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Final Report, 12 November 2018

Research careers at universities and large companies

Ten case studies from Denmark, the Netherlands and Sweden

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Göran Melin, Leif H. Jakobsen, Tine Andersen, Anneloes de Ruiter, Ivette Oomens, Cathrine Stenberg, Rikke Vendelbo Sonne, Hanna Engblom

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Summary and conclusions

This report presents a qualitative study of research careers; how early career researchers as well as recruiting managers and managers on strategic decision-taking level perceive the research career, and what experiences they have. Related issues such as recruitment of researchers, career support, and sectoral mobility between academia and industry are also dealt with. The study has the shape of ten case studies of universities and large research-intensive companies in Denmark, the Netherlands, and Sweden.

The findings are organised under four main sections:

1. Career path, including career strategies

At universities, the career path for researchers is relatively straight-forward. Although the labelling of available positions may differ, the career path is structured much the same regardless of which institution we look at. The researchers know well the respective steps, and also what is required of them in terms of scientific achievements in order to move on to the next step. They normally have no other career strategy than trying to publish as much as possible, and in as good journals or with as good publishers as possible. The research is typically combined with teaching. Those who are hired on temporary positions aim for a permanent position, and in some places, attracting external funding is of key importance to reach this goal. Our impression is that the early career researchers in academia are often stressed and the workload seems to be relatively heavy. Only occasionally have we heard voices that mention a position in industry as a future goal.

Early career researchers in industry face more diverse career opportunities. To begin with, it is not necessarily expected to keep climbing the career ladder; it is regarded as normal to stay in a certain position and not have the ambition to move upwards. But for those who wish to move, there are often several possible paths to take within the company. We have not heard anyone who regretted that they left research in academia for the industry. Early career researchers in industry seem less stressed in comparison with their peers in academia.

2. Recruitment and competence requirements

The recruitment processes vary in character both at universities and in industry. Permanent positions at universities are typically advertised openly and internationally, and evaluation of applicants is a lengthy and careful procedure. Temporary positions however are often filled with internal candidates after a much quicker application round – or without any application round as a research team proposed in application for external funding is typically accepted by the university without further evaluation. They may be advertised openly also, but we have seen many cases where a specific candidate was in mind and the position was essentially created for that person. Then the evaluation of the applicant, or the applicants, if there are several, becomes largely superficial.

Private industry is of course free to fill available positions the way they like, and there is a mix of internal and external recruitment depending on the needs.

The researchers who went through a formal recruitment process are mostly satisfied with the process itself. They mostly found the recruitment to be professional and careful. Researchers in industry are particularly happy, even impressed, with the recruitment process.

3. Development of employees

There are some support instruments in place both at universities and in industry, like training programmes of various kinds. Mostly, however, does the individual career development occur in dialogue with the nearest line manager once or a few times per year. It is much up to the researchers themselves to take action and initiate talks or seek particular training. The industry is generally

somewhat better than academia at catering for the employers' career development. Few of the researchers ask for substantially more support; they are essentially content with what is available.

4. Transparency

The level of transparency in recruitment processes or regarding requirements for promotion are perceived as high. Communication from managers to the employees is an area where there is some room for improvements, but altogether there is a satisfying degree of transparency both at universities and in industry.

We have made an attempt to create a categorised and summarised overview of our findings (Table 1), where we have graded a set of investigated circumstances or criteria related to perceptions and experiences among early career researchers.

Table 1 A summary of perceptions and experiences among early career researchers, assessed on scale from low (L), medium (M) to a high degree (H)

	Universities		**Companies**	
	Danish universities	Foreign universities	Danish companies	Foreign companies
Transparent career path	H	H	H	H
Use of fixed-term employment contracts	H	H	L	L
Experienced employment security	L	L	H	H
Transparent system for job advertisement	M	M	M	H
Understandable and transparent system for recruitment	M	M	M	H
Academic skills requirements clearly formulated	H	H	H	H
Soft-skills requirements clearly formulated	M	M	H	H
Procedures for assessing the performance of employees	M	M	H	H
Research as main ambition for the employees	H	H	H	H
Major part of working time dedicated to research	M	M	H	H
Experienced work-life balance	L	M	H	H
Career development instruments in place	M	M	M	H

The empirical findings in the ten case studies allow us to draw the following specific conclusions:

- Generally speaking, the researchers like their job and would not really want to do anything else. It is important to note this circumstance. The researchers are generally not an unhappy group of

employees. This is important not only from a fundamental human point of view, but from a labour perspective too: as they like what they do and are mostly satisfied with the job, they are likely to perform well – or at least better than if they were generally unhappy.

- Researchers within industry do not feel that they have given up certain values related to for example academic freedom in a broad sense. Often they are pleased that they left academia, because in industry, they are allowed to do research more or less full time and without the pressure to attract external funding or combine research with teaching duties.
- Researchers within academia are also quite satisfied, because of the academic freedom and a relatively free work atmosphere altogether at a university. They are however concerned about the constant pressure to apply for external funding, and those in temporary positions are often particularly stressed and somewhat worried about their future. They accept this though, as they knew what the conditions were from the beginning. It should be noted that researchers in academia are more or less expected to show very strong commitment in their work, and thus to accept long working hours and additional duties on top.
- Both the investigated universities and the investigated companies are seen as family-friendly workplaces, providing flexible conditions and showing understanding for family-related needs, and trying to care for a good work-life balance. Researchers on temporary positions in academia are in a less favoured situation than others; they mostly accept this as their own choice, but they are of course not happy about it.
- The career path is well known and clear to researchers both in industry and academia. The career path in industry is often more diversified, with several different possible paths to trait. However, an employee in industry can stay on a certain position for years and is not obliged to move up the career ladder in the same way as the universities expect from early career researchers. The career variants at universities are limited to a teaching career, and an administrative career that leads to management positions. A 'pure' research career is however rarely the case at any of the investigated universities, but to some degree at the Technical University of Denmark.
- Permanent positions at universities are normally advertised openly, and internationally. Temporary positions are to a much lesser extent advertised internationally, and the level of openness varies. The position as assistant professor differs to some extent from other temporary positions, as it is typically advertised, even if there is a specific candidate in mind. Other temporary positions are not necessarily advertised openly.
- The industry applies both international advertisement of positions and internal recruitment, depending on the business sector and the need.
- The recruitment processes are mostly regarded as transparent both at universities and in industry, but there is some room for improvements, which mostly are related to how 'soft criteria' are valued, and to how temporary positions are filled at universities. Communication is another area where improvements always seem to be desired.
- There are career support instruments in place both at universities and in industry, but they are less well developed at universities. These instruments are for instance courses or other kinds of training opportunities. Career development is to a high degree the responsibility of the employee him- or herself and is carried out in dialogue with the nearest line manager, who may for instance be the research group leader, if at a university.

1 Introduction

1.1 Objective

Many factors have an impact on career paths of researchers including mobility between academia and the private sector. In turn, career strategies, designed career paths, practice for recruiting, talent management as well as structural and economic factors have an impact on the entire research system. This focuses on career paths of researchers both at universities (public sector) and research-intensive companies (private sector), and the interaction between these sectors. This study is one part of a larger project that The Danish Council for Research and Innovation Policy (DFiR) is running. This study is specifically designed to provide qualitative information, to complement other studies and sources of information that DFiR gathers and compiles. The study contains a set of case studies, of both universities and private companies. The point of departure for the university cases is the individual university and the selected faculty, but the empirical observation is based on data and interviews representