PhD

"I continued at DTU as a postdoc It didn't feel like a real job, as it was in direct continuation of my PhD"

Method competencies in start up company

"I got contacted by a start-up. I percieve it as my first real job. My work was to develop the methods I used in my PhD."

Start up acquired by bigger company

"Later the start-up company was bought by my new employer. But I still work with deep learning methods and spectral graph theory."

Future desire for more project management

"There's a great balance between research and product development in my job. But I'd like to give more shape to our projects and take on management responsibilities."

The conclusions to be drawn from the narrative and quotes from the graduates are firstly **that, for many of them, their future career is not a great concern during their studies** until at the end, where they in varying degree take initiative to scout the market. For some of the ones who take up a position at university, they themselves consider this a temporary step in their way into the labour market. From here, their paths diverge to a larger extent (see chapter 3). According to the survey results, most start in larger companies, and some of those then turn to smaller companies. **The main driver for changes in positions are the graduates' own eagerness to try something different, especially in terms of project management and leadership.**

5. ACQUIRED SKILLS AND COMPETENCIES

This chapter examines the way the graduates see the relevance of the competencies they have acquired in connection with their PhD programme, and the match between the acquired competencies and the competencies the graduates consider relevant to their future careers. Finally, the chapter describes the demands for competencies among the interviewed recruiting companies and their assessment of how competencies match.

5.1   RELEVANCE OF ACQUIRED SKILLS

Graduates believe that education has prepared them to perform in their current job
As can be seen from Figure 14, 57% of the graduates believe that their PhD programme to a great extent has prepared them for their present job, and a further 34% believe that it did so to some extent. Relatively few (2%) feel that their PhD programme has not prepared them at all for their present job, while slightly more (7%) believe that it prepared them to a lesser extent. Thus, the general experience is that the PhD programme either to some or a high degree prepares the graduates well for their current work functions.

🔍 **COMPARISON WITH THE 2015 REPORT**

Compared to 2015 the total picture is almost identical: The general experience is that the PhD programme either to some or a high degree prepares the graduates well for their current work functions. According to the qualitative study typology in 3.3, this is often because the graduates' subject matter expertise and/or method competencies are considered a major value contribution. And if they are not, they have the background knowledge and intelligence to quickly adapt to new methods or acquire knowledge on a new topic as elaborated in 5.6.

Furthermore, Figure 14 shows that a significantly larger part of graduates employed at universities (77%), compared to those in private, public or other sector (48%), believe to a high degree that the PhD programme prepared them for their current job. This might be the case because more graduates employed at universities perform scientific tasks like research and data analysis, similar to what they did during their PhD.

A comparison based on graduation year shows that a significantly larger share of the graduates completing their PhD programme in 2016 than graduates completing in 2017, feel that the programme prepared them for their current job. Furthermore, nationality is connected to some degree with the experience of preparation through the PhD programme. A significantly larger share of Danish graduates feels that the programme prepared them to a high degree for their current job as compared to graduates of other nationalities.

Figure 14: Do you think that, overall, your PhD programme prepared you to carry out your current job (or your latest job if you do not have a job at the moment)?

Do you think that, overall, your PhD programme prepared you to carry out your current job (or your latest job if you do not have a job at the moment)? (2019 N=385)

■ To a high degree ■ To some degree ■ To a lesser degree ■ Not at all ■ Do not know

Private/public/other	48%	39%	9%	3%
University	77%	21%	2%	0%
Total	57%	34%	7%	2%
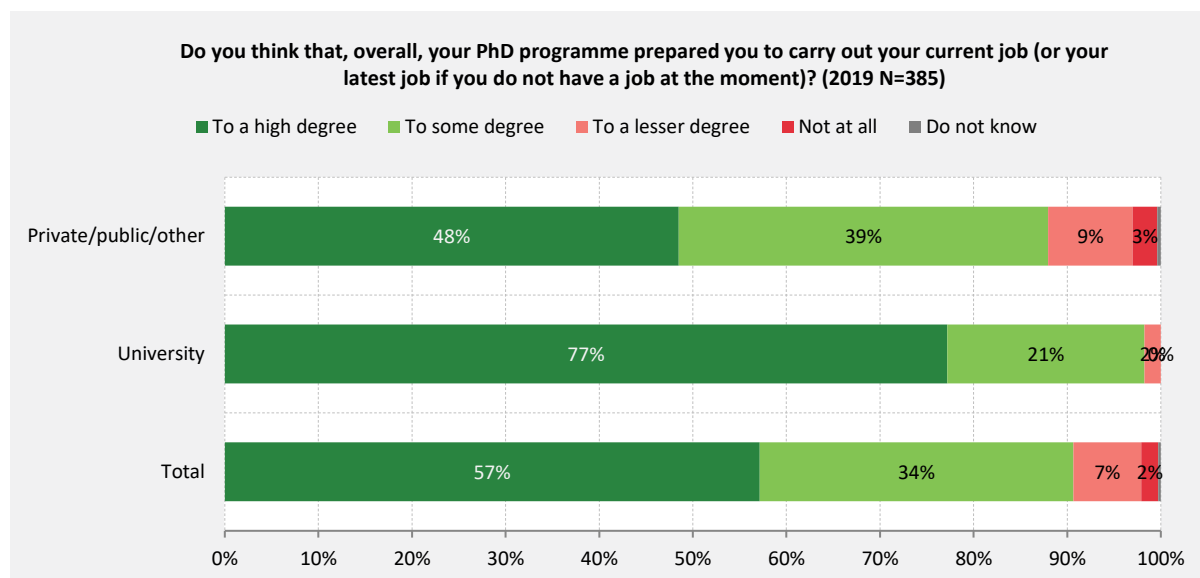
Graduates still believe that the PhD programme gave them competencies that colleagues with a master's degree followed by 3 years of professional experience have not acquired

58% of the graduates have worked with colleagues who had an MSc followed by three years of work experience in their first job after their PhD programme. Accordingly, this refers to colleagues with comparable seniority after the master's degree. As in the 2015 report, it has been examined how the PhD graduates experience their own competencies in relation to these colleagues. A little less than half of the graduates (48%) believe that they have better competencies than their colleagues with a master's degree and three years' work experience, while 23% do not believe so. The remaining 29% do not know. This, of course, only refers to the graduates' experience of the levels of competency, and this study does not allow us to check if the graduates also believed that they had better competencies than their colleagues *before* they started the PhD programme.

🔍 **COMPARISON WITH THE 2015 REPORT**

Compared to the 2015 report, the share of PhD graduates who believe they have acquired higher skills than their colleagues with comparable seniority has decreased by 9 percentage points (thus being statistically significant), pointing to this experience being less pronounced in 2019 than in 2015.

Focusing on the more specific skills, Figure 15 shows that 22% of the graduates emphasize that they have acquired a deep theoretical knowledge which their colleagues do not have. 18% of the graduates

mention strong analytical competencies while 16% mention general competencies in research. Another 13% point to project management and project understanding as acquired skills differing from their colleagues'. 9% mention that they have acquired specialized competencies while also 9% point out competencies within writing and communication.

Figure 15: Acquired competencies that your colleagues with 3 years of relevant job experience do not have?

Did you think that you had acquired relevant competencies through your PhD programme that your colleagues who had a master-level degree followed by 3 years of relevant job experience do not have? (2015 N= 193, 2019 N=114)

	2015	2019
In-depth theoretical knowledge	28%	22%
Research in general	17%	16%
Writing and communication in general	16%	9%
Specialised competencies	15%	9%
Strong analytical competencies	12%	18%
Project management and project understanding	10%	13%
Self-dependence	8%	4%
Methodology approaches	8%	1%
Innovative mindset	4%	1%
Structural working approach	3%	3%
Other	19%	4%

Note: Percentages add to more than 100% since respondents could state that they have acquired several competencies that their colleagues do not have.

🔍 **COMPARISON WITH THE 2015 REPORT**

Comparing with 2015, the PhD graduates are inclined to consider the difference between their own acquired skills and the ones of their colleagues with comparable seniority smaller. However, the differences between the two analyses are not statistically significant.

To investigate whether there is a demand for the competencies that are acquired, the graduates were asked whether they had found jobs that required a PhD. As can be seen from Figure 16, 55% of the graduates answer that the PhD was necessary to fulfil their first job. On the other hand, 26% answer that the job could be done by a person with a master's degree followed by three years of relevant work experience. Finally, 17% answer that a newly qualified MSc graduate could do their job.

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🔍 **COMPARISON WITH THE 2015 REPORT**

Comparing with the 2015 results, the share of PhD graduates considering their PhD programme necessary for their first job has been almost constant (53% in 2015 compared to 55% in 2019).

</div>

Figure 16: Did your first job require a PhD degree?

Did your first job require a PhD degree to carry out the work?
(2015 N=632, 2019 N=412)
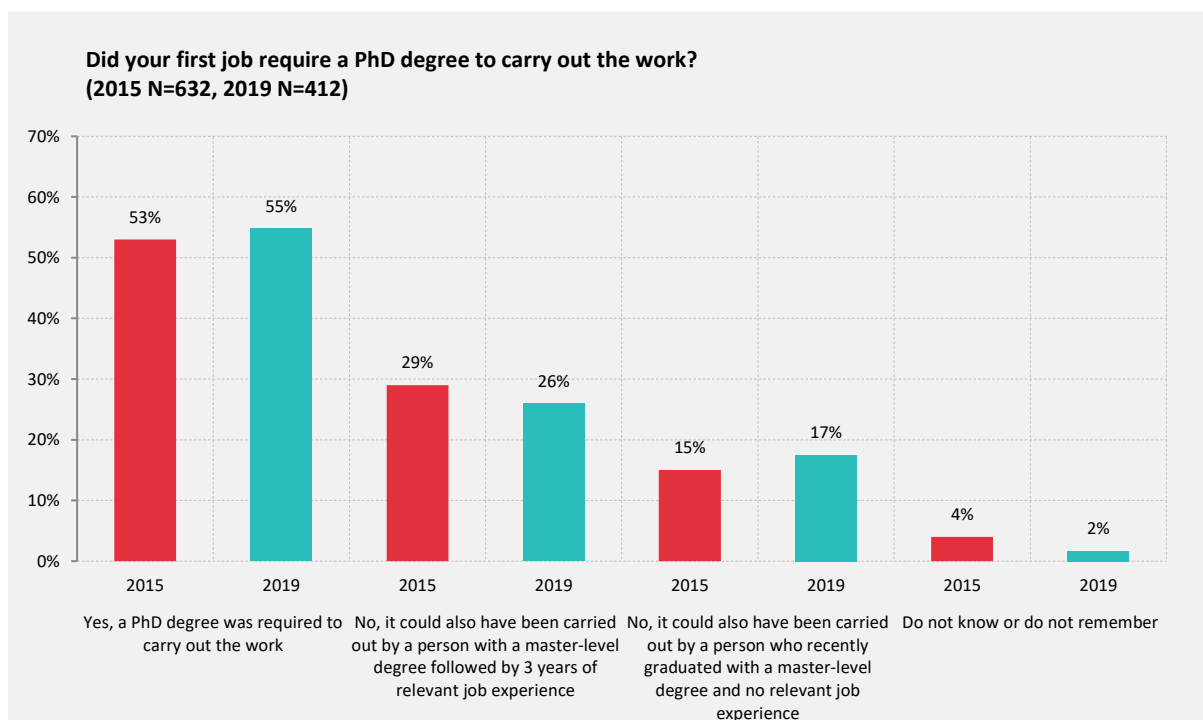
5.2 RESEARCH COMPETENCIES

The following chapter covers the PhD graduates' acquired abilities. In general, no considerable differences between 2015 and 2019 can be traced regarding the degree to which the graduates consider having acquired the abilities in question. Likewise, the differences regarding relevance of the acquired competencies across graduates employed at universities and graduates in the public, private and other sector has not changed considerably.

In both 2015 and 2019 graduates working in universities find all competencies in question significantly more relevant for their career compared to graduates working in other sectors of the labour market. This again is consistent with the fact that PhD graduates employed at universities perform tasks more

similar to what they did during their PhD and, as a natural consequence, feel a more pronounced alignment between acquired competencies and career relevant competencies.

> 🔍 **COMPARISON WITH THE 2015 REPORT**
>
> In both the 2015 report and this analysis, the graduates consider that the competencies acquired during their PhD contribute significantly to carrying out their job. This is the case for 1) their ability to acquire new knowledge, 2) development of new knowledge, 3) use of scientific methods, 4) analysis and evaluation of new ideas, 5) design and development of new techniques and 6) participation in international research discussions.

Ability to acquire knowledge at the highest international level

Almost all graduates (96%) believe that, either to a high or to some degree, they have gained competencies in acquiring knowledge at the highest international level within their research field. In total, the exact same share of graduates thought this was the case in 2015.

Among graduates working at a university, this competency is one of the most relevant in their career so far. Thus, 78% state that this ability is relevant to a high degree. On the labour market outside the universities – in the private sector, public sector and other sectors – this is also one of the competencies with greatest relevance though to a significantly lower extent, as only 46% of these graduates state that it has been relevant to a high degree in their careers so far.

Figure 17: Ability to acquire knowledge at the highest international level within your research field

Ability to acquire knowledge at the highest international level within your research field (2015 N=632 , 2019 N=409)
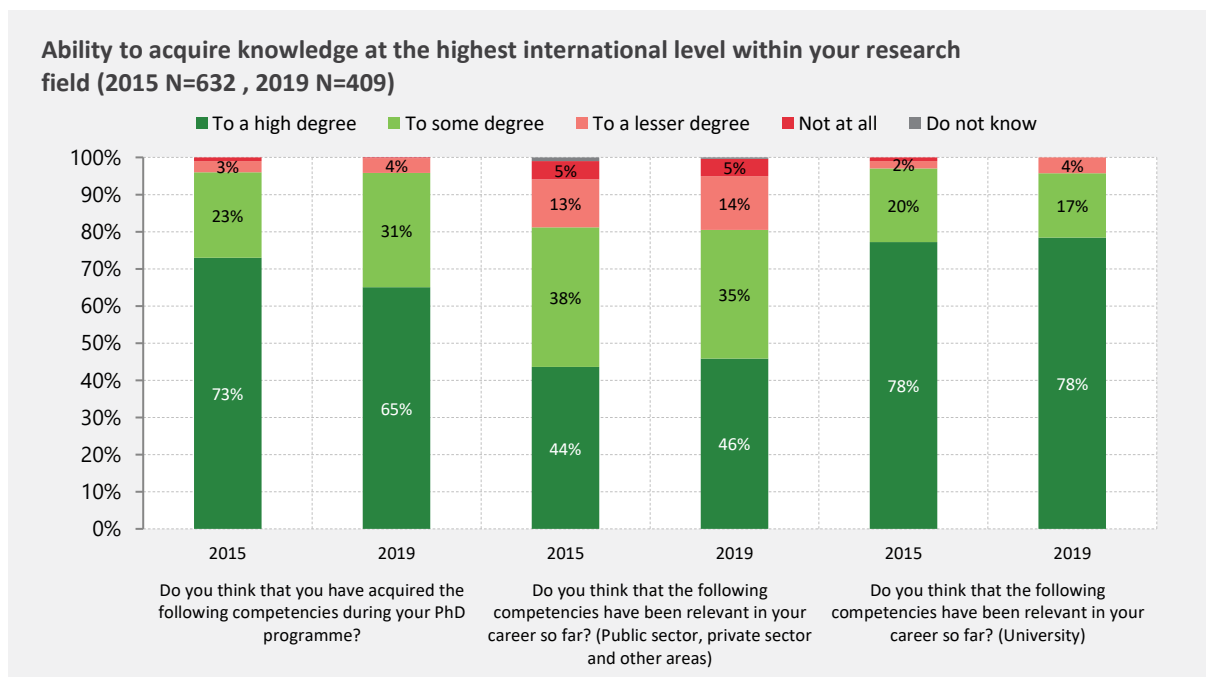
Ability to contribute to developing new knowledge based on scientific studies

Figure 18 shows that 96% of the graduates either to a high or to some degree have acquired the competency to contribute to developing new knowledge within their research field based on their PhD. This ability is considered the most relevant of all investigated abilities to graduates employed at universities, as 79% of these graduates find it highly relevant for career ends.

This is the case for a significantly smaller share of graduates employed in the public, private and other sector, as only 33% consider this ability highly relevant. All in all, the 2019 results thus confirm the 2015 results, since no notable changes can be identified.

Figure 18: Ability to contribute to developing new knowledge within your research field based on scientific studies

Ability to contribute to developing new knowledge within your research field based on scientific studies (2015 N=632 , 2019 N=409)

Legend: ■ To a high degree ■ To some degree ■ To a lesser degree ■ Not at all ■ Do not know

Do you think that you have acquired the following competencies during your PhD programme?
- 2015: 63%, 30%, 6%, 1%
- 2019: 65%, 31%, 4%

Do you think that the following competencies have been relevant in your career so far? (Public sector, private sector and other areas)
- 2015: 40%, 31%, 21%, 8%
- 2019: 33%, 35%, 23%, 8%

Do you think that the following competencies have been relevant in your career so far? (University)
- 2015: 76%, 21%, 2%, 1%
- 2019: 79%, 18%, 3%

Ability to master scientific methods

As seen from Figure 19, 94% of the graduates believe that, to a high degree or to some degree, they have acquired the ability to master the scientific methods related to research and development tasks within their research field through their PhD programme, which is nearly the same statement as in 2015. The ability to master scientific methods is a highly relevant competency for graduates working at a university (71%). The competency is also relevant for the careers of graduates who have been employed in the private, public and other sectors, though to a significantly lower degree (37%).

Figure 19: Ability to master the scientific methods related to research and development tasks within your research field

Ability to master the scientific methods related to research and development tasks within your research field (2015 N=632, 2019 N=409)

■ To a high degree   ■ To some degree   ■ To a lesser degree   ■ Not at all   ■ Do not know

Do you think that you have acquired the following competencies during your PhD programme?

Do you think that the following competencies have been relevant in your career so far? (Public sector, private sector and other areas)

Do you think that the following competencies have been relevant in your career so far? (University)

Ability to analyse and evaluate new ideas

96% of the graduates answer that, to a high or some degree, they have acquired the competency to analyse and evaluate new ideas within their research field through their PhD programme which is a small and not significant change since 2015 (increase of 2 percentage points). 72% of the graduates employed at a university consider this ability highly relevant for their career while a significantly smaller share of graduates employed in public, private or other sectors consider this ability highly relevant (48%). There are no considerable differences between 2015 and 2019 results.

Figure 20: Ability to analyse and evaluate new ideas within your research field

Ability to analyse and evaluate new ideas within your research field
(2015 N=632 , 2019 N=409)

Legend: To a high degree | To some degree | To a lesser degree | Not at all | Do not know

2015 / 2019: Do you think that you have acquired the following competencies during your PhD programme?
- 2015: 61%, 33%, 6%, 1%
- 2019: 64%, 32%, 4%, %

Do you think that the following competencies have been relevant in your career so far? (Public sector, private sector and other areas)
- 2015: 52%, 29%, 14%, 5%
- 2019: 48%, 32%, 12%, 7%

Do you think that the following competencies have been relevant in your career so far? (University)
- 2015: 71%, 23%, 5%, 1%
- 2019: 72%, 25%, 3%

Ability to design and develop new techniques

87% believe that, to a high or some degree, they have acquired the ability to design and develop new techniques within their research field through their PhD programme, thus being the least positively rated ability acquirement. To 61% of the graduates working at a university, the ability to design and develop new techniques is considered highly relevant for their career. This is the case for a significantly smaller share of the graduates working in the public, private and other sectors (39%). Since 2015, the graduates' consideration of the acquisition and relevance of this competency has not changed considerably.

Figure 21: Ability to design and develop new techniques within your research field

Ability to design and evaluate new techniques within your research field (2015 N=632 , 2019 N=409)
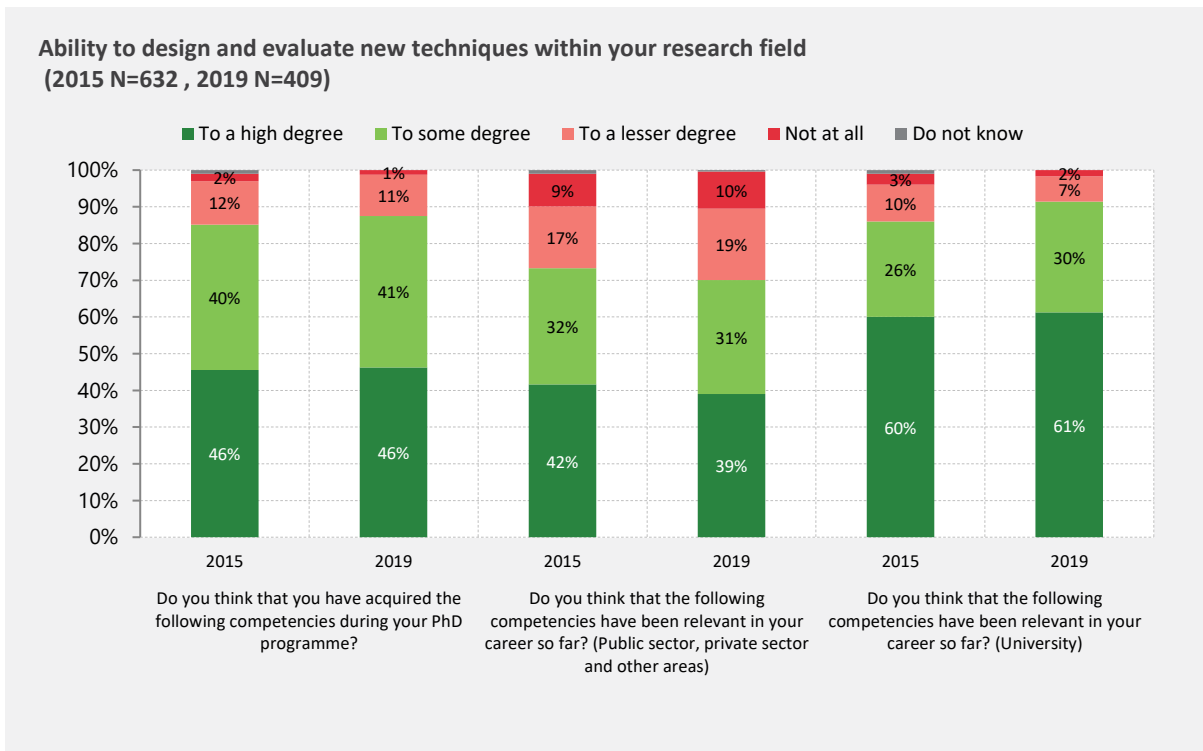
Ability to participate in international discussions

91% believe that, through their PhD, they have acquired the ability to participate in the international discussions in their research field either to a high or to some degree. The competency is considered most relevant among graduates employed at a university, as 65% consider the ability highly relevant for their career. This is the case for a significantly smaller share of graduates working within the public, private and other sectors (36%). There are no substantial differences between the 2015 and 2019 studies.

Figure 22: Ability to participate in the international discussions in your field

Ability to participate in the international discussions in your research field
(2015 N=632 , 2019 N=402)

■ To a high degree ■ To some degree ■ To a lesser degree ■ Not at all ■ Do not know
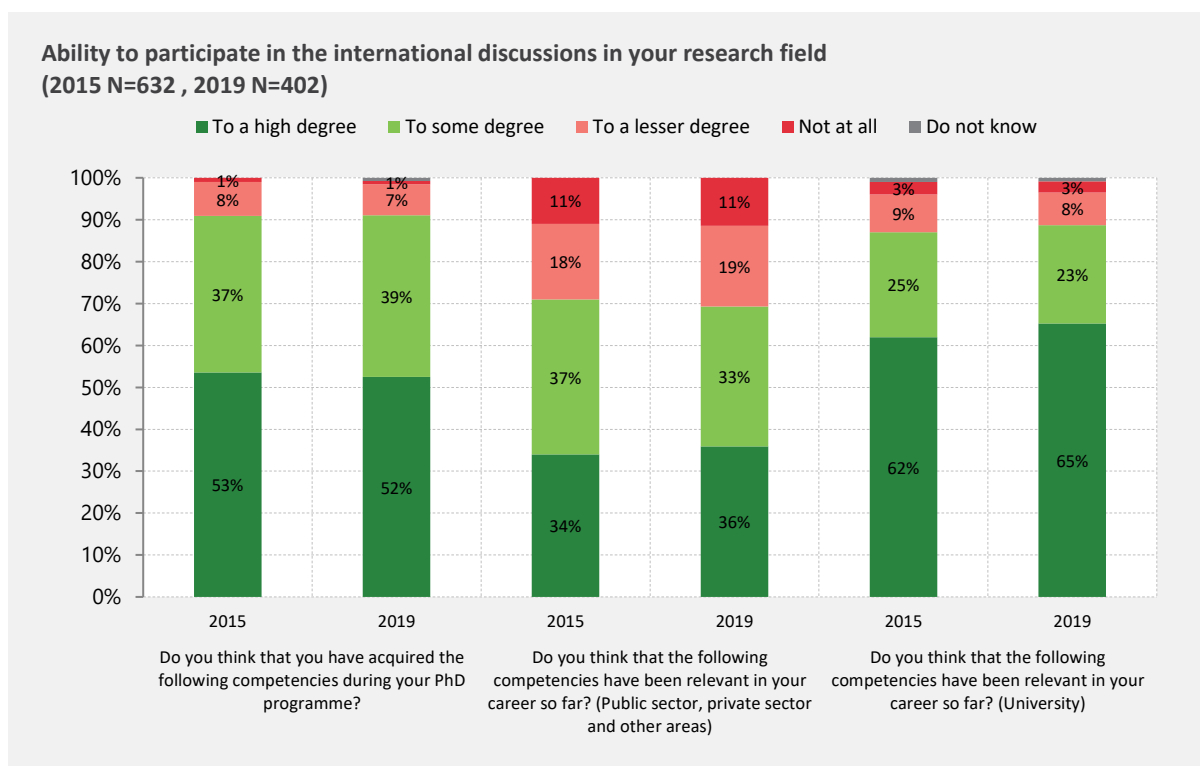
5.3 PERSONAL COMPETENCIES ASSOCIATED WITH DISSEMINATING KNOWLEDGE & PROJECT MANAGEMENT

The following subsection highlights the acquirement and relevance of personal competencies and re-lates to what was divided into social and individual competencies. Though graduates consider to have acquired the following abilities either to a high degree or some degree through their PhD programme, the acquisition is in general lower than for the above research-related competencies. Furthermore, the difference by which graduates employed at universities and graduates employed in public, private and other sectors consider the competencies relevant for their career is in general smaller than for professional and engineer-specific competencies. Typically, the difference has decreased because graduates employed at universities find personal competencies less relevant than research compe-tencies. However, when talking to recruiters, the personal competencies matter a great deal in hiring and are for some employers just as important as the research-related competencies.

🔍 **COMPARISON WITH THE 2015 REPORT**

Generally, the analysis of acquisition and relevance of personal competencies among graduates confirms the results from the 2015 report, and there are no substantial differences between the two studies in these matters.

Ability to disseminate scientific news and progress orally

The ability to disseminate scientific news and progress orally is to either a high or some degree acquired by the graduates through their PhD programme (89%). The ability is considered significantly more relevant for the career of graduates employed at universities (67%) compared to graduates employed in the public, private and other sectors (43%).

In the qualitative interviews with graduates, some heavily emphasize the importance of being able to communicate the research results. The graduates highlight several reasons for this. Firstly, because it gives you a network. Secondly, it strengthens your scientific argument. Thirdly the (tax paying) audience may benefit from listening to your findings and thoughts:

💬 **Graduate:** Finally, make a 2.5 ECTS course with focus on dissemination in the public sphere. For instance, make it compulsory to go to a high school and present your results. Give some money to send PhD students to Western Jutland to a high school to present and discuss. There are far too many PhDs hidden away in their offices. They and their audience benefit from presentations.

Figure 23: Ability to disseminate scientific news and progress orally to a broad audience

Ability to disseminate scientific news and progress orally to a broad audience (2015 N=632, 2019 N=402)

Legend: To a high degree | To some degree | To a lesser degree | Not at all | Do not know

	2015	2019	2015	2019	2015	2019
To a high degree	52%	57%	43%	43%	57%	67%
To some degree	37%	32%	35%	39%	29%	23%
To a lesser degree	10%	10%	16%	13%	11%	6%
Not at all	2%	1%	6%	6%	3%	3%

Do you think that you have acquired the following competencies during your PhD programme? | Do you think that the following competencies have been relevant in your career so far? (Public sector, private sector and other areas) | Do you think that the following competencies have been relevant in your career so far? (University)

Ability to disseminate research results in writing

The ability to disseminate research results in writing is a competency that 96% of the graduates believe they acquired through their PhD programme to either a high or some degree. This competency is valued as one of the most relevant among graduates employed at universities, as 77% consider the ability highly relevant for their career so far. This is again a significantly larger share than for graduates employed in the public, private and other sectors, as only 39% of these graduates consider the ability highly relevant. Once again, no substantial differences between the 2015 and 2019 report can be observed.

Figure 24: Ability to disseminate research results in writing

Ability to disseminate research results in writing (2015 N=632, 2019 N=402)
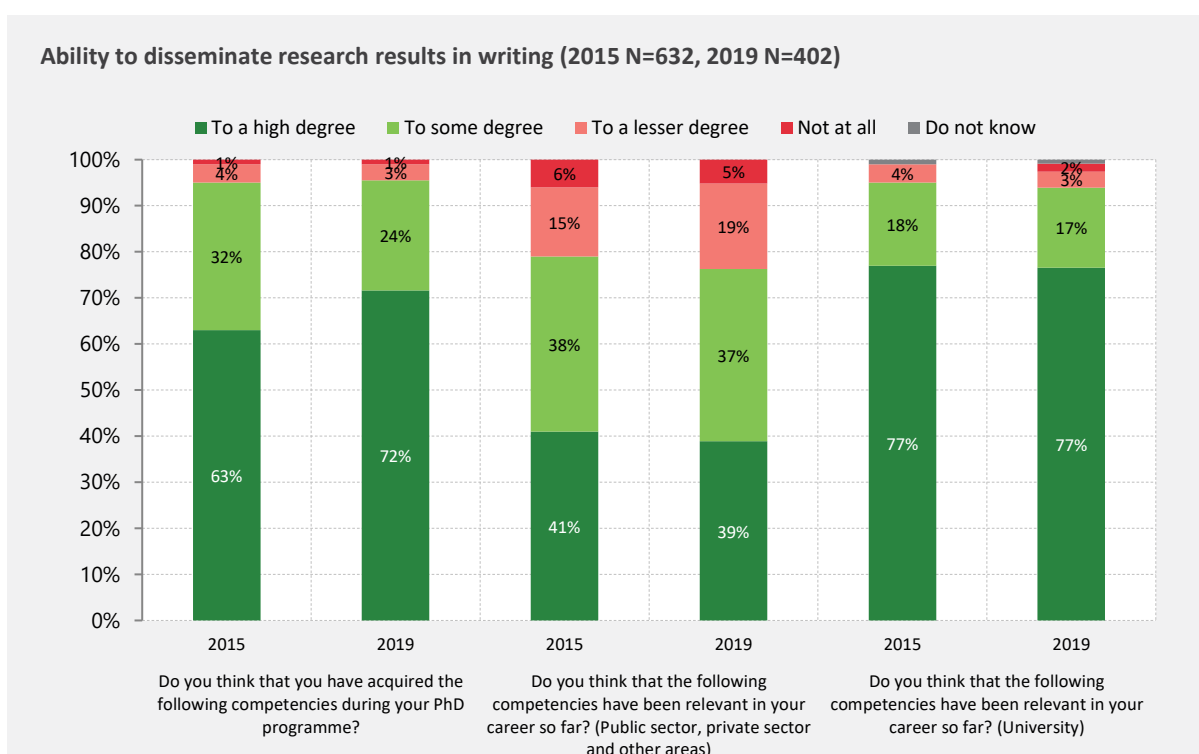
Obtaining dissemination skills, both oral and written, is also very important to the recruiters when they look for new employees. Accordingly, this focus in the PhD is a strong match with the competencies demanded by the recruiters and companies. As one recruiter says:

> **Recruiter, private company:** Lately we have started to emphasize softer disciplines like communication. It is important that the PhDs can also communicate the vast knowledge they possess.

Ability to organize research projects

In general, fewer graduates believe they acquired the ability to organize research projects compared to the above-mentioned abilities, since relatively fewer graduates believe that they have acquired the ability to a high degree.

Yet once again, a significantly larger share of the graduates employed at universities consider the ability highly relevant for their career (62%) compared to the share of graduates employed in public, private and other sectors (40%). Regarding graduates who consider the ability highly relevant, the difference between the two employment groups has increased within the last four years. Mostly this has happened as a result of more graduates employed at universities finding the ability highly relevant compared to 2015 (increase of 11 percentage points), while only a small increase of 3 percentage points applies to graduates employed in the public, private and other sectors. However, the part of the graduates answering "to a lesser degree" or "not at all" is almost constant when comparing the 2015 and 2019 results.

Figure 25: Ability to organize research projects with limited scope and duration

**Ability to organize research projects with limited scope and duration
(2015 N=632, 2019 N=402)**
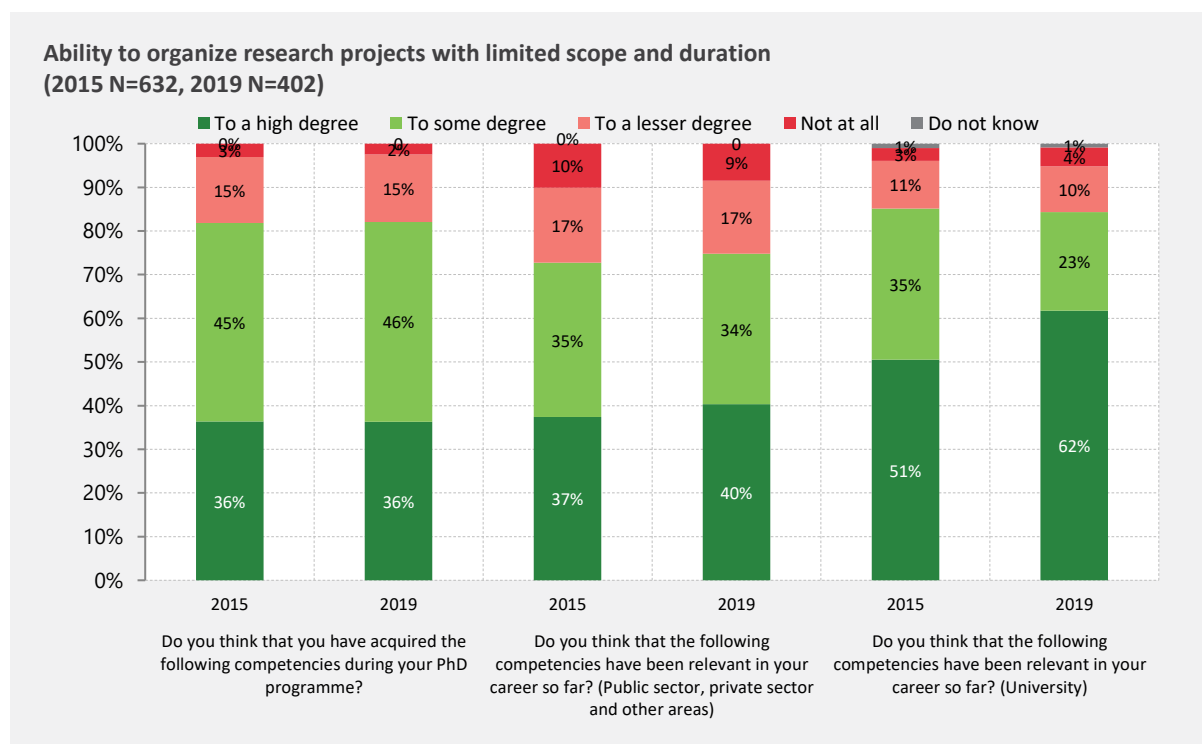
Ability to manage research projects

Compared with the above competencies, there are also relatively fewer who believe that they have acquired competencies in managing research projects. 34% believe that this is the case to a high degree, while 43% believe it applies to some degree. Even though not as evident as above, we still observe a considerable difference between the groups of employees, as graduates employed at universities consider the ability significantly more relevant than others do. No relevant changes can be observed from the 2015 and 2019 results.

Figure 26: Ability to manage research projects with limited scope and duration

Ability to manage research projects with limited scope and duration
(2015 N=632, 2019 N=402)
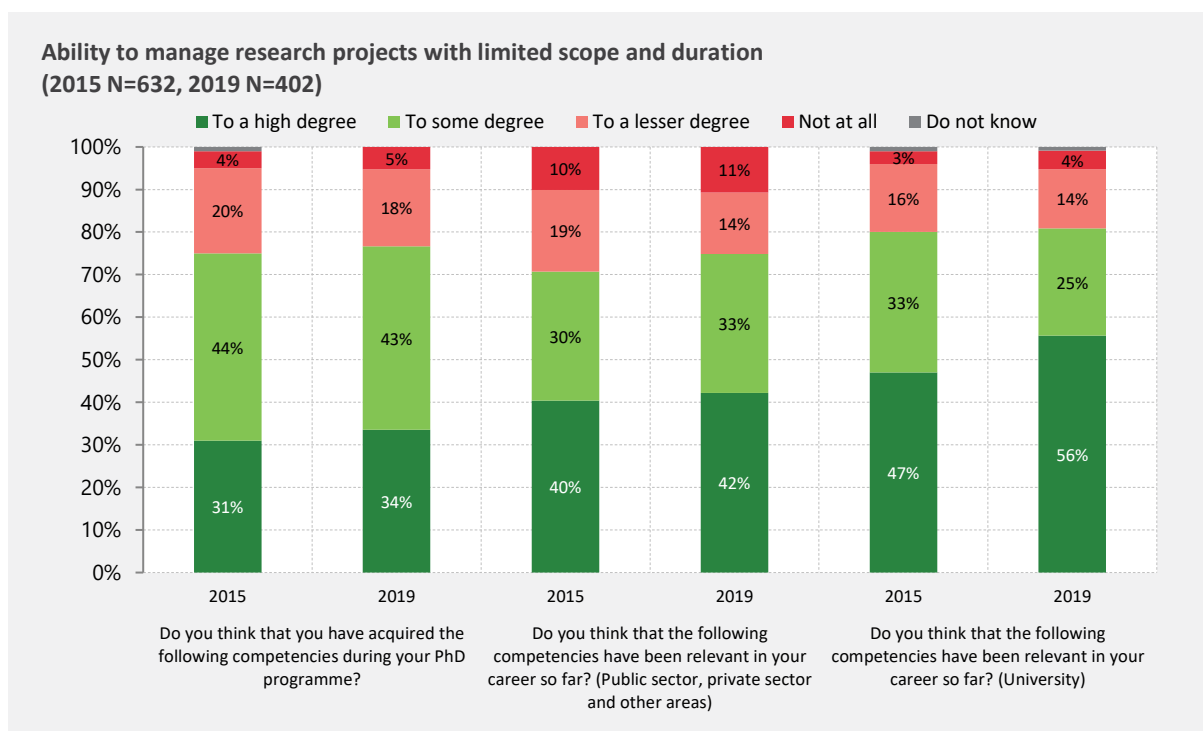
5.4   COMPETENCIES IN INNOVATION

Finally, the following subsection deals with the competencies related to innovation. Both the acquirement of these abilities and the assessment of relevance for the careers of the PhD graduates will be dealt with. In general, innovation-related competencies are believed to be acquired to a considerably lesser degree than both research and personal-related competencies. Likewise, these competencies are considered less career-relevant regardless of place of employment.

Ability to initiate collaboration with companies and other research institutions
61% of the graduates feel that, either to a high degree or to some degree, they have acquired the ability to initiate collaboration with other companies or research institutions to produce new

knowledge. The competency is considered significantly more relevant for graduates employed at universities (76%) than for those outside the universities (62%). In general, these results are similar to what was reported in 2015. The only exception is that significantly more graduates find the ability relevant for their career in 2019 than in 2015.

Figure 27: Ability to initiate collaboration with companies and other research institutions to produce new knowledge

Ability to initiate collaboration with companies and other research institutions to produce new knowledge (2015 N=632, 2019 N=402)
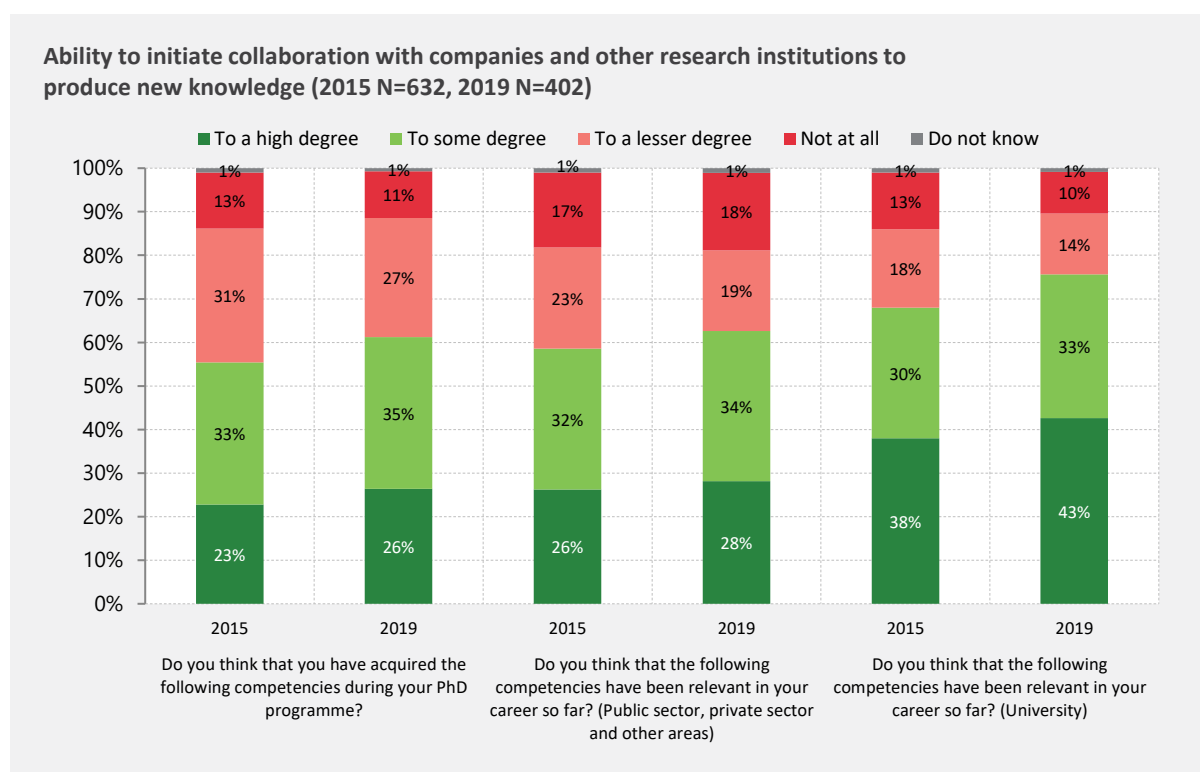
Ability to create growth and employment in Denmark's private sector through research, development and innovation

The ability to create growth and employment through research, development and innovation is the ability which fewest graduates believe they have acquired through their PhD programme, and similarly, fewest believe this has been relevant for their career so far.

Only 14% state that they have acquired this ability to a high degree, while 26% say they have acquired the ability to some degree. These are fairly similar statements compared to those made in 2015. However, a slightly larger part of the graduates considers the ability relevant for their career so far. While 18% consider the ability highly relevant, 30% consider it relevant to some degree. This is a positive though insignificant development since 2015.

Graduates with a university PhD believe, to a significantly higher degree, that they acquired the ability to create growth and employment in Denmark's private sector compared to graduates with an industrial PhD. Also, graduates with a university PhD have a significantly more positive assessment of the relevance of this ability than graduates with an industrial PhD. This pattern contrasts with what was

reported in 2015. Regarding both the acquisition of the ability and the assessed relevance of the ability, graduates with an industrial PhD used to be significantly more positive than graduates with a university PhD.

Figure 28: Ability to create growth and employment in Denmark's private sector through research, development and innovation

Ability to create growth and employment in Denmark's private sector through research, development and innovation (2015 N=632, 2019 N=402)
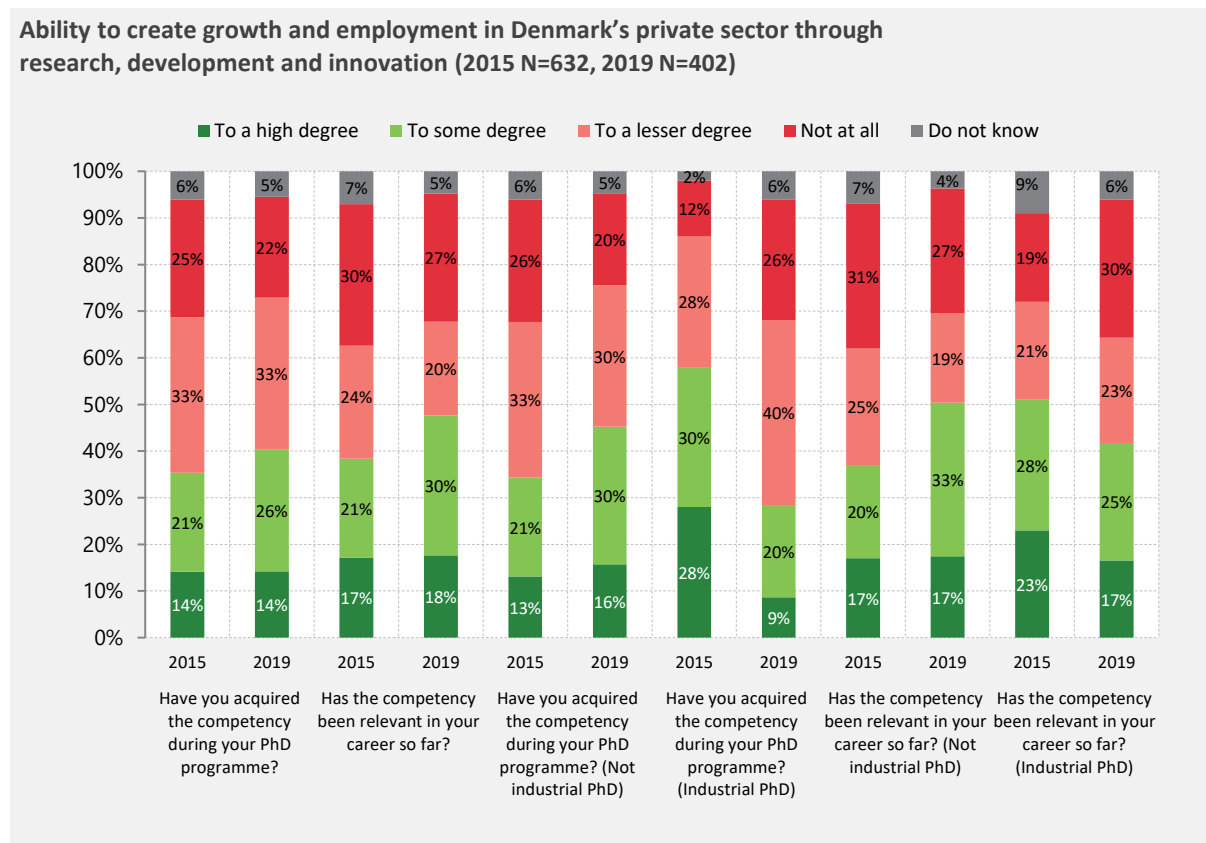
5.5 THE DIFFERENCE BETWEEN THE ACQUIRED SKILLS AND THE SKILLS GRADUATES PERCEIVE AS RELEVANT TO THEIR CAREER

Across the various personal and research abilities and competencies, graduates are generally positive and consider to a large extent the necessary competencies acquired during their PhD, and generally they also find them useful in their employment. Thus, for most target competencies there is a correlation between the number who believe that they acquired a competency to a high degree or to some degree, and the number who believe that the competency is relevant to the labour market. At the same time, there is often a correlation at individual level, so that graduates who have replied that a competency is relevant also answer that they have acquired that competency.

<table>
<tr><td>🔍</td><td>**COMPARISON WITH THE 2015 REPORT**</td></tr>
</table>

As in the 2015 report, there are some differences between graduates employed at a university, those employed outside universities and the industrial PhDs. This especially concerns the match between the competencies which the graduates have found to be relevant for their careers and the competencies they have in fact acquired.

The following three figures (Figure 29, 30 and 31) visually depict the match between acquired competencies and relevance in work among three different groups of graduates: graduates employed at a university, those employed outside universities and the industrial PhDs.

The figures illustrate the match of competencies, showing on the y-axis (vertical) how highly relevant the graduates consider the competency to have been for their career so far (demand), and on the x-axis (horizontal) to what extent they have acquired the competency (supply).

The red dots indicate the answers from employees at universities, the green dots show answers from employees in private, public or other businesses outside universities, while the blue dots are industrial PhDs.

A dot above the broken line indicates that the graduates consider a competency more relevant or more in demand than what they are able to supply (a so-called under-match). A dot below the broken line indicates that the graduates consider a competency less relevant or less in demand than they are able to supply (a so-called over-match). Dot on the broken line or close to the broken line indicates a match between the demand and supply of a given competency.

The figure below shows an overview of the match between demand and supply of competencies. The two following figures focus on scientific and supporting and personal competencies, respectively.

Figure 29: (Mis)Match Analysis – an overview
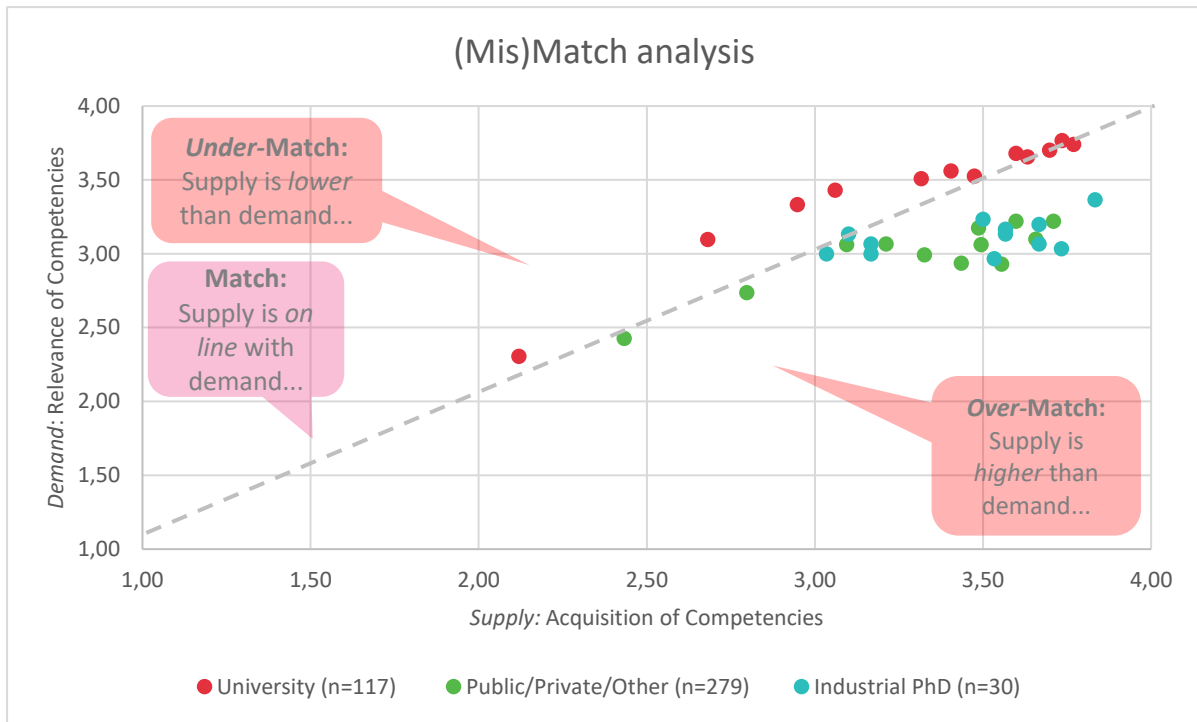
Figure 30: (Mis)Match Analysis – Scientific competencies

Figure 31: (Mis)Match Analysis – Supporting and personal competencies

5.6   COMPETENCE MATCH AS SEEN FROM GRADUATES AND RE-CRUITERS

This subsection further describes what characterizes the competence profiles of graduates described in chapter 3. Firstly, the perspective of recruiters is analysed and secondly that of the graduates. Conclusions are that:

- Engineer-specific method competencies or subject matter expertise is the main asset of PhDs for recruiters and employers
- Graduates feel that their competencies in methods is their biggest asset
- Master's degrees with previous experience from labour market are preferred for managerial and operational positions
- Among recruiters, personality appears to become an increasingly important aspect when hiring
- The individuality of a PhD study is believed to lead to a lack of competencies in collaboration
- Project management is on the one hand lacking, but on the other hand not expected

Engineer-specific and professional competencies are the main asset of PhD graduates

When it comes to the required skills of the graduates, **the most highlighted competence among recruiters are professional, engineer-specific skills** – either subject matter expertise or method competencies, as described in chapter 3. The recruiters are interested in proficient, specialized graduates with expert knowledge, often in a very narrow and particular topic. This is primarily the case in big companies with the sufficient resources to prioritize specialized personnel. Secondly, this also counts for small start-ups that draw on a particular idea or product developed through research. **The need for subject matter expertise and methods competencies is therefore big and based on the number of comments and mentions in the interviews.** Furthermore, it is the main reason to recruit PhDs instead of other graduates with experience from labour market.

> **Recruiter, private company:** The thing we care the most about are the subject-specific competencies. And then the other things like collaboration skills and so on will come. But we will teach people that.

As described earlier, beyond the engineer-specific skills, the recruiters especially mention the individual and social competencies, **where particularly dissemination and communication skills are common issues for recruiters**. The graduates should be able to do oral presentations as well as written reports. Regarding dissemination, it is also important for many recruiters that the graduates can explain themselves and their knowledge and work in a less scientific way when they are communicating with clients who usually have less specialized knowledge on niche areas. It seems, however, like **the recruiters in general have good experience with the dissemination skills** of PhD graduates from DTU as well as other Danish universities. As one recruiter explains:

> **Recruiter, private company:** You work in a specialist organization, but often you need to translate this to non-specialists. You need to be able to translate your specialist knowledge. We also look for that. Dissemination.

Personality becomes increasingly important among recruiters

Beyond that, **personality matters**. It is important for the recruiter to feel good chemistry with the graduate, as well as the graduate being able to fit in to the environment at work. In this context it is also important that the graduate has some social skills both regarding the interaction at work but especially in the meeting with clients.

> **Recruiter, private company:** We try to find a competency match, but otherwise it is attitudes and personality we are concerned with.

Compared to the findings in the 2015-report, personality is more often mentioned as a concern in recruitment procedures, pointing to the fact that it may become more important. However, person-

ality is still subordinate to engineer-specific, professional competencies. Furthermore, how one's personality interferes with the kind of tasks carried out by PhDs employed in private and public sector is also a concern for the graduates themselves:

> **Recruiter, private company:** There are many of us [PhDs] who are introvert by nature. But now you receive a mail from someone in Spain who heard you are an expert. Then you have to be really confident in yourself, and it has been a challenge for me. It is expected from me.

Master's with three years of experience preferred for operational and managerial positions

When asked when and why recruiters and employers prefer candidates with a master's and three years of experience, it is because they possess more professionalized personal competencies. **Candidates with a master's degree and three years of experience are thus preferred by employers, when they are looking for someone proficient in operational and managerial tasks**. Project management skills are appreciated but usually not a necessity for hiring a PhD graduate. For recruiters and employers, the engineer-specific companies are the crucial aspect of match-making. The supportive, personal competencies – either individual or social – are to larger extent determining for candidates with a master's degree and three years of experience. This finding confirms the pattern identified in the 2015 report.

PhD graduates feel that their method competencies are of the biggest value in their new positions

This resonates well with the PhD graduates who also emphasize subject matter expertise and method competencies. However, **among the candidates interviewed, the match with method competencies is more often mentioned than subject matter expertise**. This might not be an issue though, since the method competencies and working approach in general make the graduates capable of acquiring new knowledge, e.g. in another field, which enables them to familiarize themselves with new topics quite fast as also described in chapters 3 and 4. This is caused by the general abilities aquiredduring their PhD, which includes being able to read scientific articles, plan work, structure work processes, form overviews of new topics and think critically:

> **Graduate, private company:** My PhD has been really good in regard to the methods, I have learned. It has made the transition to a job quite painless. I've become used to reading articles and implementing the methods they apply in the articles.

Collaboration and project management are the biggest challenges experienced

In most other types of competencies, the graduates seem to note a high degree of conformity between their own competencies and the competencies required by the recruiters and employers in general. This resonates with the survey results. **However, in two areas there seems to be less of a match between the graduates' competencies and the competencies required by employers**: **project management skills and especially regarding collaboration.** Some PhDs find this lack of a match within project management to be critical, but since most employers do not expect the PhD graduates to be experienced project managers and they are ready to teach the graduates these skills after hiring them.

For many companies, however, **project management is not a must since the graduates usually can acquire these abilities during their training and time in the company**.

The collaboration where the lowest degree of match between skills and demand is reported in the qualitative interviews is mostly due to the transition from the life of a PhD, which is often character-ized by a large degree of individual work, to a job in industry, where a lot of tasks are carried out in teams. This transition can sometimes be difficult since it is a quite a big change in the everyday work. **Although it is a challenge, most graduates appreciate this shift in working environment and have often missed a more social environment during their PhD**:

> **Graduate, private company:** There is a lot more collaboration in the real world. That was also one of the things I missed during my PhD process. I sat alone a lot. It seemed like people kept the cards close to their chest. Also, because there is a lot of competition. I think that it is really great now. It's really important that you know how to collaborate.

Hence, initiatives directed towards collaboration in the PhD may not only contribute to the well-being of PhDs but also the professional skills they develop and which are valued by employers.

Interestingly, **only five of the graduates mention dissemination, even though it is one of the most highlighted competencies among recruiters**. This suggests that the recruiters put more attention to this competence than the graduates do themselves. Their personality is also a less mentioned quality among graduates whereas it is a relatively important feature among recruiters. So there seems to be some discrepancy regarding what the graduates think are important competencies and what recruit-ers think or at least what they emphasize when talking about competencies and qualities.

6. INTERNATIONALIZATION – AT HOME AND ABROAD

This section of the survey examines the graduates' experience with the international dimension of the PhD study at DTU. Focus is on the graduates' international experience during their studies and on whether they generally regard DTU as an internationally-oriented university. Finally, the recruiters' assessment of the importance of research trips abroad will be described.

> **COMPARISON WITH 2015 REPORT**
>
> Generally, the results from this survey mirror the findings from the 2015 report. There are slight changes. Significantly more Danish graduates in 2019 than in 2015 report to have had stays abroad. Regarding the contribution of stays abroad, most graduates still find that it contributes to both their personal and professional development. Verbal competencies and knowledge about international engineering have become more pronounced contributions to the qualifications of the graduates compared to 2015.

6.1 STUDYING ABROAD

More than half of the graduates have studied or carried out research abroad during the PhD programme. Like in 2015 this has contributed to their professional and personal development.
59% of the graduates have studied abroad or carried out research at a different university during their PhD programme. While the Danish graduates in 2015 had spent time at universities abroad to the same extent as graduates from other countries, in 2019 a slightly larger part of the Danish graduates (62%) than graduates from other countries (58%) did so, though this is still not a significant difference.

Graduates who have been abroad believe that it has contributed to their development, both professionally and personally. A little fewer have answered "to a high degree" in both cases in 2019 compared with 2015, however the difference is not statistically significant. In 2019, as can be seen from Figure 32, 49% believe that their visit abroad has contributed to a high degree to their professional development, while 37% considered it to be the case to some degree. Only 3% answered that their study abroad has not contributed at all to their professional development. Similarly, the majority of graduates believe that their visit abroad has contributed to their personal development. 55% consider it to be the case to a high degree while 31% consider it to be the case to some degree. Only 1% answered that this was not the case at all, and all in all, the picture thus mirrors the results from 2015.

Figure 32: Did you think that your study or research visit outside Denmark contributed to your personal/professional development?

Did you think that your study or research visit outside Denmark contributed to your ...
(2015 N=345, 2019 N=235)
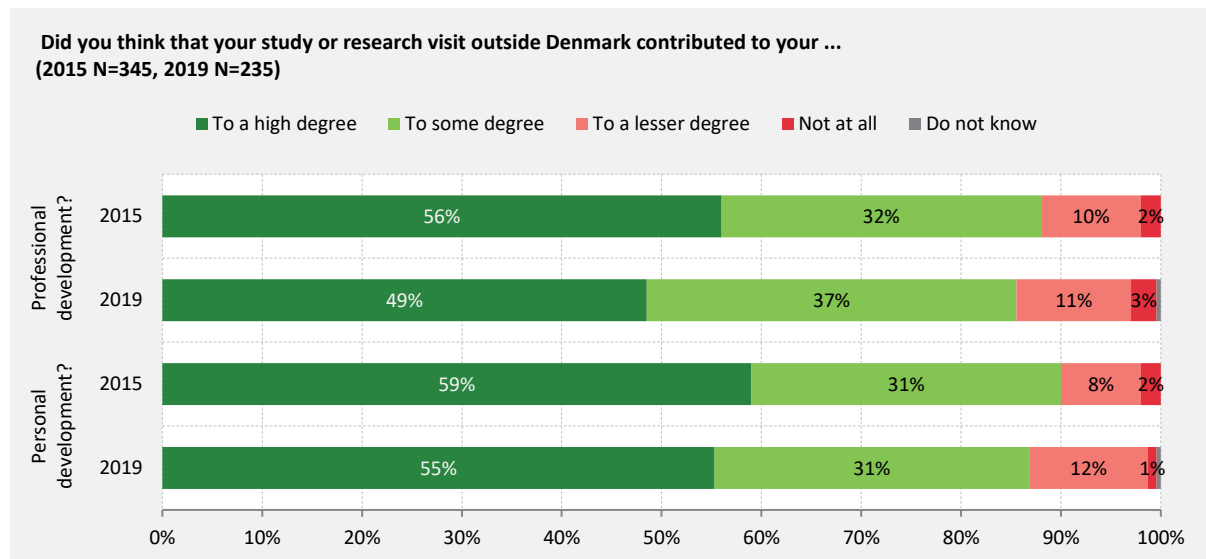
6.2 INTERNATIONAL NETWORKS AND COMPETENCIES

Nine out of ten graduates have experienced DTU as an internationally-oriented university in terms of the research environment

In 2019, more than half (55%) of the graduates strongly agree while 34% agree that they have experienced DTU as an internationally-oriented university in terms of research environment. 7% neither agree nor disagree, and only 3% disagree.

Additionally, most graduates either agree or strongly agree that they have developed an international network (74%) and obtained experience in collaborating with people with a different cultural background than their own (88%). Regarding development of an international network, only 11% disagree or strongly disagrees, while looking at whether the graduates obtained experience in collaborating with people with a different cultural background than their own only 5% disagree or strongly disagree.

Even among the Danish graduates who have not studied or conducted research at other universities outside Denmark, there are 81% who obtained experience in collaborating with people with a different cultural background than their own through their PhD studies. The numbers are almost the same as in 2015 or a bit higher, and it appears that the graduates find that DTU has an international profile.

Knowledge about international research and engineering are of highest priority

Graduates were asked to rank seven international and intercultural competencies according to importance in their current job. The results are illustrated in Figure 33. In the figure, competencies are arranged in order of their average priority from 1-7, so that the competency which on average has the lowest score, and is thus given highest priority, is farthest to the left.

In 2019 the largest number of graduates indicate *Knowledge about international research* and *Knowledge about international engineering* as their first priority, as 26% have chosen both of these as their first priority. In 2015, the largest number chose *Knowledge about international research* too (27%), while only 10% chose *Knowledge about international engineering* back then. On average, there are fewest graduates who have given first priority to *Understanding foreign cultures* in both 2015 and 2019.

In general, the ranking of the seven factors in question has not changed significantly since 2015. Only *Knowledge about international engineering* is ranked as the first priority by significantly more graduates in 2019.

Figure 33: Rank the importance of the following 7 (international) competencies in carrying out your current job (or your latest job if you do not have a job at the moment)

How important were the following factors for you being hired for your first job?
(2015 N=622, 2019 N=385)
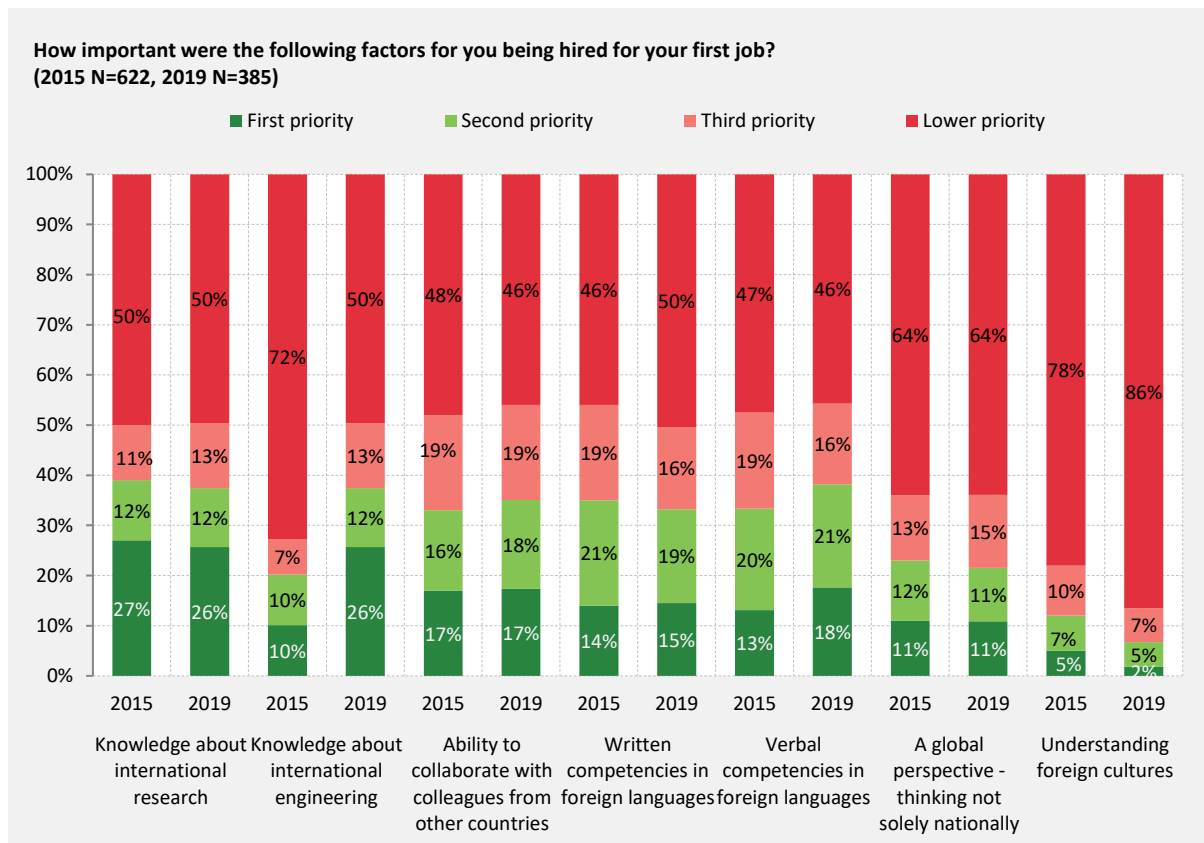
6.3   FOR RECRUITERS THE VALUE OF STAYS ABROAD IS INDIRECT

Whether the graduate has had visits abroad is not a crucial factor in the hiring process according to the recruiters. **About half of the recruiters who mention studying abroad do not attach great importance to this fact and some do not even care.** The other half consider visits abroad as a positive feature, but not something that is of particular importance when hiring a graduate.

There are several reasons why visits abroad are considered as a positive feature. Some recruiters express that the graduates become a little more mature during a visit abroad. Others point out the educational aspect of studying abroad, where the visit can provide new and relevant knowledge and learning for the graduate that he or she might not have been able to obtain in the same way in Denmark. Lastly the cultural factor is also of importance to a few recruiters. This is mainly relevant for bigger, international companies who have a great number of international employees. **In these positions, it is considered to be a plus if the graduate is used to other cultures, getting along with people from different countries and maybe even have some network abroad that can be used for business or researching purposes.** As a recruiter of a company with a lot of international cooperation says:

> **Recruiter, private company:** Research stays are very positive; they learn a lot from it, and it is healthy to see something else. The company has a lot of international cooperation, so it can be good if the graduates can contribute to this.

Thus, visits abroad have a positive effect on most recruiters, but it is not seen as a crucial factor for employment, **rather a positive feature.** A recruiter of a large, private company for example considers visits abroad as a plus, albeit a small one, in the hiring process:

> **Recruiter, private company:** It has bigger importance than we immediately attribute it, I think. In terms of the maturity you achieve from staying abroad. But in the hiring process it is a plus but a small detail.

The value gained from international stays abroad among public and private companies is more indirect than direct, in the words of another recruiter.

7. PROGRAMME SCHEDULING, CAREER GUID-ANCE, AND LEAVE

This chapter looks in detail at the graduates' PhD programme. First, it describes the graduates' own opinions of the programme and their specific suggestions for what could be improved. Next, focus is on whether the graduates made use of guidance or leave during their PhD study. Finally, it describes the recruiters' assessment of the possibilities for collaboration in connection with a PhD programme.

7.1 GRADUATES' SUGGESTIONS FOR IMPROVEMENT IN SURVEY

Graduates wish to be better prepared for a job in trade or industry
Graduates were given the opportunity to describe what they consider could have been better regarding the PhD programme, and many different suggestions were put forward by the 140 graduates who chose to take advantage of this opportunity.

> **COMPARISON WITH THE 2015 REPORT**
>
> As seen in Figure 34, the biggest change from 2015 to 2019 is regarding PhD supervision, where 12% percentage points more chose this as a suggestion for improvement in 2019 (23%) than in 2015 (11%), and the difference is statistically significant.

Figure 34 shows that more than a quarter (29%) of the graduates' answers refer to the fact that career guidance during the PhD programme could be improved, and the share is almost the same as in 2015 (28%). Furthermore 11% mention collaboration with industry. In addition, there are a number of suggestions concerning, for example, that future job opportunities should influence the PhD programme to a greater extent, generic skills, help to non-Danish students and more flexibility for the PhD students.

Figure 34: Is there something DTU could do better with regard to the PhD programme, career guidance, etc.?

Is there something DTU could do better with regard to the PhD programmes, career guidance, etc.?
(2015 N=197, 2019 N=140)

■ 2015 ■ 2019

Category	2015	2019
Career guidance (Coaching, information)	28%	29%
PhD supervision	11%	23%
Collaboration with Industry (Contacts, branding, workshops etc.)	16%	11%
Future job opportunities should influence the PhD programme to a greater extent	10%	7%
Generic skills (Project management, leadership etc.)	4%	7%
Help to non-Danish students	3%	4%
More flexibility to the PhD students	0%	3%
Conducting interviews (one-year interview etc.)	5%	2%
Internationalization (Use of English, study abroad etc.)	4%	2%
The number of PhD students	3%	2%
Other	16%	9%

Graduates would have appreciated more focus on project management, application of funds or writing a scientific proposal and teamwork and networking

In the survey, more specific questions were asked about whether there are any types of competency or knowledge which the graduates did not gain in their studies, but which should have been included in the PhD programme. 24% answered 'yes' to this question, which is the same amount as in 2015. 29% indicated that project management should have been included. As highlighted in paragraph 5.6, the recruiters do not always agree with this, and suggest that it is up to their new workplace to develop competencies in project management. An additional 11% of the PhD graduates answered that they would like to have acquired competencies in application for funding or writing a scientific proposal. A further 7% mentioned teamwork and networking.

Graduates were also asked whether any of the knowledge or competencies they acquired in connection with their PhD programme have been irrelevant so far. In total, 13% of the graduates mentioned competencies which were irrelevant to them, and this is almost the same amount as in 2015 (12%). They mention in particular subject-specific knowledge (33%), or specific methods and topics not mentioned in connection with the PhD subject (16%), and teaching (6%).

7.2   CAREER GUIDANCE, COACHING AND LEAVE

Career and competence guidance during the PhD programme
The graduates' opinions of when students should begin to clarify which competencies are necessary for future jobs is shown in

Figure **35**. Just above a third believe that this should be continually (36%), 17% think it should be in connection with the first year-interview and 12% think it should be in connection with preparing the study plan. Thus, there are apparently highly varied and individual needs, and this tendency is the same as in 2015.

Figure 35: When do you think that the competencies needed for job opportunities after graduation should begin to be clarified in the PhD programme?

When do you think that the competencies needed for job opportunities after graduation should begin to be clarified in the PhD programme? (2015 N=644, 2019 N=391)
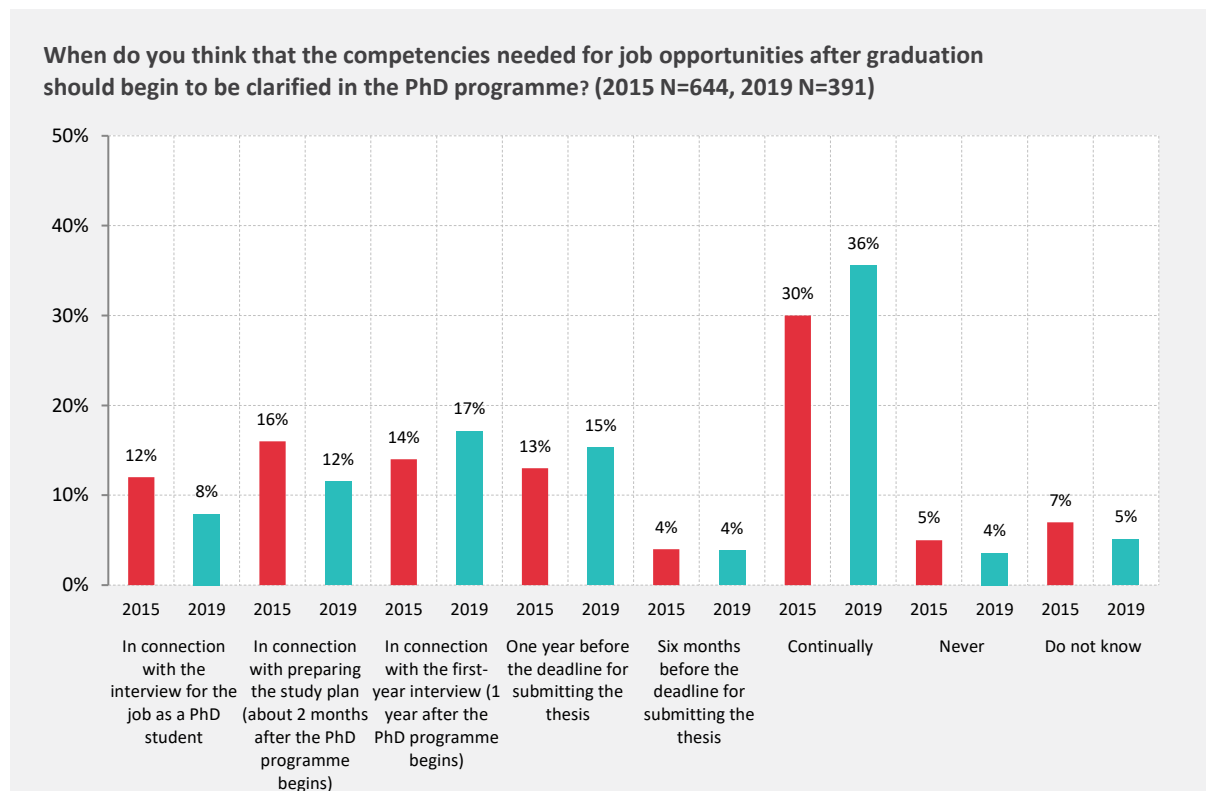
Figure 36 shows that 44% did not seek career guidance during their PhD programme, which is 6 percentage points more than in 2015 (38%), and thus a significant increase. As it was also the case in the 2015 study, Danish graduates in general seek less guidance than graduates from other countries. 53% of the Danish students did not seek career guidance, compared with 35% of the students from abroad, and the difference is statistically significant.

Thus, the students from abroad are more likely to make use of all the options available to obtain career guidance. In 2019, graduates who did seek career guidance did so primarily through their PhD supervisor (33%), personal network (31%), and/or professional network (31%). In comparison, only a few graduates sought career guidance from a coach (4%) or at the DTU career centre (4%).

Figure 36: How did you seek career guidance for yourself during your PhD programme?

How did you seek career guidance for yourself during your PhD programme in 2019 (n=391)

Legend: ■ Total ■ Danish ■ Other

	Total	Danish	Other
I did not seek career guidance	44%	53%	35%
I sought career guidance from my PhD supervisor	33%	28%	38%
I sought career guidance from my personal network	31%	27%	36%
I sought career guidance from my professional network	31%	27%	34%
I sought career guidance from DTU's Career Centre	4%	1%	7%
I sought career guidance from a coach	4%	3%	5%
Other, please state where	3%	2%	4%
Do not know or do not remember	1%	1%	2%

Note: Percentages add up to more than 100% since respondents were allowed to give more than one answer.

Some students have seen a coach during their PhD programme

13% of the graduates have received coaching related to the completion of their PhD education. Hereof, 7% received coaching at DTU while 6% received it outside DTU. In 2015, the numbers were higher, where 18% consulted a coach at DTU during their PhD programme and, additionally, 4% had a coach outside DTU. However, the difference in the amounts who sought coaching is not statistically significant.

In 2019, the percentage of students from abroad (12%) and the percentage of Danish students (14%) were almost the same. In 2015, the percentage of students from abroad (27%) who consulted a coach was higher than the percentage of Danish students who had a coach (12%).

Just below one in five of the graduates have taken leave during their PhD programme (parental leave excluded)

18% of the graduates stated that they took leave that was not parental leave during their PhD programme. Figure 37 illustrates that for the majority of those who took leave, it was paid for by DTU

(54%). This amount has decreased by 13 percentage since 2015 (67%), but given the small base of each group of comparison, the difference is not statistically significant. In 2019, about a third of the graduates (34%) also took leave that was relevant to their PhD without payment from DTU, while 15% took leave that was not relevant to their PhD without payment from DTU. First mentioned is about the same amount as in 2015, while nobody took the last mentioned in 2015.

Figure 37: Which type of leave did you take?
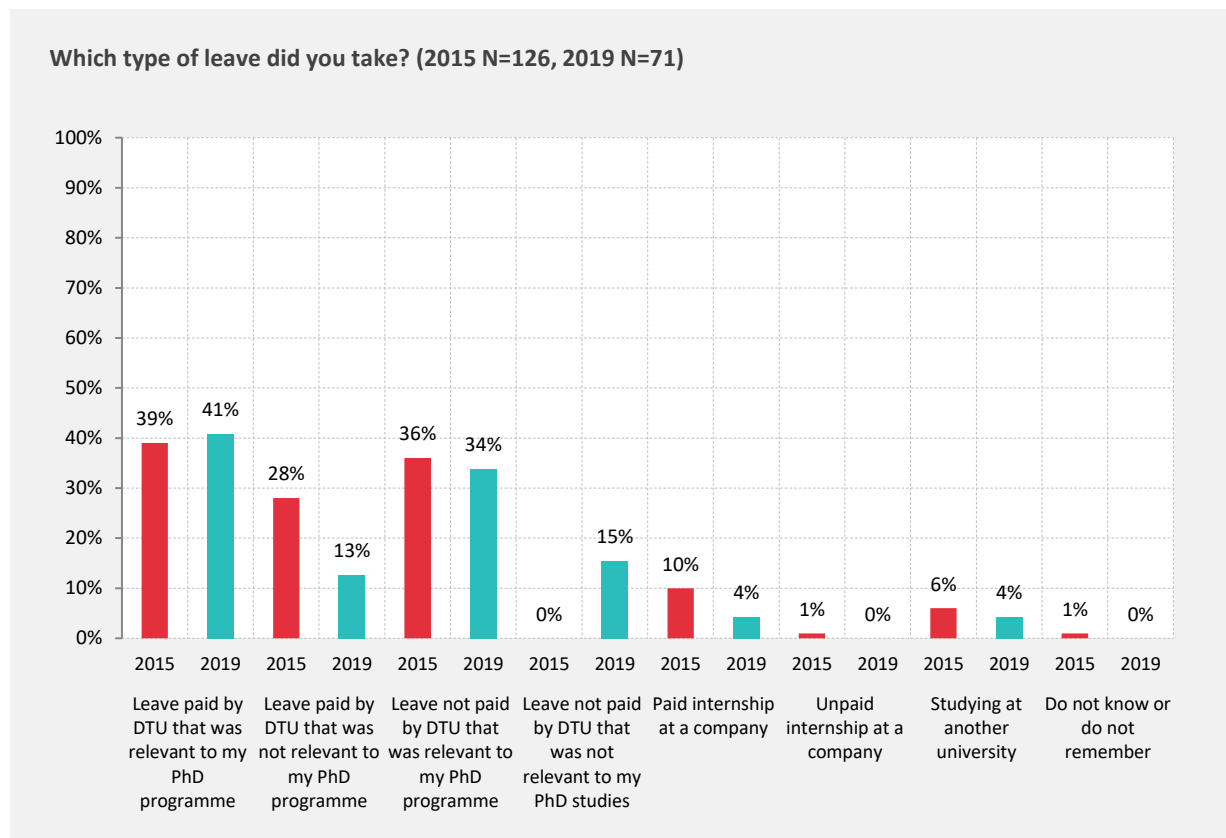
Which type of leave did you take? (2015 N=126, 2019 N=71)

Note: Percentages add up to more than 100%, since respondents were allowed to state more than one type.

Finally, the graduates were asked whether they had acquired competencies during their leave which have been relevant in their career so far. 48% of the graduates indicate that they acquired competencies during their leave which have been relevant. By contrast, 41% answered that they acquired competencies that have not been relevant, while 11% do not know or cannot remember.

Looking more closely at the competencies acquired by graduates during their leave, it appears that competencies associated with research are the most common. A few graduates have also gained experience with project work and project management during their leave. Finally, competencies in knowledge of companies, international collaboration and knowledge about other fields than their PhD are mentioned.

7.3 THE RECRUITERS' VIEW ON COLLABORATION OPPORTUNITIES

Among the recruiters, a mixed image forms when talking about collaboration opportunities with graduates from DTU. Some of the companies already have an established set up with industrial PhDs. These industrial PhDs work in collaboration with the company during their PhD, which is often viewed as a benefit for both parties. The companies experienced with industrial PhDs are widely satisfied with the arrangement and often hire the graduate after he or she finishes their PhD, or at least hope to in the case of this recruiter:

> **Recruiter, private company:** Then we have some industrial PhDs and that works well too. We are really happy about that. We really hope they want to stick around.

Having done an industrial PhD in collaboration with the company gives the employer a strong sense of the graduates' skills but also their personality and work approach. Some recruiters mention that they do not yet have a collaboration in the sense of industrial PhDs, but they would like to in the future. Some of the barriers for this cooperation are the number of articles the PhDs have to write during their education, geography, collaboration with DTU and the fact that the arrangement often demands an effort from the company, which small companies in particular do not think they have the resources for. A recruiter of a private company says about the challenges:

> **Recruiter, private company:** In the beginning we struggled quite a lot with getting DTU to downgrade their demands on number of articles. But then anyway, because they are in academia, they [the students] feel most loyal towards the university. That can be a problem since they are hired by us. They feel they must choose between mom and dad. We should be better in that area and have ways to handle that. You need to help them from the side of the university. It's something else than being an ordinary researcher. The ordinary professors don't have a chance at doing that. Industrial PhD is a different education than an ordinary PhD and it has a different goal. And the university also must see it as an opportunity, and we are not quite at that point yet. It's very controlled by the atmosphere of the faculty.

Finally, several recruiters also mention a collaboration with DTU in general. This collaboration can be in regard to development projects or through professors at DTU who, for example, introduce promising PhDs to the company through networks. The companies already in collaboration with DTU are in general very pleased with the arrangement, and some would even like a stronger connection. Furthermore, several recruiters from companies who do not have any type of collaboration with DTU yet mention that they would like to initiate a collaboration in the future.

7.4 SUGGESTIONS FOR IMPROVEMENTS FROM INTERVIEWS

The following section is a qualitative elaboration on survey results reported in 7.1, which supplements with recruiters' perspectives on future directions for future PhD education at DTU and graduates' explanations of why certain aspects could be emphasized more heavily in the PhD education.

During the interviews with recruiters as well as graduates, both parties were asked if they had any comments or suggestions for DTU and their PhD programme. First of all, though, it is worth mentioning that both the recruiters and graduates in general are pleased with the PhD programme at DTU, which is also proven by the high employment rates for graduates as shown in 3.1.

Recruiters emphasize the importance of a mindset prepared for rapid changes
There are, however, no clear points of improvement in the suggestions from the recruiters. Overall, the development, especially the technological, is extremely fast at the moment. Hence, general advice for DTU and other universities is to keep up with this fast development. It is important **that the study programmes are up to date on the subjects that are trendy in business** to keep the graduates relevant and in demand. This recruiter, for example, explains how the graduates' skills and mindset are important in the development of a new business area:

> **Recruiter, private company:** Artificial Intelligence. It's quite complicated and something we are betting on, so in that area PhDs are useful… It's important that the graduates understand how fast the world changes and that they want to keep up with it. Both in connection to the technical and the theoretical things.

The point that the mindset of graduates is important to recruiters also resonates well with increasing emphasis on personality, described in 5.6. **The attitude of the PhDs is increasingly important because they cannot expect that their job is a (straight) continuation of their PhD.** Recruiters emphasize that they rapidly face new challenges, to which PhDs have to be willing to adapt.

A few recruiters also mention that **the professional level needs to be kept at a high level and the PhDs should still be able to immerse themselves into complicated subject matter and methods**. One recruiter mentions that it would be helpful to prepare the graduates better in connection with the transition to the business world, but a majority of recruiters prefer that the graduates prioritize their research over business courses. For these recruiters, the mentality is that if the graduate is clever enough, he or she will be able to learn business-related matters quickly, and they might as well just teach them in the business instead of at the university.

Missing: Possibilities for collaboration and supervisor focus on career, say graduates
The comments from the graduates themselves regarding improvement of the PhD education can be categorized into three topics:

- Socialization and collaboration
- Career guidance
- Supervisors

As also specified earlier is the fact that some graduates feel quite lonely during their PhD. Because of this, **graduates propose the introduction of initiatives such as PhD-networks or to provide the PhDs better opportunities to collaborate on projects during their study programme**. This would be helpful to those who feel lonely, but it would also improve their social competence and collaborative skills,

66

which is often very important outside of academia and something that recruiters sometimes experience difficulty with when training a new graduate employee. A graduate from a private company says:

> **Graduate, private company:** If you could do projects together with a couple of others. You could encourage students to join in open source coding because that is also a way to collaborate. It is also in demand in the companies.

The survey results showed that some students have participated in career initiatives at DTU. In the interviews, **some graduates also find the career possibilities to be incalculable or have a hard time finding them at all**. Especially at the end of the PhD, graduates would like to get a little more guidance on the possibilities after finishing their PhD. In this regard the career fairs are good, but some graduates demand even more guidance. For example, a graduate mentions that it would be great inspiration to know what other graduates are doing after finishing their PhD:

> **Graduate, private company:** It could be very nice to share the results with the students. To see what possibilities there are and talk about what people are doing now. What possibilities do you have as a PhD student in regard to what you can do afterwards? What does it take to go in one direction or another? Courses and networks to focus on.

Finally, some suggestions are also related to the supervision and the expectations from the university in general during the PhD. **A few graduates mention that some supervisors tend to be less involved with their PhD students.** It is also pointed out that the quality among the supervisors fluctuates since not all good professors are also good supervisors. The supervisor you get can be quite influential on how the PhD process turns out for the student, also with regard to collaboration and future career path.

Some graduates would also like the programme to be a little more flexible, e.g. in terms of change in supervisor(s). In extension to this, a graduate also emphasizes his experience from talking to several other PhD students who had troubles getting their mandatory half-year reports signed by their supervisor. This is another case of lack of flexibility since a PhD project probably, like many other projects, will include ups and downs. This point is only pointed out by a few graduates, though, whereas **the quality of the supervisor seems to be a bit more frequently mentioned.** The mentioning of lack of supervision quality tend to focus on either low response rates or presence, recognition of the student or the trouble of navigating between two or more supervisors who disagree on what the PhD should do. Supervisors are less often mentioned in relation to career opportunities.

8. CONTINUING EDUCATION

This chapter contains an investigation of whether graduates have taken part in continuing education after completing their PhD and whether they are interested in continuing education in the future. The results are supplemented by identification of the reasons for participating in continuing education courses and thereby what outcomes the graduates are expecting to gain from continuing education.

8.1   PARTICIPATION IN CONTINUING EDUCATION

Approximately one in five have participated in a continuing education course
19% of the PhD graduates have either completed or are currently enrolled in a continuing education course. The enrolment in continuing education is significantly more common among graduates employed in the public, private and other sectors (23%) than for graduates employed at universities (12%). Also, Danish graduates are significantly more prone to enrol in continuing education (24%) than graduates of another nationality (12%). On the other hand, the enrolment in continuing education shows no connection with the kind of PhD (industrial PhD or university PhD) or the degree to which the graduates feel that the PhD programme prepared them for their current job.

The number of graduates who have completed or are enrolled in continuing education courses tends to increase as time passes following completion of their PhD programme. Among those who completed their programmes in 2015 and 2016, the share of graduates who completed or currently enrolled in continuing education is respectively 23% and 21%, while the share is only 13% among graduates completing their degree in 2017.

COMPARISON WITH THE 2015 REPORT

Since 2015, the share of graduates has not changed significantly. However, in the 2015 report, the relation between graduation year and enrolment in continuing education was more pronounced, as recent graduates were significantly less prone to take or to have taken continuing education.

Figure 38 shows that graduates enrolled in continuing education are taking mostly short courses rather than longer, part-time courses. 82% of the graduates enrolled in continuing courses participate in courses of three days or less. Even though Figure 38 gives the impression that this tendency is more pronounced in 2019 than in 2015 the difference is not significant.

Figure 38: What continuing education programmes have you attended?
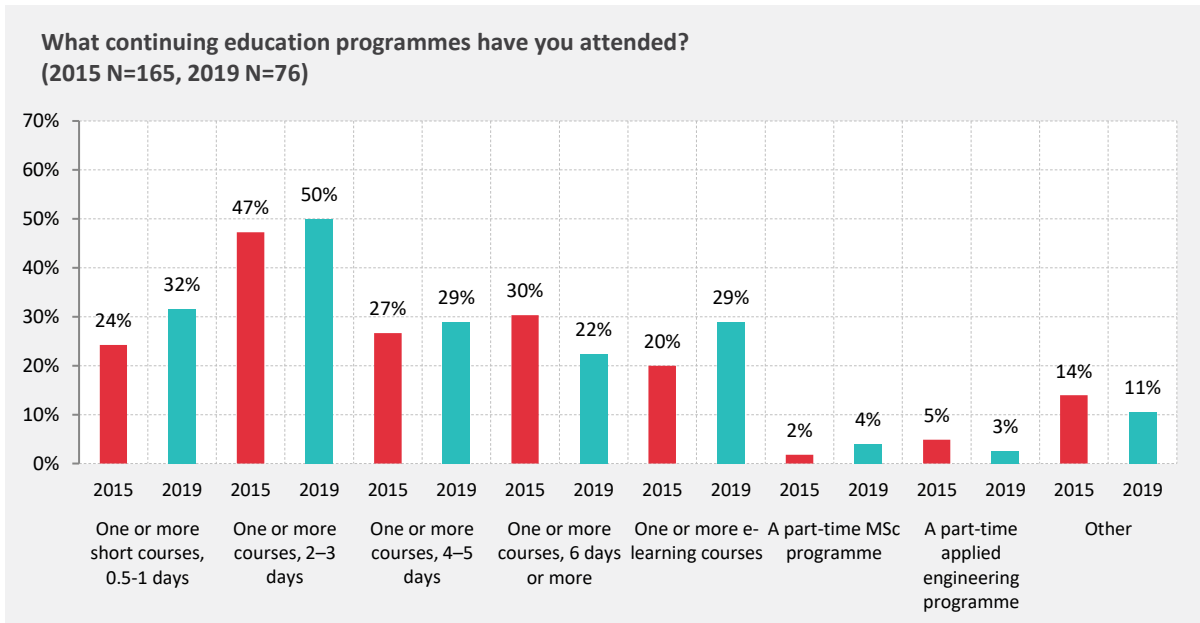
What continuing education programmes have you attended?
(2015 N=165, 2019 N=76)

Category	2015	2019
One or more short courses, 0.5-1 days	24%	32%
One or more courses, 2–3 days	47%	50%
One or more courses, 4–5 days	27%	29%
One or more courses, 6 days or more	30%	22%
One or more e-learning courses	20%	29%
A part-time MSc programme	2%	4%
A part-time applied engineering programme	5%	3%
Other	14%	11%

Note: Percentages add up to more than 100%, since respondents were allowed to state more than one programme.

DTU is the single largest provider of continuing education – especially for university-employed graduates

As can be seen from Figure 39, 32% of the graduates who have taken part in continuing education have participated in a course at DTU. This is a relatively small and insignificant decrease of 6 percentage points since 2015. Furthermore, graduates enrolled in continuing education courses at DTU are primarily those graduates who are currently employed at universities (71%), while using DTU as a provider of continuing education is significantly less common among employees in the public, private and other sectors (23%). The latter group of graduates mainly enrol in courses provided by a private organisation (69%) or internal courses provided by the company they work for (49%), the former type of courses being significantly more popular in 2019 than in 2015.

The share of graduates enrolling in courses at other universities is fairly equal across places of employment. Comparing with 2015, a slightly but insignificantly smaller share of the graduates had enrolled in courses provided by universities other than DTU.

Figure 39: Which provider of continuing education have you used for your continuing education programmes or courses?

Which provider of continuing education have you used for your continuing education programmes or course in 2019? (N=76)

■ Private/public/other   ■ University   ■ Total

DTU – Technical University of Denmark
- 23%
- 71%
- 32%

A private provider
- 69%
- 29%
- 61%

An internal course in the company in which I am or was employed
- 49%
- 0%
- 39%

Another university outside Denmark
- 16%
- 14%
- 17%

Another university in Denmark
- 8%
- 7%
- 8%

Other, please state
- 7%
- 14%
- 8%
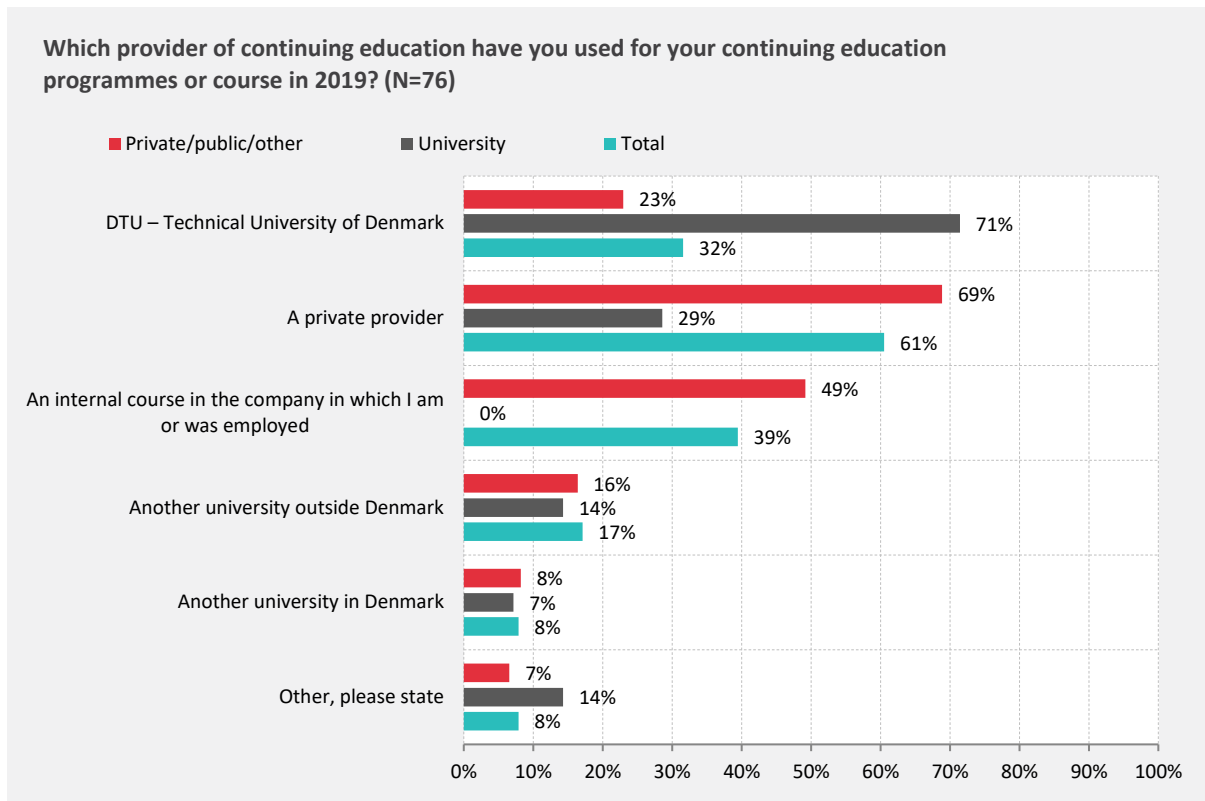
Note: Percentages add up to more than 100% since respondents were allowed to give more than one answer.

Half of the graduates who have been enrolled in continuing education have taken courses within their own research field (50%). Besides, graduates have mostly been enrolled in courses within the field of project management (37%) or a completely new research field (29%). These were also the three main fields within which graduates enrolled in 2015.

8.2   THE VALUE OF CONTINUING EDUCATION

Approximately three in four believe that continuing education is important for them to maintain their value on the labour market.

As shown in Figure 40, 73% of all graduates believe that continuing education is important to a high or some degree in order to maintain their value on the labour market. Compared with 2015 results, there has been no significant change in this regard. One in five (20%) consider continuing education less or not at all important for maintaining their value on the labour market.

A significantly larger share of graduates employed in the labour market outside of universities finds continuing education highly or somewhat important for maintaining their value (80%) than graduates employed at universities (59%).

🔍 **COMPARISON WITH 2015 REPORT**

For graduates employed at universities, continuing education is considered significantly less important today than in 2015, while the consideration among graduates employed in sectors outside universities has been constant.

Figure 40: To what degree do you think that continuing education is important for you to maintain your value on the labour market?

To what degree do you think that continuing education is important for you to maintain your value on the labour market? (2015 N=632, 2019 N=390)

Legend: ■ To a high degree ■ To some degree ■ To a lesser degree ■ Not at all ■ Do not know

	Total 2015	Total 2019	University 2015	University 2019	Private/Public/Other 2015	Private/Public/Other 2019
Do not know	3%	6%	4%	14%	3%	3%
Not at all	3%	4%	5%	4%	2%	4%
To a lesser degree	16%	16%	16%	23%	15%	14%
To some degree	41%	39%	43%	31%	40%	43%
To a high degree	37%	34%	31%	28%	40%	37%
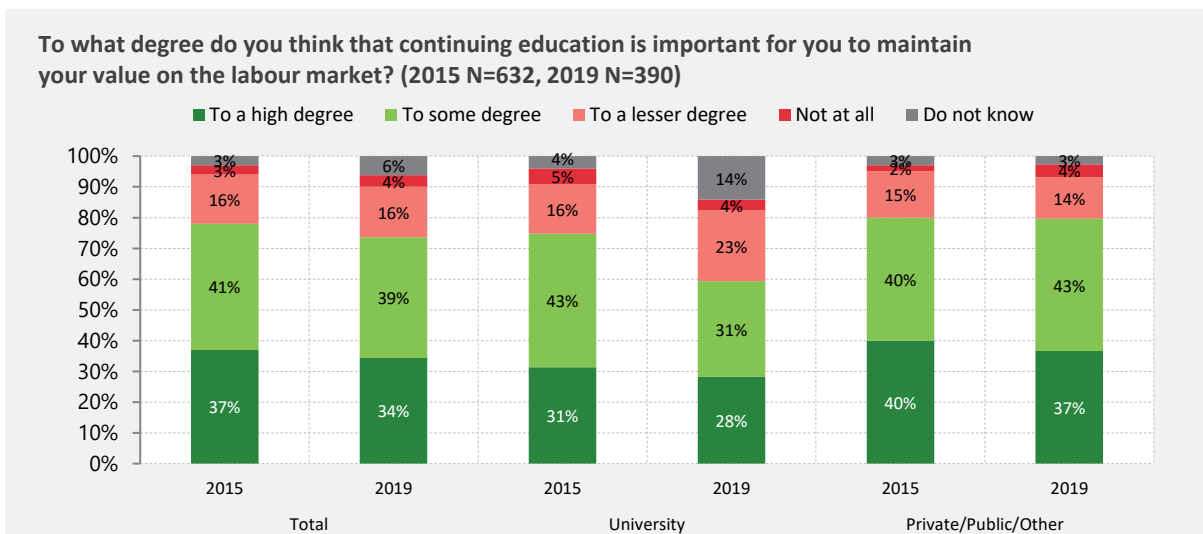
The graduates who find it important to enrol in continuing education courses were asked why. The answers are shown in Figure 41. As can be seen, the predominant factor being pointed out is the possibility of linking work experience and new knowledge in order to reach greater professional flexibility (68%). Also, the ability to more easily seek new opportunities as they obtain new and better qualifications is mentioned by a majority of graduates (56%) as an important reason for enrolling in continuing education. The importance attached to the different factors has not changed noticeably since the 2015 study.

Figure 41: Why do you think that continuing education is important for you to maintain your value on the labour market?

Why do you think that continuing education is important for you to maintain your value on the labour market? (2015 N=500, 2019 N=287)
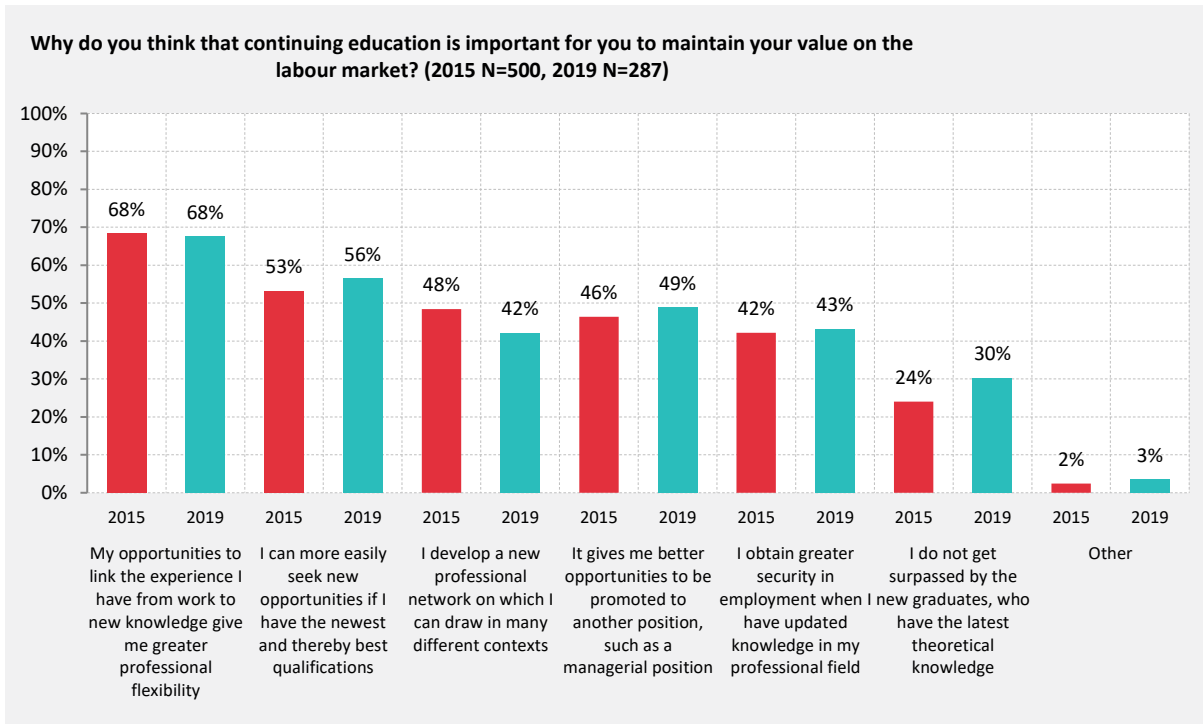
Note: Percentages add up to more than 100% since respondents were allowed give more than one answer.

Profession-specific continuing education is considered important by most graduates

As seen in Figure 42, most graduates also believe that subject-specific continuing education is important in order to maintain their value on the labour market. Almost three in four (73%) graduates are of that belief, and Figure 43 shows for what reasons this might be the case. The majority of graduates point to the possibility of profession-specific training contributing to new and more interesting assignments (85%). Half the graduates also mention the possibility of creating new job opportunities (50%) as an important reason to take part in profession-specific continuing education. The answers relating to profession-specific continuing education are very similar to what was said in 2015, both regarding the importance of this type of education and the reasons why.

Figure 42: To what degree do you think that profession-specific continuing education is important for you to maintain your value on the labour market?

To what degree do you think that profession-specific continuing education is important for you to maintain your value on the labour market? (2019 N=390)
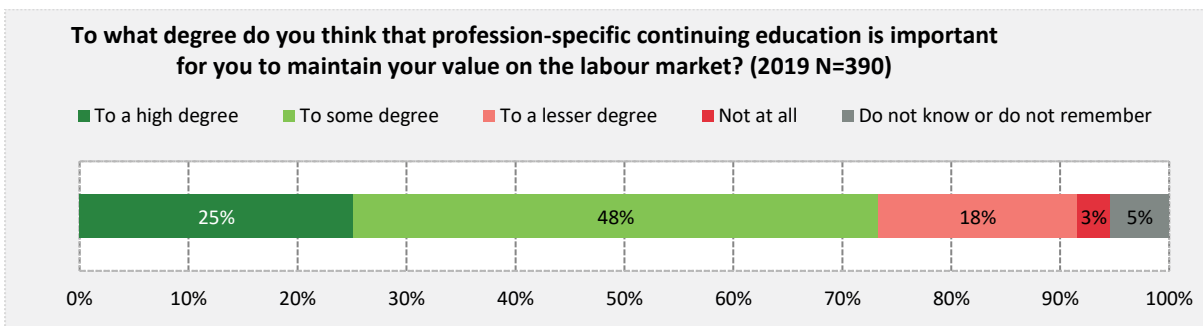
Figure 43: Why do you think that profession-specific continuing education is important for you to maintain your value on the labour market?

Why do you think that profession-specific continuing education is important for you to maintain your value on the labour market? (2015 N=480, 2019 N=286)

	It may contribute to obtaining new or more interesting assignments		It may contribute to obtaining a new professional network		It may contribute to obtaining a new job		It will make me secure in my current job		Other	
	2015	2019	2015	2019	2015	2019	2015	2019	2015	2019
	83%	85%	56%	42%	50%	50%	41%	38%	2%	4%
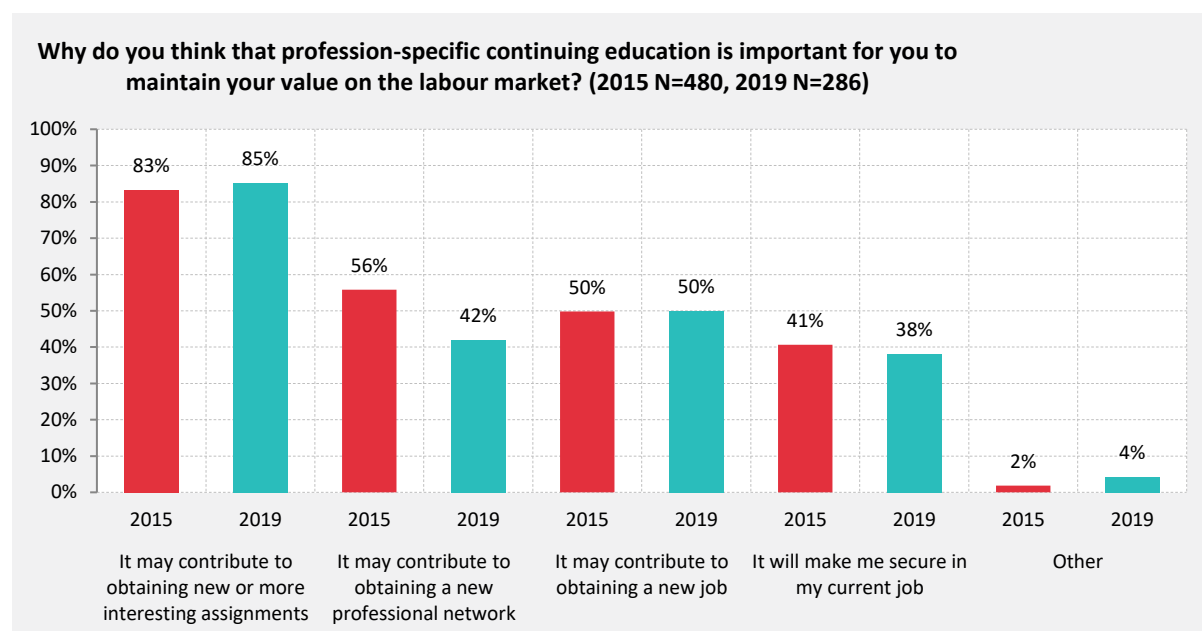
Note: Percentages add up to more than 100% since respondents were allowed to give more than one answer.

Graduates are most attracted by individual non-virtual courses

Figure 44 shows that graduates pointed to individual non-virtual courses as the most interesting courses within continuing education (60%). This is similar to what was stated in 2015. Graduates employed in the public, private or other sector are significantly more interested in individual non-virtual courses (65%) than graduates employed at universities (50%).

Besides, Figure 44 shows that graduates are interested in e-learning courses (49%), certification (40%) and part time programmes (35%). Even though not significant, the interest in these three courses has increased by 6, 5 and 3 percentage points respectively since 2015. Considering the nationality of the graduates, it can be seen that Danish graduates are significantly more interested in individual non-virtual courses, while graduates of other nationalities are significantly more interested in all other types of courses.

Figure 44: Which types of continuing education are you most interested in?
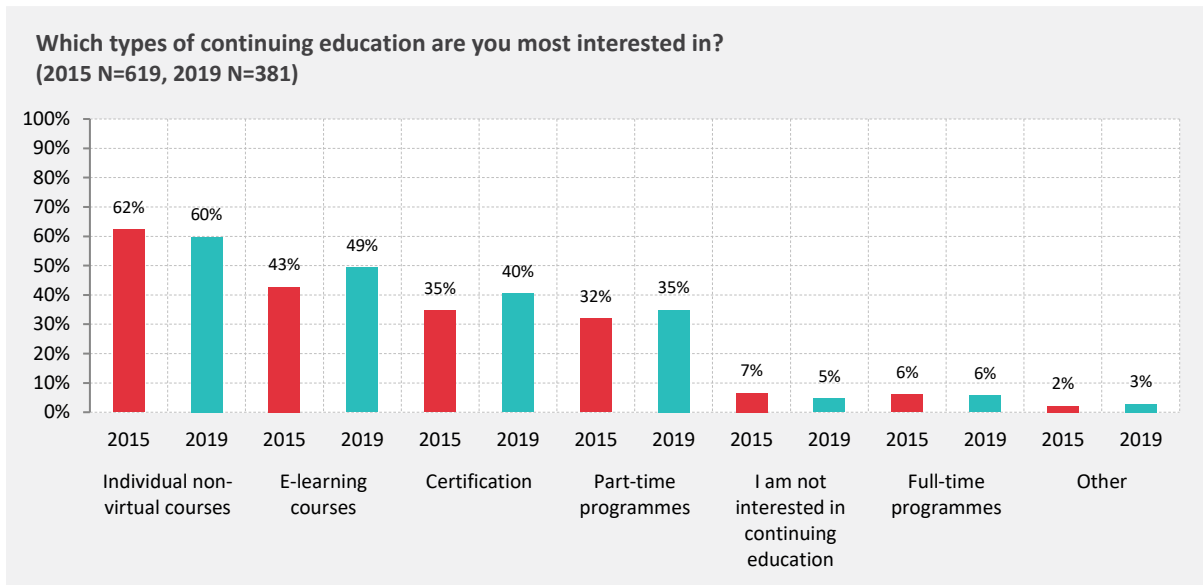
Which types of continuing education are you most interested in?
(2015 N=619, 2019 N=381)

	Individual non-virtual courses	E-learning courses	Certification	Part-time programmes	I am not interested in continuing education	Full-time programmes	Other
2015	62%	43%	35%	32%	7%	6%	2%
2019	60%	49%	40%	35%	5%	6%	3%

Note: Percentages add up to more than 100% since respondents were allowed to give more than one answer.

9. INNOVATION, ENTREPRENEURSHIP AND PA-TENTS

This chapter examines how many of the PhD graduates who have worked with companies on their PhD projects. Furthermore, the chapter examines whether the PhD graduates have taken initiative to gather knowledge about innovation, entrepreneurship and starting up their own company. In extension, the chapter investigates what DTU offered regarding opportunities for starting up one's own business.

9.1 GRADUATES' EXPERIENCE WITH COLLABORATION AND INNOVATION

Almost half the graduates have collaborated with industry in connection with their PhD projects
First of all, 45% of the graduates have collaborated with industry in connection to their PhD projects. Beyond the industrial PhD graduates – which amount to 35 (8%) individuals in the 2019 survey – 41% of the remaining graduates have worked with industry in connection with their PhD.

🔍 **COMPARISON WITH 2015 REPORT**

The prevalence of collaboration with industry during the PhD is not significantly different to 2015, where 43% of the graduates had collaborated with industry in connection to their PhD project.

Far fewer of the graduates have taken initiative to improve their knowledge about innovation and entrepreneurship, or how they could start their own company. Figure 45 below shows that 55% of the graduates did not show any initiative at all to strengthen their knowledge of innovation, entrepreneurship or to establish a company based on the research or professional knowledge they had acquired in connection with their PhD.

Figure 45: During your PhD programme, did you take the initiative to improve your knowledge of innovation and entrepreneurship in general or on how you could start your own company based on your research and your professional knowledge?

During your PhD programme, did you take the initiative to improve your knowledge on innovation and entrepreneurship in general or on how you could start your own company based on your research and your professional knowledge?
(2015 N=644, 2019 N=395)

■ To a high degree ■ To some degree ■ To a lesser degree ■ Not at all ■ Do not know or do not remember

	To a high degree	To some degree	To a lesser degree	Not at all	Do not know or do not remember
2015 (n=644)	6%	12%	24%	56%	2%
2019 (n=395)	7%	14%	23%	55%	2%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
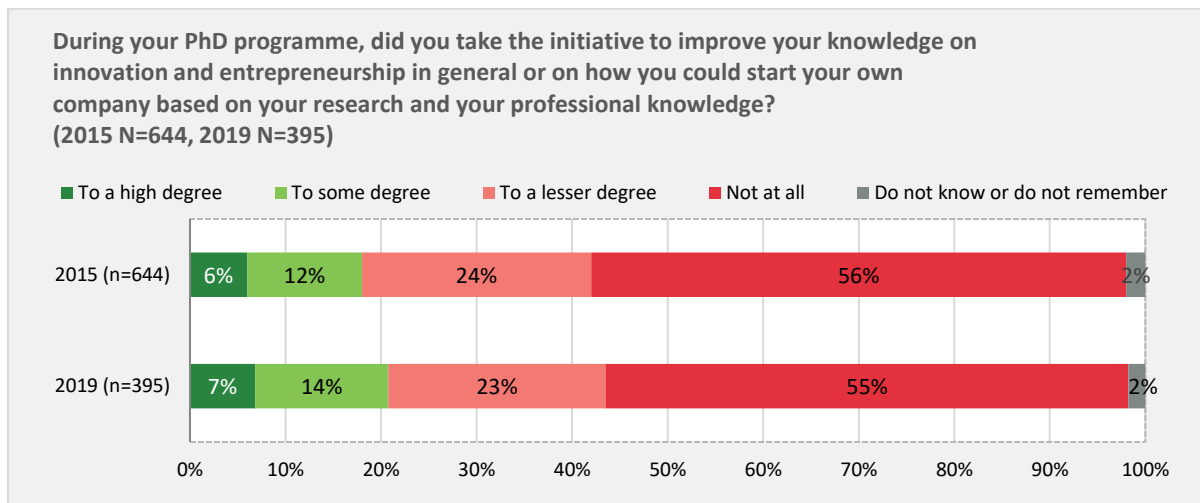
When looking only at industrial PhD graduates, 35% did not show any initiative at all to strengthen their knowledge of innovation, entrepreneurship or to establish a business based on the research or knowledge they had acquired in connection with their industrial PhD. This is a small and significant improvement from 2015, where 42% of the industrial PhD graduates did not show any initiative at all to strengthen their knowledge at this point.

Even though only very few graduates started their own company, the graduates were still innovative and creative during their PhD studies. 11% of the graduates developed technology, software, etc. which has been patented. The most innovative were the 35 industrial PhD students; 24% of these developed a product that was patented.

Only one fourth of the PhD graduates experienced that DTU offered knowledge regarding starting up own business.
The survey from 2019 has examined whether the PhD graduates experienced that DTU offered knowledge regarding starting up one's own business during the PhD studies.

The results show that only 28% of the graduates knew that DTU offered knowledge regarding starting up one's own business.

In the qualitative interviews with graduates, they were asked about participation in activities directed towards innovation and entrepreneurship. Among the 20 interviewed graduates, none had partici-pated. Some had not given it any thought, while others associated it with specific research groups, especially in machine learning and DTU CogSys:

Graduate, private company: My experience with start-ups is only indirect. There are quite a few from DTU Cognitive Systems, but I have not considered it relevant for myself.

50 PhD graduates participated in one or more of the opportunities for starting up own businesses, which corresponds to 40% of the PhD graduates who knew that DTU offered this kind of opportunity. Of these 50 PhD graduates, 33 of them (66%) participated in one or more opportunities at the department while 36% participated elsewhere at DTU.

Figure 46: Where did you participate in the opportunities that DTU offered you?

Where did you participate in the opportunities that DTU offered you? (2019 N=50)

- Yes, at the department
- Yes, elsewhere at DTU
- Yes, courses and summer schools
- Yes, Skylab

| 66% | 36% | 16% | 10% |

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
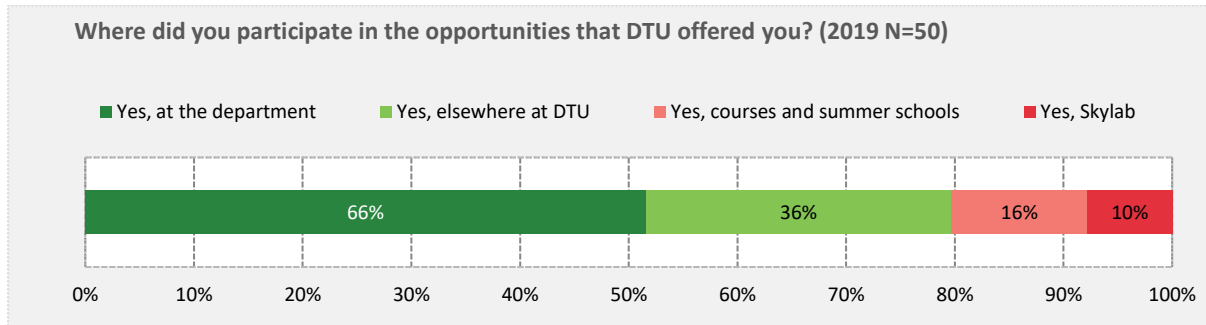
Almost all the PhD graduates get an increased knowledge about innovation and entrepreneurship when participating in DTU courses about these topics.

As shown in Figure 47 below, 88% of the graduates who participated in the opportunities that DTU offered increased their knowledge to some or to a high degree, while only 2 of the PhDs answered that the opportunities did not increase their knowledge at all (4%). The PhD graduates mention, for instance, that the opportunities increased their knowledge about how to seek funding, greater knowledge about procedures and patents, and taught the graduates the workflow and basic knowledge of starting up a business.

Furthermore, 57% of the graduates who participated in opportunities about starting up their own company have studied Electronics and Communications, while none of the graduates from Construction, Management Engineering, Mechanical Engineering, and Wind Energy have participated in any of these opportunities.

Figure 47: To what degree did this increase your knowledge about innovation and entrepreneurship?

To what degree did this increase your knowledge about innovation and entrepreneurship? (2019 N=50)

- To a high degree
- To some degree
- To a lesser degree
- Not at all
- Do not know or do not remember

| 28% | 60% | 4% | 4% | 4% |

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
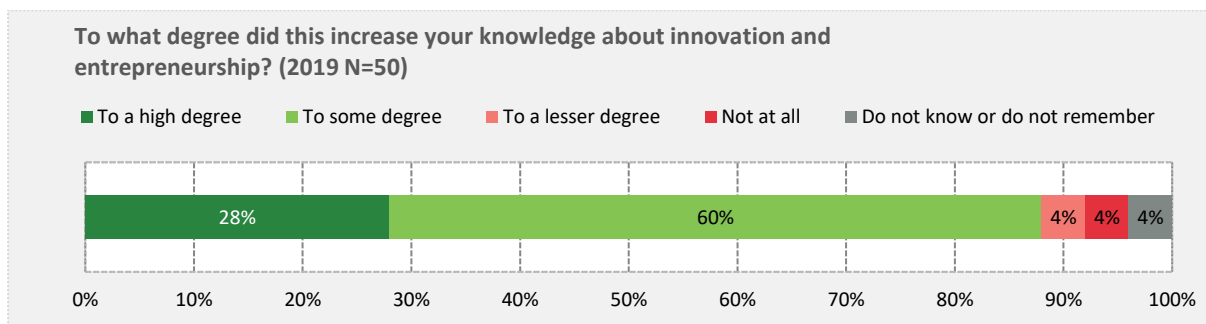
Innovation, entrepreneurship and collaboration with industry varies among different PhD fields
When examining closer, the degree of collaboration with industry varies across the PhD graduates' field of study.

Figure 48: Did you collaborate with industry on your PhD project?
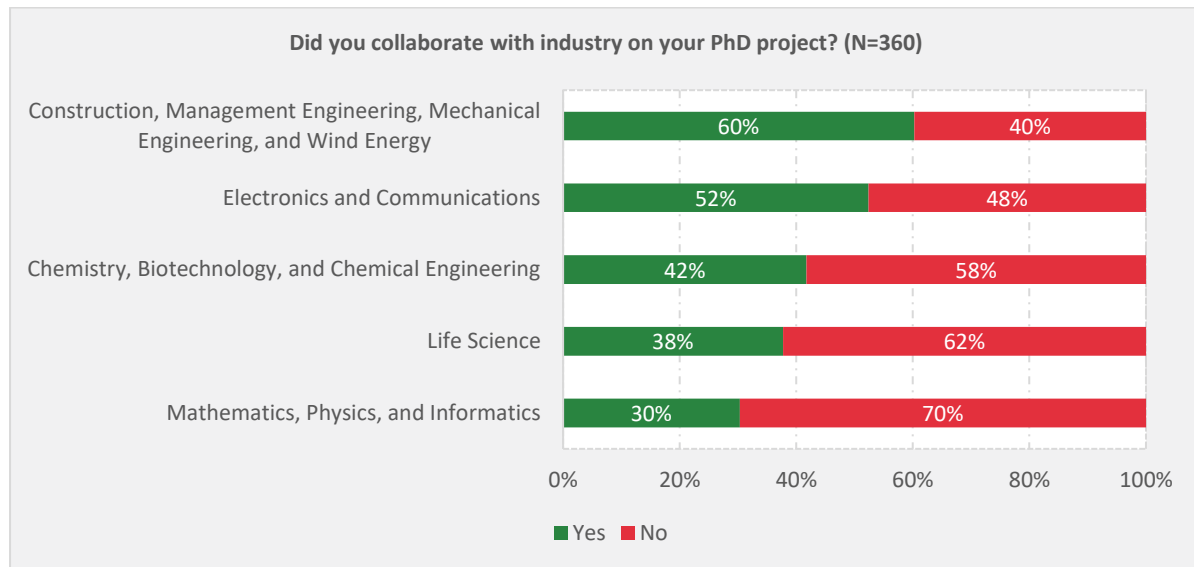
Figure 48 above shows that graduates who have taken a PhD in Construction, Management Engineering, Mechanical Engineering, and Wind Energy tend to collaborate more with industry than the other PhD programmes. 60% of the PhD graduates within this area have collaborated with industry (54% when the industrial PhD graduates are disregarded). This is slightly more than in Electronics and Communications, and in Chemistry, Biotechnology and Chemical Engineering, where 52% and 42% have collaborated with industry (45% and 40% when the industrial PhD graduates are disregarded). Finally, the proportion of collaboration with industry is lower in Life sciences and in Mathematics, Physics and Informatics compared to the three above mentioned field of studies. Only 38% and 30% of the PhD graduates within these areas have collaborated with companies (37% and 26% when the industrial PhD graduates are disregarded).

Similarly, the 2019 results show a difference in the extent to which the graduates themselves have taken the initiative to strengthen their knowledge of innovation, entrepreneurship or setting up a company. 31% of the PhD graduates from Electronics and Communications had to some or to a high degree taken the initiative, in one form or another, to improve their knowledge of innovation and entrepreneurship. In comparison, between 15% and 20% of the graduates in the other fields of study took this kind of initiative during their studies.

Finally, 39% of the PhD graduates from Electronics and Communications developed patented products during their PhD. In comparison, fewer graduates from Chemistry, Biotechnology, and Chemical Engi-

neering (28%), from Life Science (13%), from Mathematics, Physics, Informatics (13%), and significantly fewer from Construction, Production, Building and Wind Energy (8%) developed patented products during their PhD.

9.2   HOW RECRUITERS VIEW ENTREPRENEURSHIP

Among the interviewed recruiters, a few explicitly address the importance of creativity, innovation and entrepreneurship. Firstly, this indicates that this is not a primary concern with regard to hiring PhDs. As seen in the previous chapters (in particular 3.3 and 5.6), subject matter expertise and method competencies matter in particular. Secondarily, personal competencies such as individuality and social competence matter. **What characterizes those recruiters who address creativity and innovation is that they discern it as an independent competence from the other ones**, e.g.:

> **Recruiter, private company:** It's a plus that they have a specific professionalism and if they're keen on collaboration with clients. However, it's always a matter of balancing how far you dig into the substance in every process. That's the risk with PhDs. But I also see that there's a creativity part, and I think it's pretty well developed in the PhD education. We can make use it, if we do it properly.

As the recruiter here says, it is also demanding for the company to gain value from the creativity of the graduate. The first priority is to find the right balance between e.g. customer contact (social competencies) and digging into the details of a project (subject matter expertise). Secondarily, they can think of how to make the most of the ideas and innovations that the PhD brings along. Others explicitly separate the creativity and innovative competencies of graduates from their PhD, and one hypothesis may be that some recruiters indirectly imply that doing a PhD is somehow in opposition to being creative.

> **Recruiter, private company:** I'd say it this way. I did not pick him because of his PhD. But because he had a great creativity in his approach to solutions.

Those statements point to the fact that innovative competencies are not only something that needs to be cultivated during the PhD, but perhaps also **something that recruiters need to see the potential of and make use of, in case the PhD and DTU's PhD programmes have such aspirations**.

10. METHOD

10.1 QUANTITATIVE INTERVIEWS WITH GRADUATES

The quantitative survey among graduates was conducted in the period from 29 November 2018 to 27 January 2019. Initially—to the extent that a valid email address was available—the graduates received an email with an invitation and information about the survey, providing a unique link to a web-based questionnaire. If a valid email address was not available for a graduate, a letter of invitation was sent out by digital post.

During the survey period, the graduates who had received an invitation by email, but had not yet answered the questionnaire, received a further three reminder emails and a letter of invitation by digital post. After enrichment with telephone numbers on the basis of names and postal addresses, a telephone reminder was also implemented. During the entire survey period, the graduates were able to contact Epinion by telephone or email. Altogether, 458 graduates took part, which resulted in a total response rate of 41%.

Questionnaire
The questionnaire used for this survey is identical to that used for the 2015 report. Only slight changes were made to clarify the language in the existing questions, and a few questions were added with specific attention to entrepreneurship and innovation (reported in chapter 9). Regarding the development of the original survey, the following method was used for development and quality assurance. It has not been considered necessary to take any further steps to assure quality. From the 2015 report process:

> "DTU was responsible for drawing up the relevant questionnaire. After a joint working meeting, a few adjustments were made to the questions and answer categories based on Epinion's comments and recommendations. DTU translated the final questionnaire in order to enable the graduates to select their preferred language. The questionnaire was subsequently converted to a web-based setup using Epinion's SPSS-Dimension/IBM-platform, and the project manager in charge finally carried out a thorough manual quality check of the conversion. DTU also took part in the manual quality check of the conversion via a test link.

> As additional quality assurance, Epinion carried out a pilot test involving nine graduates. Immediately after they had completed the questionnaire, the consultant in charge called the pilot participants and asked them about their experience with answering the questionnaire. The aim of the pilot test was to ensure that the questionnaire was unambiguous and that there were no difficulties in understanding the way individual items were formulated—such as the competencies which graduates were asked to give opinions of in the questionnaire. Based on the results of the questionnaire, a short memo was prepared, which gave rise to a few adjustments in the final questionnaire."

Obtainment and participant basis for mailing

After entering into a written contract for processing the data, DTU delivered a population extract to Epinion. The population extract included information on all graduates from DTU's PhD programme in the years 2015 to 2017. Besides details consisting of names, addresses, sex, nationality, department and type of study, the population extract also included contact details in the form of email addresses and postal addresses to the extent that these were accessible. Since the survey was conducted as a population survey, the population extract served at the same time as the participant basis for sending out the survey. An overview of the participant basis for mailing used in the survey, the form of contact and the obtainment are shown in Table 1 below.

Table 2.   Overview of basis for mailing, including contact form and obtainment

Form of contact	Population	Obtainment	Obtainment (pct.)
Graduates invited via a valid email address	814	378	46
Graduates with no or invalid email address	292	80	27
Total	*1,106*	*458*	*41*
Graduates invited via digital post	801	80	10
Graduates who were not invited	8	0	0
Total, excluding graduates not invited and returned invitations	*1,098*	*458*	*42*

Source: Epinion for DTU—Graduate Survey, 2019

As can be seen from Table 2 above, DTU's population extract contained information about a total of 1,106 graduates. Out of these, 814 graduates appeared with valid email addresses. Those who had not responded to email invitations received a letter by digital post. There were 8 graduates for whom it was not possible to obtain valid contact information.

Full answers were obtained from 458 graduates in total. When obtainment is compared with the gross population, i.e. the total population of 1,106 graduates, the response rate obtained was 41%. If obtainment is compared with the net population, i.e. the total population excluding the 8 graduates who were not invited, the response rate obtained was 42%. Thus, regardless of whether the obtainment is compared with the gross or the net population, a satisfactory response rate was achieved compared to other surveys of the same nature.

Representativity and non-response analysis

A satisfactory response rate is not necessarily synonymous with satisfactory data quality. Even when an unusually high response rate can be assumed, systematic differences may arise between the population and the data obtained, which affects the representativity of the survey. In other words, if one sub-population is over-represented at the expense of others, the answers from the over-represented population may have a disproportionate effect on the results of the survey.

For example, the graduates from one year might be over-represented at the expense of graduates from other years, which—assuming there were systematic differences between the over-represented year and the other years—would have a disproportionate effect on the result of the survey. Besides the years of graduation, it would be reasonable to test the representativity for background characteristics such as gender, selection of programme, type of study, year of graduation and nationality. An overview of the differences between the population and the data obtained in relation to these particular characteristics is given in Table 3 below.

Table 3. **Summary of population and obtainment**

Background characteristics	Population	Population (pct.)	Obtainment	Obtainment (pct.)	Difference (percentage points)
Gender					
Man	742	67	288	68	1
Woman	364	33	138	32	-1
Total	*1,106*	*100*	*426*	*100*	*0*
PhD graduation year					
2015	356	32	149	35	3
2016	399	36	140	33	-3
2017	351	32	137	32	0
Total	*1,106*	*100*	*426*	*100*	*0*
Programme selection					
Mathematics, Physics and Informatics	167	15	76	18	3
Chemistry, Biotechnology and Chemical Engineering	272	25	91	22	-3
Electronics and Communications	252	23	94	22	-1
Construction, Management Engineering, Mechanical Engineering and Wind Energy	246	22	100	24	2
Life Science	160	15	62	15	-1
Total	*1,097*	*100*	*423*	*100*	*0*
Type of study					
Industrial PhD	90	8	35	8	0
Other	1,016	92	391	92	0
Total	*1,106*	*100*	*426*	*100*	*0*
Nationality					
Danish	505	46	236	55	9
Other	601	54	190	45	-9
Total	*1,106*	*100*	*426*	*100*	*0*

Source: Epinion for DTU—Graduate Survey, 2019

As can be seen from Table 3 above, there is generally good correlation between the percentages in the population and the 2019 data obtained. When background characteristics such as *gender* and *type of study* are examined, the differences are limited to between one and two percentage points, which is highly satisfactory. In relation to the background characteristic *PhD graduation date,* a slight overrepresentation of graduates from 2015 appears at the expense of graduates from 2016. Regarding 2017, there is perfect correlation. In relation to the background characteristic *Programme selection,* there is a slight overrepresentation of graduates from mathematics, physics and informatics, while there is a limited underrepresentation of graduates from Chemistry, biotechnology and chemical

engineering. At last, in relation to the background characteristic *nationality* there also appears to be an overrepresentation of Danish graduates at the expense of graduates of other nationalities, i.e. graduates from abroad. The differences between the proportions in the population and in the data obtained for the last three background characteristics mentioned must thus be kept in mind when reading the report. In the attached table-form report there are cross tabulations for all survey questions and, in particular, for the background characteristics *PhD graduation date* and *nationality*.

10.2 QUALITATIVE INTERVIEWS WITH RECRUITING COMPANIES

Purpose and process

To contrast and compare the results from the survey among graduates, Epinion carried out 30 qualitative in-depth interviews with those responsible for recruitment of PhD graduates from DTU or the day-to-day managers of the PhD graduates employed at relevant recruiting companies. The qualitative in-depth interviews contribute to the insight into how and to what extent the PhD programme at DTU lives up to the recruiting companies' requirements for competencies and expectations of PhDs.

In the proposal, 50 interviews were suggested, however, as the interviews were undertaken and transcribed, the point of saturation was reached at about 20 interviews. This meant that by interview number 30 no additional points or views on the questions of particular qualitative interest were reached. This is partly because there is a relatively high degree of consensus among recruiters in their view upon and experience with PhDs, and partly because the answers from recruiters to a large extent mirrored the findings and statements from the 44 interviews carried out for the 2015 report.

The qualitative in-depth interviews with the recruiting companies were held in the period from 1 December 2018 to 7 February 2019. The interviews were in the form of telephone interviews, with the qualitative consultant writing down interview notes simultaneously, while dictaphone recordings of the interviews were taken. At the end of each interview, the qualitative consultant wrote out the interview notes, with clarifying points and any details only written in note form during the interview, and with the sound recording as support. The sound files were treated as confidential and deleted after the report was delivered.

Content covered in the interviews

The interview guide used for the interview was similar to the one used for the 2015 report, with only minor changes with regard to language. See previous report for details on how the interview guide was developed.

Recruiting companies were specifically asked about their motives for hiring PhD candidates, focusing on which specific competencies recruiting companies are looking for. Next, we examined the recruiting companies' view of the competencies of PhD graduates from DTU, investigating specifically which relevant engineering or research competencies or which more general or personal competencies (e.g. project management, ability to collaborate etc.) the PhD graduates possess and which they lack.

The qualitative in-depth interviews were carried out as semi-structured interviews and covered questions of factual matter, such as company size, type of industry etc. From here, the interview guide went on to cover four themes. The fist theme covered was the demand for competencies experienced in the company with questions about prioritizing between engineer-specific competencies and general and personal competencies. After scrutinizing the demand, the interviewee was questioned about the relation between their demand for competencies and the supply they experience, with particular focus on PhDs. Thirdly, the interview guide dwelled on the PhDs' transition from academia to the labour market. Lastly, the guide covered the recruiters' experience with and view upon the differences between hiring PhDs straight from DTU and master graduates with three years of experience from the labour market.

Recruitment of interviewees

The interviewees were either responsible for recruitment or they were day-to-day managers. Thus, those interviewed were knowledgeable both about the strategies and needs of the company and had first-hand experience with managing PhDs in their daily work. The recruitment was undertaken through two strategies. Firstly, DTU handed over a list of relevant companies which were contacted. Secondly, in the survey, graduate respondents were given the option to enter contact details for their manager or superior. The majority of interviewees were recruited through the second option.

The selection of recruiting companies targeted both large and small companies in relevant sectors. In the 2015 report, university personnel were also included in the recruiter interviews, however they did not contribute with much knowledge that DTU did not know beforehand and hence they were excluded for this report. Below is the distribution of interviewees across sectors and company sizes. The sector of each company is made upon qualitative interpretation of their description of the company in the interviews.

Table 1 Distribution of recruiter interviews across company sizes

Company size	Number of interviews
Medium- sized (< 250)	21
Small (< 50)	5
Micro (< 10)	4

Table 2 Distribution of recruiter interviews across sectors

Sector	Number of interviews
Production company (including production in the chemical and biotech areas)	7
Liberal, scientific and technical services	9
Electricity, energy, gas and district heating	8

| Building and construction companies | 3 |
| Other sectors | 3 |

10.3 QUALITATIVE INTERVIEWS WITH GRADUATES

Purpose and process

In addition to the survey data, qualitative in-depth telephone interviews were also done with 20 PhD graduates from the period 2015-2017. Those interviews are a new contribution compared to the 2015 report. The purpose of the interviews was to get deeper insight into the career paths of graduates, with particular attention to how they experienced the journey themselves, what has been experienced as successful and where would they like to have had better support. The interviews have also served as a backdrop for comparison for the statements of the recruiters in terms of how the transition is experienced from academia to labour market and what competencies are relevant and useful in their new professional context.

Content covered in the interviews

The interview guide used for the interviews with PhD graduates took its point of departure in a time-line principle (past-present-future) and was semi-structured. This means that the consultant conducting the interviews had a series of topics and questions to be covered, but that the guide did not have to be followed strictly. However, most of the interviews progressed as the guide suggested.

Firstly, the graduates were asked about the past, particularly their time as PhD students, what ideas and expectations they had about their career at that time and what they, retrospectively, would like to have done differently, or what DTU could have done. Secondly, they were asked about how they experienced the end of their PhD studies with regard to expectations and efforts concerning future jobs. Thirdly, they were asked about their first job, the competencies they use from their PhD studies and how it has been different from academia. Lastly, ideas about future work were discussed, and it was asked to which extent their visions relate to the topic of their PhD and the competencies gained through their studies.

Recruitment of interviewees

The 20 graduates interviewed were recruited through the survey, where they had the option to add contact details. The interviews were conducted simultaneously with the survey data collection from December 2018 to January 2019. The criteria for participation were not defined in terms of sectors and company sizes, but rather that the participants were willing to voluntarily speak about their career paths, experiences and reflections. That said, among the graduates interviewed were representatives from all sectors and company sizes.

APPENDIX 1: QUESTIONNAIRE – GRADUATE SURVEY

The PhD graduates could choose between a Danish and an English version of the questionnaire, below is the English version. The new questions added compared to the 2015-survey are marked by "_new" after the Q-(question) number, e.g. "Q20_new".

[Intro, Info]
Thank you for participating in this survey of DTU graduates. This will take about 20 minutes.

The survey questions concern the thoughts you had about employment while you were doing your PhD studies and your subsequent employment situation. The last questions in the survey focus on your opinions about the competencies you acquired during your PhD studies.

The results of the survey will comprise an important part of the task of developing the PhD programmes at DTU, and your participation is therefore very important to us.

Your responses will be treated confidentially, and you have the right to withdraw your consent at any time. In that case we will delete your informations if they are not already anonymized.

If you want to know more about your rights, please visit our web page: http://insights.epinionglobal.com/privacy-policies. If you have questions about the survey, please send an e-mail to Astrid Marie Olsen DTU@epinion.dk. You can always contact Epinions data protection advisor at dpo@epinionglobal.com or call 87 30 95 00.

Click 'Next' to begin the survey.

Best regards,
DTU and Epinion

[Q1_intro, Info]
The questions in this section focus on your thoughts on future employment during your PhD studies and immediately after graduation.

[Q1, Grid, Row, Normal, EXPANDED, Must Answer]
To what degree did you consider which job or jobs your PhD education would lead to at the following point in time?

		(_2) To some degree	(_3) To a lesser degree	(_4) Not at all	(_5) Do not know or do not remember

	(_1) To a high degree				
(_1) Before I started my PhD studies	○	○	○	○	○
(_2) During the PhD studies	○	○	○	○	○
(_3) Right before I submitted my PhD thesis	○	○	○	○	○
(_4) Right after I submitted my PhD thesis	○	○	○	○	○

[#9] If Q1._1.resp.ContainsAny("_1.._3") OR Q1._2.resp.ContainsAny("_1.._3")
[Q1_2, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
To what degree did your future employment considerations influence your choice of courses during your PhD studies?

o   (_1) To a high degree
o   (_2) To some degree
o   (_3) To a lesser degree
o   (_4) Not at all
o   (_5) Do not know or do not remember

[Q1_3, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
To what degree did your future employment considerations influence how you otherwise organized your PhD studies?

o   (_1) To a high degree
o   (_2) To some degree
o   (_3) To a lesser degree
o   (_4) Not at all
o   (_5) Do not know or do not remember

[#9] End If
[Q2, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
When did you begin actively seeking employment?

o   (_1) Before I submitted my PhD thesis

- o (_2) After I submitted my PhD thesis but before the PhD defence
- o (_3) Less than 1 month after my successful defence
- o (_4) 1–3 months after my successful defence
- o (_5) More than 3 months after my successful defence
- o (_6) I was headhunted without actively seeking employment first
- o (_7) I became self-employed with my own company without actively seeking employ-
     ment first
- o (_8) I began a new education programme without actively seeking employment first
- o (_9) I have not yet actively sought employment
- o (_10) Do not know or do not remember

[#11] If Q2 = {_9}

[Q2_1, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Why have you not yet actively sought employment?

- o (_1) State the reason:<Open Textbox>
- o (_2) Do not know or do not want to answer

[#11] End If

[Q3, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Which of the following best describes your current employment situation?

Notice: In case of maternity or sick leave, please choose the option that best described your employment situation before the leave.

- o (_1) I am employed (including part-time jobs, jobs with public salary subsidies and
     the like)
- o (_2) I am self-employed with my own company
- o (_3) I am unemployed
- o (_4) I am enrolled in a new education programme

[#13] If Q3 = {_1}

[Q3_1, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

How many jobs did you have after you completed your PhD studies but before you started your present job?

- o (_1) 0 (I have only had my present job)
- o (_2) 1
- o (_3) 2
- o (_4) 3
- o (_5) 4 or more

[#13] ElseIf Q3 = {_2}

[Q3_2, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

How many jobs have you had after you completed your PhD studies but before you started being self-employed with your own company?

- o (_1) 0 (My only employment has been my present self-employment with my own company)
- o (_2) 1
- o (_3) 2
- o (_4) 3
- o (_5) 4 or more

[#13] ElseIf Q3 = {_3}

[Q3_3, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

How many jobs have you had since you completed your PhD studies?

- o (_1) 0
- o (_2) 1
- o (_3) 2
- o (_4) 3
- o (_5) 4 or more

[#13] Else

[Q3_4, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

How many jobs have you had after you completed your PhD studies but before you started a new education programme?

- o (_1) 0
- o (_2) 1
- o (_3) 2
- o (_4) 3
- o (_5) 4 or more

[#13] End If
[#14] If Q3 = {_1} OR Q3_2.ContainsAny("_2.._5") OR Q3_3.ContainsAny("_2.._5") OR Q3_4.ContainsAny("_2.._5")

[Q4_intro, Info]

The next questions focus on your first job after submitting your PhD thesis.

[Q4, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

How much time elapsed between the time you submitted your thesis until you were hired for your first job (that is, signed an employment contract)?

- o (_1) I was hired before I submitted my PhD thesis

o (_2) I was hired after I submitted my PhD thesis but before the PhD defence
o (_3) I was hired less than 1 month after my successful defence
o (_4) I was hired 1–3 months after my successful defence
o (_5) I was hired 4–6 months after my successful defence
o (_6) I was hired 7–12 months after my successful defence
o (_7) I was hired more than 12 months after my successful defence
o (_8) Do not know or do not remember

[Q12, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

How many jobs did you apply for from the time when you submitted your PhD thesis until you were hired for your first job?

o (_1) 0 (I was hired without formally applying)
o (_2) 1–5
o (_3) 6–15
o (_4) 16–30
o (_5) More than 30
o (_6) Do not know or do not remember

[Q4_1, Grid, Row, Normal, EXPANDED, Must Answer]

How important were the following factors for in connection with you being hired for your first job?

	(_1) Very impor-tant	(_2) Some-what im-portant	(_3) Slightly important	(_4) Not impor-tant	(_5) Do not know
(_1) My general PhD competencies	○	○	○	○	○
(_2) My competencies specific to my PhD field	○	○	○	○	○
(_3) My personal network (family, friends etc.)	○	○	○	○	○
(_4) My professional network (su-pervisors, company contacts through the PhD programme etc.)	○	○	○	○	○
(_5) Experience from research pro-jects in collaboration with a com-pany	○	○	○	○	○

(_7) Previous relevant job experience (after receiving the MSc degree)	○	○	○	○	○
(_8) The reputation of my PhD education or DTU	○	○	○	○	○

[Q4_2, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

How many years of relevant job experience (after you received your MSc degree) did you have when you began your PhD studies?

o   (_1) None
o   (_2) Less than 1 year
o   (_3) 1–2 years
o   (_4) 3–4 years
o   (_5) 5 years or more
o   (_6) Do not know or do not remember

[#14].[#5] If Q2 <> {_6}

[Q5_, Categorical/Multiple, Normal, Min:1, Max:8, Must Answer]

How did you get your first job? (Check all the answers that apply)

☐   (_1) By applying for an advertised job
☐   (_2) Through my personal network (family, friends etc.)
☐   (_3) Through my professional network (supervisors, company contacts through my PhD studies etc.)
☐   (_4) Through a research project in collaboration with a company
☐   (_5) I was headhunted
☐   (_6) Through an uninvited application to an employer
☐   (_7) Through active public labour market measures (job with public salary subsidies, internship etc.)
☐   (_8) Other, please describe:<Open Textbox>
☐   (_9) Do not know or do not remember<Exclusive>

[#14].[#5] End If

[Q6, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Where were you employed in your first job?

o   (_1) I was employed in the private sector
o   (_2) I was employed in the public sector
o   (_3) I was employed as a postdoctoral fellow, researcher or assistant professor at DTU

o   (_4) I was employed as a postdoctoral fellow, researcher or assistant professor at an-
other institution than DTU

o   (_5) Other, please describe:<Open Textbox>

[#14].[#7] If Q6.ContainsAny({_1,_2,_4,_5})

[Q7, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Where was your fixed workplace in your first job?

o   (_1) Denmark

o   (_2) Other country, please state which:<Open Textbox>

[#14].[#7].[#2] If Q7 = {_1}

[Q7_1, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

In which administrative region in Denmark was the fixed workplace of your first job lo-
cated?

o   (_1) Region Hovedstaden

o   (_2) Region Sjælland

o   (_3) Region Midtjylland

o   (_4) Region Syddanmark

o   (_5) Region Nordjylland

[#14].[#7].[#2] Else

[Q7_2, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

What factors were important for you in choosing to work outside Denmark?

o   (_1) Please state:<Open Textbox>

o   (_2) Do not know or do not remember

[#14].[#7].[#2] End If

[Q8_, Categorical/Multiple, Normal, Min:1, Max:2, Must Answer]

Which company, institution or organization employed you?

☐   (_1) Please state the name of the company:<Open Textbox>

☐   (_2) If relevant, please state the department (e.g. R&D, production or similar):<Open
Textbox>

☐   (_3) Do not want to answer<Exclusive>

[Q8_1, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Did you on a daily basis work together with collegaes who also have a PhD degree?

o   (_1) Yes, in every or almost every work procedures

o   (_2) Yes, in some work procedures
o   (_3) Yes, in a few work procedures
o   (_4) No
o   (_5) I do not know

[Q9, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
How many employees does the company, institution or organization have worldwide?

o   (_1) 1–9
o   (_2) 10–49
o   (_3) 50–199
o   (_4) 200–500
o   (_5) 501–1000
o   (_6) 1001–5000
o   (_7) More than 5000
o   (_8) Do not know or do not remember

[#14].[#7] End If
[Q10, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
In which economic sector was your first job? Please select the economic sector from the list in which your workplace primarily operates. The sectors are defined based on the Danish Industrial Classification used by Statistics Denmark.

o   (_1) Administrative and support service activities
o   (_2) Construction
o   (_3) Electricity, gas, steam etc.
o   (_4) Activities of extraterritorial organizations and bodies
o   (_5) Wholesale and retail trade; repair of motor vehicles and motorcycles
o   (_6) Manufacturing (including manufacturing within chemical or biotechnological industry)
o   (_7) Information and communication
o   (_8) Arts, entertainment and recreation activities
o   (_9) Agriculture, forestry and fishery
o   (_10) Knowledge-based services
o   (_11) Public administration, defence and compulsory social security
o   (_12) Financial and insurance
o   (_13) Consultancy etc.
o   (_14) Mining and quarrying
o   (_15) Human health and social work
o   (_16) Transportation
o   (_17) Education
o   (_18) University or research institution
o   (_19) Water supply, sewerage, waste management and cleaning of soil and subsoil water
o   (_20) Other service activities

o   (_21) Other, please state:<Open Textbox>

[Q11_, Categorical/Multiple, Normal, Min:1, Max:20, Must Answer]
Which work tasks did you carry out in your job? (Check all that apply)

- ☐   (_1) Tasks specifically related to the PhD programme (such as food quality and safety, construction etc.)
- ☐   (_2) Administration (including accounting and secretariat functions)
- ☐   (_3) Data analysis
- ☐   (_4) Documentation
- ☐   (_5) Research
- ☐   (_6) Human resources
- ☐   (_7) Information
- ☐   (_8) Information technology tasks
- ☐   (_9) Chemical analysis
- ☐   (_10) Management or organization
- ☐   (_11) Middle or executive management
- ☐   (_12) Planning
- ☐   (_13) Production
- ☐   (_14) Product development or innovation
- ☐   (_15) Project management
- ☐   (_16) Consultancy
- ☐   (_17) Sales, marketing or advertising
- ☐   (_18) Service (including customer service)
- ☐   (_19) Teaching
- ☐   (_20) Other, please state:<Open Textbox>

[Q13, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
In your first job, did you work with colleagues who had a master-level degree followed by 3 years of relevant job experience?

o   (_1) Yes
o   (_2) No
o   (_3) Do not know or do not remember

[#14].[#11] If Q13 = {_1}
[Q13_1, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
Did you think that you had acquired relevant competencies through your PhD studies that your colleagues who had a master-level degree followed by 3 years of relevant job experience did not have?

o   (_1) Yes, please state which:<Open Textbox>
o   (_2) No
o   (_3) Do not know or do not remember

[#14].[#11] End If
[Q14, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
Did your first job require a PhD degree to carry out the work?

o   (_1) Yes, a PhD degree was required to carry out the work
o   (_2) No, it could also have been carried out by a person with a master-level degree followed by 3 years of relevant job experience
o   (_3) No, it could also have been carried out by a person who recently graduated with a master-level degree and no relevant job experience
o   (_4) Do not know or do not remember

[Q15, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
To what degree were your PhD education and your first job related professionally?

o   (_1) To a high degree
o   (_2) To some degree
o   (_3) To a lesser degree
o   (_4) Not at all
o   (_5) Do not know or do not remember

[#14].[#14] If Q15 = {_4}
[Q15_1, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
Did you consciously choose your first job because the job and your PhD education were unrelated professionally?

o   (_1) Yes
o   (_2) No
o   (_3) Do not know or do not remember

[#14].[#14] End If
[#14] End If
[Q16, Grid, Row, Randomize, EXPANDED, Must Answer]
To what degree are the following qualities important in a good job?

	(_1) Very important	(_2) Somewhat important	(_3) Slightly important	(_4) Not important	(_5) Do not know
(_1) Close to my home	○	○	○	○	○
(_2) Great job security (long-term employment)	○	○	○	○	○

(_3) An international environment	◯	◯	◯	◯	◯
(_4) Job-related travel	◯	◯	◯	◯	◯
(_5) Relevant to my education	◯	◯	◯	◯	◯
(_6) The sector is relevant to my research	◯	◯	◯	◯	◯
(_7) Relevant to my further career	◯	◯	◯	◯	◯
(_8) High professional standards among colleagues	◯	◯	◯	◯	◯
(_9) Good research facilities	◯	◯	◯	◯	◯
(_10) Professional challenges	◯	◯	◯	◯	◯
(_11) I can influence decision-making processes	◯	◯	◯	◯	◯
(_12) Human resource management	◯	◯	◯	◯	◯
(_13) High degree of responsibility	◯	◯	◯	◯	◯
(_14) High salary	◯	◯	◯	◯	◯
(_15) A good mental working environment	◯	◯	◯	◯	◯
(_16) Good human resource policies	◯	◯	◯	◯	◯
(_18) Good Work/Life balance	◯	◯	◯	◯	◯
(_17) Opportunities for continuing education	◯	◯	◯	◯	◯

[Q16_1, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
Are there any other qualities you consider important in a good job?

o   (_1) Yes, please state:<Open Textbox>
o   (_2) No

[#17] If Q3_1.ContainsAny("_2.._5") OR Q3_2.ContainsAny("_3.._5") OR Q3_3.ContainsAny("_3.._5") OR Q3_4.ContainsAny("_3.._5")
[Q17_intro, Info]
The next questions focus on your current job, if you are employed. If you are unemployed, in an educational programme or self-employed with your own company, we ask you to answer based on your most recent job.

[Q17, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
Where are you employed in your current job?

o   (_1) I am employed in the private sector
o   (_2) I am employed in the public sector
o   (_3) I am employed as a postdoctoral fellow, researcher or assistant professor at DTU
o   (_4) I am employed as a postdoctoral fellow, researcher or assistant professor at another institution than DTU
o   (_5) Other, please describe:<Open Textbox>

[#17].[#2] If Q17.ContainsAny({_1,_2,_4,_5})
[Q19, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
Where is your fixed workplace?

o   (_1) Denmark
o   (_2) Other country, please state which: <Open Textbox>

[#17].[#2].[#2] If Q19 = {_1}
[Q19_1, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
In which administrative region in Denmark is the fixed workplace of your job located?

o   (_1) Region Hovedstaden
o   (_2) Region Sjælland
o   (_3) Region Midtjylland
o   (_4) Region Syddanmark
o   (_5) Region Nordjylland

[#17].[#2].[#2] Else

[Q19_2, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

What factors were important for you in choosing to work outside Denmark?

- o (_1) Please state:<Open Textbox>
- o (_2) Do not want to answer

[#17].[#2].[#2] End If

[Q20_new, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Which company, institution or organization are you currently employed by?

- o (_1) Please state the name of the company:<Open Textbox>
- o (_2) If relevant, please state the department (e.g. R&D, production or similar):<Open Textbox>
- o (_3) Do not want to answer

[Q20_new1, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Do you on a daily basis work together with colleagues who also have a PhD degree?

- o (_1) Yes, in every or almost every work procedure
- o (_2) Yes, in some work procedures
- o (_3) Yes, in a few work procedures
- o (_4) No
- o (_5) I don't know

[Q21, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

How many employees does the company, institution or organization have worldwide?

- o (_1) 1–9
- o (_2) 10–49
- o (_3) 50–199
- o (_4) 200–500
- o (_5) 501–1000
- o (_6) 1001–5000
- o (_7) More than 5000
- o (_8) Do not know or do not remember

[#17].[#2] End If

[Q22, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

In which economic sector are you employed? Please select the economic sector from the list in which your workplace primarily operates. The sectors are defined based on the Danish Industrial Classification used by Statistics Denmark.

- o (_1) Administrative and support service activities

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o   (_2) Construction
o   (_3) Electricity, gas, steam etc.
o   (_4) Activities of extraterritorial organizations and bodies
o   (_5) Wholesale and retail trade; repair of motor vehicles and motorcycles
o   (_6) Manufacturing (including manufacturing within chemical or biotechnological in-
      dustry)
o   (_7) Information and communication
o   (_8) Arts, entertainment and recreation activities
o   (_9) Agriculture, forestry and fishery
o   (_10) Knowledge-based services
o   (_11) Public administration, defence and compulsory social security
o   (_12) Financial and insurance
o   (_13) Consultancy etc.
o   (_14) Mining and quarrying
o   (_15) Human health and social work
o   (_16) Transportation
o   (_17) Education
o   (_18) University or research institution
o   (_19) Water supply, sewerage, waste management and cleaning of soil and subsoil
      water
o   (_20) Other service activities
o   (_21) Other, please state:<Open Textbox>

[Q23_, Categorical/Multiple, Normal, Min:1, Max:20, Must Answer]
Which work tasks do you carry out in the workplace? (Check all that apply)

☐   (_1) Tasks specifically related to your PhD studies (such as food quality and safety,
      construction etc.)
☐   (_2) Administration (including accounting and secretariat functions)
☐   (_3) Data analysis
☐   (_4) Documentation
☐   (_5) Research
☐   (_6) Human resources
☐   (_7) Information
☐   (_8) Information technology tasks
☐   (_9) Chemical analysis
☐   (_10) Management or organization
☐   (_11) Middle or executive management
☐   (_12) Planning
☐   (_13) Production
☐   (_14) Product development or innovation
☐   (_15) Project management
☐   (_16) Consultancy
☐   (_17) Sales, marketing or advertising
☐   (_18) Service (including customer service)
☐   (_19) Teaching

☐ (_20) Other, please state:<Open Textbox>

[#17] End If

[Q25_intro, Info]

For the following questions, please assess, based on your PhD education, various professional competencies based on two parameters:

- Whether you acquired the competencies during your PhD studies at DTU; and

- Whether the competencies have been relevant in your career so far.

Some questions are related to competencies related to research and some are related to your other competencies.

[Q25_1, Grid, Row, Normal, EXPANDED, Must Answer]

Do you think that you have acquired the following competencies during your PhD studies?

	(_1) To a high degree	(_2) To some degree	(_3) To a lesser degree	(_4) Not at all	(_5) Do not know or do not remember
(_1) Ability to acquire knowledge at the highest international level within your research field	○	○	○	○	○
(_2) Ability to contribute to developing new knowledge within your research field based on scientific studies	○	○	○	○	○
(_3) Ability to master the scientific methods related to research and development tasks within your research field	○	○	○	○	○
(_4) Ability to analyse and evaluate new ideas within your research field	○	○	○	○	○
(_5) Ability to design and develop new techniques within your research field	○	○	○	○	○

[Q25_2, Grid, Row, Normal, EXPANDED, Must Answer]
Do you think that the following competencies have been relevant in your career so far?

	(_1) To a high degree	(_2) To some degree	(_3) To a lesser degree	(_4) Not at all	(_5) Do not know or do not remember
(_1) Ability to acquire knowledge at the highest international level within your research field	○	○	○	○	○
(_2) Ability to contribute to developing new knowledge within your research field based on scientific studies	○	○	○	○	○
(_3) Ability to master the scientific methods related to research and development tasks within your research field	○	○	○	○	○
(_4) Ability to analyse and evaluate new ideas within your research field	○	○	○	○	○
(_5) Ability to design and develop new techniques within your research field	○	○	○	○	○

[Q26_1, Grid, Row, Normal, EXPANDED, Must Answer]
Do you think that you have acquired the following competencies during your PhD studies?

	(_1) To a high degree	(_2) To some degree	(_3) To a lesser degree	(_4) Not at all	(_5) Do not know or do not remember
(_1) Ability to participate in the international discussions in your field	○	○	○	○	○
(_2) Ability to disseminate scientific news and progress orally to a broad audience	○	○	○	○	○

(_3) Ability to disseminate research results in writing	○	○	○	○	○
(_4) Ability to organize research projects with limited scope and duration	○	○	○	○	○
(_5) Ability to manage research projects with limited scope and duration	○	○	○	○	○
(_6) Ability to initiate collaboration with companies and other research institutions to produce new knowledge	○	○	○	○	○
(_7) Ability to create growth and employment in Denmark's private sector through research, development and innovation	○	○	○	○	○

[Q26_2, Grid, Row, Normal, EXPANDED, Must Answer]

Do you think that the following competencies have been relevant in your career so far?

	(_1) To a high degree	(_2) To some degree	(_3) To a lesser degree	(_4) Not at all	(_5) Do not know or do not remember
(_1) Ability to participate in the international discussions in your field	○	○	○	○	○
(_2) Ability to disseminate scientific news and progress orally to a broad audience	○	○	○	○	○
(_3) Ability to disseminate research results in writing	○	○	○	○	○
(_4) Ability to organize research projects with limited scope and duration	○	○	○	○	○
(_5) Ability to manage research projects with limited scope and duration	○	○	○	○	○
(_6) Ability to initiate collaboration with companies and other research institutions to produce new knowledge	○	○	○	○	○

(_7) Ability to create growth and employment in Denmark's private sector through research, development and innovation	○	○	○	○	○

[Q27, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Are there any types of knowledge or competencies you did not acquire during your PhD studies that should have been included?

- o (_1) Yes, please state which:<Open Textbox>
- o (_2) No

[Q28, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Are there any types of knowledge or competencies you acquired during your PhD studies that have been irrelevant in your career so far?

- o (_1) Yes, please state which:<Open Textbox>
- o (_2) No

[qcoach, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Did you receive career coaching related to the completion of your PhD education?

- o (_1) Yes, at DTU
- o (_2) Yes, but outside DTU
- o (_3) No

[PAINEN_1, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

During your PhD studies, did you develop any technologies, software or the like that have been patented?

- o (_1) Yes
- o (_2) No

[PAINEN_4, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Did you collaborate with industry on your PhD project?

- o (_1) Yes
- o (_2) No

[PAINEN_5, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

During your PhD studies, did you take the initiative to improve your knowledge on innovation and entrepreneurship in general, or on how you could start your own company based on your research and your professional knowledge?

o (_1) To a high degree
o (_2) To some degree
o (_3) To a lesser degree
o (_4) Not at all
o (_5) Do not know or do not remember

[PAINEN_5_1, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Did you experience that DTU offered you knowledge regarding opportunities for starting up your own business during your PhD studies?

o (_1) Yes
o (_2) No

[#30] If PAINEN_5_1 = {_1}

[PAINEN_5_2_, Categorical/Multiple, Normal, Min:1, Max:4, Must Answer]

How did DTU offer you knowledge about the opportunities to start up your own business?

☐ (_1) At the department
☐ (_2) Elsewhere at DTU
☐ (_3) Skylab
☐ (_4) Elsewhere, please state:<Open Textbox>
☐ (_5) I do not know/do not remember<Exclusive>

[#30].[#1] If PAINEN_5_2_.ContainsAny("_1.._4")
          PAINEN_5_2_1_.Categories.Filter = PAINEN_5_2_ + {_5}

[PAINEN_5_2_1_, Categorical/Multiple, Normal, Min:1, Max:4, Must Answer]

Did you participate in any of the opportunities that DTU offered you?

☐ (_1) Yes, at the department
☐ (_2) Yes, elsewhere at DTU
☐ (_3) Yes, Skylab
☐ (_4) Yes, {#PAINEN_5_2_._4}
☐ (_5) No<Exclusive>

[#30].[#1].[#1] If PAINEN_5_2_1_.ContainsAny("_1.._4")

[PAINEN_5_3, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

To what degree did this increase your knowledge about innovation and entrepreneurship?

- o (_1) To a high degree
- o (_2) To some degree
- o (_3) To a lesser degree
- o (_4) Not at all
- o (_5) Do not know

[#30].[#1].[#1].[#1] If PAINEN_5_3.ContainsAny({_1,_2,_3})

PAINEN_5_4.Banners.AddNew("css","")

[PAINEN_5_4, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Please state how it increased your knowledge

- o (_1) <Open Textbox>

[#30].[#1].[#1].[#1] End If
[#30].[#1].[#1] End If
[#30].[#1] End If
[#30] End If

[Q29, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Did you study or carry out research at a university outside Denmark as part of your PhD studies?

- o (_1) Yes
- o (_2) No

[#32] If Q29.ContainsAny({_1})

[Q30, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Did you think that your research visit outside Denmark contributed to your professional development?

- o (_1) To a high degree
- o (_2) To some degree
- o (_3) To a lesser degree
- o (_4) Not at all
- o (_5) Do not know or do not remember

[Q31, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Did you think that your research visit outside Denmark contributed to your personal development?

- o (_1) To a high degree

o   (_2) To some degree
o   (_3) To a lesser degree
o   (_4) Not at all
o   (_5) Do not know or do not remember

[#32] End If
[Q32, Grid, Row, Normal, EXPANDED, Must Answer]
To what degree do you agree or disagree with the following statements?

	(_1) Strongly agree	(_2) Agree	(_3) Neither agree nor disagree	(_4) Disagree	(_5) Strongly disagree	(_6) Do not know
(_1) I have obtained experience in collaborating with people with a different cultural background than my own through my PhD studies at DTU	○	○	○	○	○	○
(_2) I have developed an international network through my PhD studies at DTU	○	○	○	○	○	○
(_3) I experienced DTU as an internationally oriented university in terms of the research environment	○	○	○	○	○	○

[#34] If Q3.ContainsAny({_1}) OR Q3_2.ContainsAny("_2.._5") OR Q3_3.ContainsAny("_2.._5") OR Q3_4.ContainsAny("_2.._5")
        Q33_.Validation.MinValue = 7
[BEGIN PAGE: pageQ33]
[Q33_, Categorical/Multiple, Normal, Min:1, Max:7, Must Answer]
Rank the importance of the following 7 (international) competencies in carrying out your current job (or your latest job if you do not have a job at the moment). 1 is the most important and 7 the least important and we will ask you to only use each number from 1-7 once:

☐   (_1) Verbal competencies in foreign languages
☐   (_2) Written competencies in foreign languages
☐   (_3) A global perspective – thinking not solely nationally
☐   (_4) Knowledge about international research
☐   (_5) Knowledge about international engineering
☐   (_6) Understanding foreign culture

☐ (_7) Ability to collaborate with colleagues from other countries
☐ (_8) Do not know<Exclusive>

[Q33_Order, Text, Min:0, Max:4000, Must Answer]

[END PAGE: **pageQ33**]
[#34] End If
[Q34, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
Other than any parental leave, did you take any leave during your PhD studies?

o (_1) Yes
o (_2) No
o (_3) Do not know or do not remember

[#36] If Q34 = {_1}
[Q35_, Categorical/Multiple, Normal, Min:1, Max:7, Must Answer]
Which type of leave did you take? (Check all that apply)

☐ (_1) Leave paid by DTU that was relevant to my PhD studies
☐ (_2) Leave paid by DTU that was not relevant to my PhD studies
☐ (_3) Leave not paid by DTU that was relevant to my PhD studies
☐ (_4) Leave paid by DTU that was not relevant to my PhD studies
☐ (_5) Paid internship at a company
☐ (_6) Unpaid internship at a company
☐ (_7) Studying at another university
☐ (_8) Do not know or do not remember<Exclusive>

[Q36, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
Did you acquire competencies during your leave that have been relevant in your career so far?

o (_1) Yes, please state which:<Open Textbox>
o (_2) No
o (_3) Do not know or do not remember

[#36] End If
[#37] If Q3.ContainsAny({_1}) OR Q3_2.ContainsAny("_2.._5") OR Q3_3.ContainsAny("_2.._5") OR Q3_4.ContainsAny("_2.._5")
[Q37, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
Do you think that your PhD studies overall prepared you to carry out your current job (or your latest job if you do not have a job at the moment)?

o   (_1) To a high degree
o   (_2) To some degree
o   (_3) To a lesser degree
o   (_4) Not at all
o   (_5) Do not know

[#37] End If

[Q39, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

When do you think that the competencies needed for job opportunities after graduation should begin to be clarified in the PhD programme?

o   (_1) In connection with the interview for the job as a PhD student
o   (_2) In connection with preparing the study plan (about 2 months after the PhD studies begins)
o   (_3) In connection with the first-year interview (1 year after the PhD studies begins)
o   (_4) One year before the deadline for submitting the thesis
o   (_5) Six months before the deadline for submitting the thesis
o   (_6) Continually
o   (_7) Never
o   (_8) Do not know

[Q40_, Categorical/Multiple, Normal, Min:1, Max:6, Must Answer]

How did you seek career guidance for yourself during your PhD studies (Check all that apply)

☐   (_1) I sought career guidance from my PhD supervisor
☐   (_2) I sought career guidance from DTU's Career Centre
☐   (_3) I sought career guidance from a coach
☐   (_4) I sought career guidance from my personal network
☐   (_5) I sought career guidance from my professional network
☐   (_6) I did not seek career guidance
☐   (_7) Other, please state where:<Exclusive><Open Textbox>
☐   (_8) Do not know or do not remember<Exclusive>

[q41_new_b, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Is there something that DTU could do better with regards to the PhD programmes, career guidance, etc.?

o   (_1) Yes, please state:<Open Textbox>
o   (_2) No, I have no comment on what DTU could do better

[q42_intro, Info]

The last questions are about your possible continuing education after having completed your PhD education.

[Q42, Categorical/Single, Normal, Min:1, Max:1, Must Answer]
Are you currently in or have you attended a continuing education programme after you graduated from your PhD education?

o   (_1) Yes
o   (_2) No

[#43] If Q42.ContainsAny({_1})
      Q42_1_.Categories.Order = OrderConstants.oCustom
      Q42_1_.Categories.Filter = {_1,_2,_3,_7,_4,_5,_6,_8}

[Q42_1_, Categorical/Multiple, Normal, Min:1, Max:8, Must Answer]
What continuing education programmes have you attended? (Check all that apply)

☐   (_1) One or more short courses, 0.5-1 days
☐   (_2) One or more courses, 2–3 days
☐   (_3) One or more courses, 4–5 days
☐   (_4) One or more courses, 6 days or more
☐   (_5) One or more e-learning courses
☐   (_6) A part-time MSc programme
☐   (_7) A part-time applied engineering programme
☐   (_8) Other, please state:<Open Textbox>

[Q42_2_, Categorical/Multiple, Normal, Min:1, Max:6, Must Answer]
Which provider of continuing education have you used for your continuing education pro-grammes or courses? (Check all that apply)

☐   (_1) DTU – Technical University of Denmark
☐   (_2) Another university in Denmark
☐   (_3) Another university outside Denmark
☐   (_4) A private provider
☐   (_5) An internal course in the company in which I am or was employed
☐   (_6) Other, please state:<Open Textbox>

[Q42_3_, Categorical/Multiple, Normal, Min:1, Max:6, Must Answer]
In which field have you taken your continuing education courses? (Check all that apply)

☐   (_1) My research field
☐   (_2) Project management
☐   (_3) Management (HR)
☐   (_4) Quality assurance

☐   (_5) A new research field
☐   (_6) Other, please state:<Open Textbox>

[#43] End If

[Q43, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

To what degree do you think that continuing education is important for you to maintain your value on the labour market?

o   (_1) To a high degree
o   (_2) To some degree
o   (_3) To a lesser degree
o   (_4) Not at all
o   (_5) Do not know

[#45] If Q43.ContainsAny({_1,_2})

[Q43_1_, Categorical/Multiple, Randomize, Min:1, Max:6, Must Answer]

Why do you think that continuing education is important for you to maintain your value on the labour market? (Check all that apply)

☐   (_1) I obtain greater security in employment when I have updated knowledge in my professional field
☐   (_2) I can more easily seek new opportunities if I have the newest and thereby best qualifications
☐   (_3) I do not get surpassed by the new graduates, who have the latest theoretical knowledge
☐   (_4) My opportunities to link the experience I have from work to new knowledge give me greater professional flexibility
☐   (_5) I develop a new professional network on which I can draw in many different contexts
☐   (_6) It gives me better opportunities to be promoted to another position, such as a managerial position
☐   (_7) Other, please state:<Exclusive><Fixed><Open Textbox>

[#45] End If

[Q44, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

To what degree do you think that profession-specific continuing education is important for you to maintain your value on the labour market?

o   (_1) To a high degree
o   (_2) To some degree
o   (_3) To a lesser degree
o   (_4) Not at all
o   (_5) Do not know

[#47] If Q44.ContainsAny({_1,_2})

[Q44_1_, Categorical/Multiple, Normal, Min:1, Max:5, Must Answer]

Why do you think that profession-specific continuing education is important for you to maintain your value on the labour market? (Check all that apply)

- ☐ (_1) It will make me secure in my current job
- ☐ (_2) It may contribute to obtaining new or more interesting assignments
- ☐ (_3) It may contribute to obtaining a new job
- ☐ (_4) It may contribute to obtaining a new professional network
- ☐ (_5) Other, please state:<Open Textbox>

[#47] End If
[#48] If Q43.ContainsAny({_1,_2,_3,_5}) OR Q44.ContainsAny({_1,_2,_3,_5})

[Q45_, Categorical/Multiple, Normal, Min:1, Max:6, Must Answer]

Which types of continuing education are you most interested in? (Check all that apply)

- ☐ (_1) Part-time programmes
- ☐ (_2) Full-time programmes
- ☐ (_3) Individual non-virtual courses
- ☐ (_4) Certification
- ☐ (_5) E-learning courses
- ☐ (_6) Other, please state:<Open Textbox>
- ☐ (_7) I am not interested in continuing education<Exclusive>

[#48] End If
[#49] If Q3 <> {_1} AND Q7 <> {_3}

[Q47, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Do you have any employment at DTU, such as being an external associate professor, part-time lecturer or the like?

- o (_1) Yes
- o (_2) No

[#49] End If
[#50] If q3 = {_1}

[Q48_1, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

To get a deeper insight into some of the topics from this survey, we wish to conduct a number of qualitative interviews with PhD graduates from DTU. May we contact you in order to make an appointment for an interview?

- o (_1) Yes, please enter your contact information (name, e-mail and/or telephone):<Open Textbox>
- o (_2) No

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[q48, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

In connection with this evaluation, we wish to conduct a number of qualitative interviews with companies/institutions to examine how they experience PhD graduates from DTU. Could it be that you would allow us to contact someone from your company/institution that has experience in management of newly qualified PhD graduates from DTU?

The interview will not be about you or the answers that you have given, but about the competencies of DTU PhD graduates and master graduates in general.

- o (_1) Yes, please enter contact information (name, e-mail and/or telephone) of the person in your company/institution<Open Textbox>
- o (_2) No, I don't wish to enter contact information

[RAPPORT, Categorical/Single, Normal, Min:1, Max:1, Must Answer]

Do you wish to receive a report with the results of this survey? Do you wish to receive this at another e-mail address than the one we used to contact you?

- o (_1) Yes, please send the report to the following e-mail address:<Open Textbox>
- o (_2) Yes, please send the report to the e-mail address you used to contact me
- o (_3) No, I do not want to receive the report

APPENDIX 2: INTERVIEW GUIDES

RECRUITERS (2019)

Tema og spørgsmål	Varighed	Sluttid

1. INTRODUKTION
 	
Kursiveret tekst er information til interviewer og læses ikke op.
 	
• Forud for interviewet er følgende baggrundsoplysninger om aftageren ind-hentet:
   o Branche, primære aktiviteter, antal ansatte, internationalt/dansk etc.
   o Antal ph.d.'er ansat? (firma/afdeling)
   o Ansætter I primært ph.d.'er fra DTU eller fra andre universiteter?
   o Hvilke institutter på DTU ansætter I/du fra? (afdeling/firma)
   o Interviewpersonens stilling i firmaet og relation til DTU-dimitten-der? (nærmeste chef, HR, top-chef …)
 	
Præsentation og rammesætning
 	
• *Præsentation af Epinion og interviewer*
• *Præsentation af undersøgelsen:*
 	
Vi vil gerne undersøge om PhD'er fra DTU opfylder virksomhedernes behov
Vi vil anvende dine svar til at udvikle ph.d. uddannelsen på DTU
 	
• *Afgrænsning:* Vi beder dig om at tænke på PhD'er der har fået deres grad fra DTU indenfor de senest 4-5 år, og som er ansat/har været ansat hos jer i din afdeling.
 	
• *Temaer:* I interviewet kommer vi igennem følgende 5 temaer:
   o Virksomhedens KOMPETENCEBEHOV
   o Match mellem kompetencebehov og PH.D.-DIMITTENDERnes kompetencer
   o Ph.d.-dimittendernes OVERGANG TIL ARBEJDSMARKEDET
   o Forskelle mellem PH.D.'ER OG KANDIDATER
 	
De formelle og etiske rammer:
 	
• *Referat og lydoptagelse*
• *Anonymitet, GDPR*
	5	5

• *Ingen rigtige eller forkerte svar – vi vil gerne have alle nuancer og for-skellige oplevelser med*
 	
 Præsentation
 	
 • Vil du ikke starte med at præsentere dig selv?
 	
     o *Navn*
     o *Virksomhed/arbejdsområder*
     o *Stilling og relation til DTU-dimittender? (nærmeste chef, HR, top-chef …)*
     o *Selv ph.d. uddannet*
     o *Anciennitet*
     o *Rolle/relation til PhD'erne i virksomheden*
     o *Med til at ansætte medarbejdere, herunder ph.d.er?*		

2. KOMPETENCEBEHOV OG PH.D.-DIMITTENDER
 I dette afsnit afdækkes det generelle kompetencebehov blandt aftagervirksom-hederne og hvordan PHD'erne matcher dette behov, samt hvordan DTU ph.d.'er klarer sig sammelignet med ph.d.'er fra andre universiteter.
 	
 • Hvad lægger I i dag vægt på, når I ansætter ingeniørfaglige med-arbejdere?
 • Hvilke tre kompetencer er mest vigtige i din virksomhed/afdeling?
 	
 Afdække om der er tale om nogle af nedenstående kompetencer:
     o Snævre, faglige kompetencer
     o Praktisk erfaring
     o IT-kompetencer
     o Projektledelse
     o Forskning
     o Design og udvikling
     o Analyse af data
     o Indhente og anvende ny viden
     o Mestring af videnskabelige metoder
     o Formidling
     o Samarbejde
     o Personaleledelse
     o Bidrage til udvikling af ny viden
     Hvorfor disse?
 	
 • Hvilke personlige/understøttende kompetencer efterspørger I?
     o Tage del i fagområdets internationale diskussioner
     o Formidle videnskabelige nyheder og fremskridt
     o Tilrettelægge og styre forskningsprojekter,
     o Initiere samarbejde med virksomheder og andre forskningsinstitutioner
	10	15

o   Skabe vækst og beskæftigelse
    Hvorfor disse?
• Har jeres kompetencebehov ændret sig over de seneste år?
     o   Beskriv…
• Hvordan vægter I de enkelte dele, når I rekrutterer? *(generelle in-geniørfaglige kompetencer, forskningskompetencer, og person-lige kompetencer)*
 	
Efter at have kortlagt virksomhedernes behov og forventning, vil vi spørge ind til deres konkrete erfaringer med ph.d.-dimittender generelt (ie. ikke kun PhD'er fra DTU.
 	
• Med udgangspunkt i de behov, du nu har fortalt om, hvordan me-ner I, at ph.d.'er matcher jeres forventninger og behov?
     o   Komptencerne kan opdeles i ingeniørfaglige forsk-nings og personlige kompetencer
• Er der nogle andre kompetencer, som ph.d.erne er særligt gode til?
• Oplever du, at der er nogle kompetencer, som ph.d.erne mang-ler?
 	
Hvis relevant spørges ind til
     o   Hvilken betydning har det for jer at ph.d.'erne har væ-ret på forskningsophold i udlandet?
     o   Hvad betyder afhandlingens emne for ph.d.'ernes mu-lighed for at blive ansat hos jer?
 	
Vi vil nu spørge ind til virksomhedernes konkrete erfaringer med DTU ph.d.-dimittender.
 	
• Foretrækker i PhD'er fra bestemte universiteter? Hvorfor/hvorfor ikke? *(probe:Bygger det på konkrete erfaringer?*
     o   Hvordan udmærker DTU ph.d.'er sig? (jf. ovenstående kompetencer)
     o Er der områder, hvor DTU ph.d.'er kunne blive bedre ift. jeres kompetencebehov? Sammenlignet med ph.d.'er fra andre universiteter?		

3. OVERGANG TIL ARBEJDSMARKEDET *I dette tema afdækkes ph.d.'ernes overgang fra uddannelse til arbejdsmarked* • Hvordan oplever I, at ph.d.'ernes overgang er fra uddannelse til arbejds-marked? o Hvilke udfordringer oplever I typisk (hvis nogen)? • I hvilken grad mener du, at ph.d.'erne skal have opnået følgende kompe-tencer gennem deres studie?	5	20

o Projektlederkompetencer o Viden om økonomi, ledelse og organisering? o Andet?		

4. FORSKELLE MELLEM PH.D.'ER OG KANDIDATER
 	
Efter at have spurgt ind til jeres konkrete erfaringer med ph.d.'er, vil vi spørge ind til, hvordan I oplever ph.d.'er sammenlignet med kandidater
 	
• Ansætter i primært ph.d.'er eller kandidater? (ansætter I overhovedet kandidater?) Hvorfor ansætter I således?
• Hvordan oplever du forskellen på at ansætte en civilingeniør med tre års relevant erhvervserfaring og en ph.d?
   o Varetager kandidater med tre års relevant erhvervserfaring og ph.d.'er de samme jobfunktioner hos jer? *(hvis de ikke har kandidater ansat, kan der spørges ind til, om det opleves at de ville kunne varetage de samme jobfunktioner – altså opfattelse fremfor erfaringer)*
 	
   o Er der ph.d. specifikke kompetencer, som ph.d.'er besidder, og som kandidatuddannede med tre års relevant erhvervserfaring ikke besidder? Hvilke?
      o Mangler ph.d.'erne viden eller kompetencer, som kandidatuddannede med tre års relevant erhvervserfaring besidder?
   o Er der modsat kompetencer som kandidatuddannede med tre års relevant erhvervserfaring besidder, som ph.d.'er ikke besidder? Hvilke?
      o Mangler kandidatuddannede med tre års relevant erhvervserfaring viden eller kompetencer, som ph.d.'erne besidder?
	5	25

5. UDVIKLINGSTENDENSER *I dette afsnit afdækkes de udviklingstendenser, som aftagerne identificerer* • Hvordan ser du jeres behov for ph.d.'er fremover? Hvilke udviklingstendser i jeres branche er betydende for det? • Ser du en udvikling i de kompetencer, I efterspørger fra jeres medarbejdere? (specifikt ift. ph.d.'er) Hvilke udviklingstendser i jeres branche er betydende for det? o Ift. ex. viden, faglig ekspertise og uddannelse?	5	30
7. AFSLUTTENDE SPØRGSMÅL • Har du afsluttende kommentarer til undersøgelsen? Tak for din tid!	0	30

GRADUATES (2019)

Tema og spørgsmål	Varig-hed	Slut-tid
1. INTRODUKTION *Kursiveret tekst er information til interviewer og læses ikke op.* **Præsentation og rammesætning** • *Præsentation af Epinion og interviewer* • *Præsentation af undersøgelsen:* Du har udfyldt et spørgeskema omkring dine jobovervejelser som ph.d.-studerende på DTU. I dette interview skal vi snakke lidt nærmere om din karrierevej og hvad der har formgivet den. Det vil handle om de overvejelser du har gjort dig og de valg du har truffet. Der er tre overordnede temaer, vi skal omkring. De vil være bygget op efter din karrierevej. Først lidt om din tid som ph.d., derefter om overgangen til dit første job og til sidst lidt om din ønsker til og tanker om fremtiden. **De formelle og etiske rammer:** • *Referat og lydoptagelse* • *Anonymitet, GDPR* • *Ingen rigtige eller forkerte svar – vi vil gerne have alle nuancer og forskellige oplevelser med*	5	5

2. PH.D.-FORLØBET
I dette afsnit afdækkes det, hvilke overvejelser dimittenden gjorde sig ift. beskæftigelse og karriere under ph.d.-forløbet.
Ph.d.-projektets indhold
• Hvor lang tid er det siden, du blev færdig?
• Vil du indledningsvist ikke fortælle mig lidt om, hvad dit ph.d.-projekt handlede om?
 	
• Hvorfra kom interessen for dette?
 	
Motivation for ph.d.
• Hvilke hensyn var vigtigst for dig ift. at blive ph.d.-studerende?
    o Indhold
    o Arbejdsbetingelser
    o ..
	10	15

• Tænk på da du startede på din ph.d. Hvilke overvejelser gjorde du dig da om, hvad ph.d.-forløbet ville betyde for din fremtid?
 	
Ph.d.-forløbet i bakspejlet
• Hvis du prøver at tænke tilbage. Savnede du noget undervejs ift. karrieremuligheder?
 	
    o Er der noget, du selv ville have gjort anderledes ift. karriere?
 	
    o Noget DTU kunne have gjort anderledes?
 	
• Du nævnte at dit projekt handlede om [nævn emneord om indholdet]. Hvordan vil du beskrive projektets erhvervsrelevans?
 	
• Gjorde du noget aktivt for, at dit forløb kunne åbne karrieremæssige muligheder efterfølgende?
    o Framede projektets emne
    o Relationer/networking
    o ..
 	
• Hvordan så dit drømmejob ud i slutningen af forløbet?		

3. FØRSTE JOB OG OVERGANGEN
I dette tema afdækkes overgangen fra ph.d. til videre beskæftigelse.
Første job – fakta
• Først vil jeg høre, om det arbejde du har nu er det du fik, efter du blev færdig som ph.d.?
 	
• Hvis ja: Er du blevet forfremmet? Har dine arbejdsopgaver ændret karakter? (fx fra hovedsageligt teknisk karakter til mere udviklende karakter)
 	
• Hvis nej: Hvor mange forskellige jobs har du haft siden?
 	
Første job – overgangen
Jeg vil høre dig lidt om, hvordan overgangen fra ph.d. til dit første job var.
• Først helt åbent, hvordan oplevede du overgangen fra ph.d. til job? [spørg gerne uddybende ind her: hvordan og hvorfor?]
    o Overvejelser
    o Tid
    o Sparring
 	
• Hvilke hensyn var vigtigst for dig ift. det første job?
    o Indhold
    o Arbejdsbetingelser
    o ..
	10	25

- Hvordan fik du jobbet?
  - Hvad vurderer du selv, var udslagsgivende for at du fik dit job?

- Hvad har været det mest betydningsfulde, du har taget med dig fra ph.d. ift. videre beskæftigelse? (her kan nogle af DTU's opmærksom-hedspunter ift innovation, entrepreneurskab, projektledelse afdæk-kes hvis relevant)

- Hvad betød din ph.d.'s indhold for at du fik arbejde?

- Hvad var sværest for dig at vænne dig til?

Første job – kompetencematch
- Har du oplevet, at der var kompetencer, du manglede?

- Hvordan har du oplevet arbejdsgiver og kollegaers forståelse for dine kompetencer?

- Sammenlignet med da du var ph.d.-studerende, har dit nye job så ændret dit syn på, hvad en god medarbejder er?

- Hvad er dit indtryk har været dine største kvaliteter for arbejdsgiver?
  - Faglighed
  - Personlighed
- Hvad ville være det sværeste for dig at håndtere i det nye job, hvis ikke du havde din ph.d.?

- Hvordan matchede dit første job det drømmejob, du beskrev tidli-gere?

Hvis forfremmelse eller nyt job

- Hvad var årsagen til at du skiftede job [eller blev forfremmet, (eller fik nye arbejdsopgaver)]?
- Hvilke hensyn var vigtigst for dig ift. dette job?
  - Indhold
  - Arbejdsbetingelser
  - ..
  -
- Hvordan vil du beskrive relationen mellem din nye position og de kompetencer, du opnåede gennem din ph.d.?

- Hvordan matcher dit nuværende job det drømmejob, du beskrev tid-ligere?

4. FREMTIDIGE ØNSKER
Afslutningsvist skal vi snakke lidt om, hvad du kunne tænke dig af fremtiden ift. karriere.
 	
• Når du tænker frem, hvad kunne du så godt tænke dig af nye udfordringer?
 	
      ○ Hvordan vil du beskrive disse ønskers relation til de kompetencer, du erhvervede under din ph.d.?
      ○ Er der nogle kompetencer fra din ph.d.-tid, du særligt gerne vil have mere i spil fremover?
	5	30

6. AFSLUTTENDE SPØRGSMÅL • Har du afsluttende kommentarer til undersøgelsen? Tak for din tid!	5	35

EPINION

OM OS

Vi er et af Skandinaviens største konsulent- og analysefirmaer med kontorer i Danmark, Grønland, Norge, Storbritannien, Sverige, Tyskland, Vietnam og Østrig.

Vi er en mangfoldig arbejdsplads med internationalt perspektiv og samarbejdspartnere i hele verden og beskæftiger mere end 150 fastansatte medarbejdere og 500 interviewere.

Vi leverer skræddersyede undersøgelser, der sikrer et solidt grundlag for optimale beslutninger. Vores mål er altid at præsentere analyseresultater og yde rådgivning af højeste kvalitet.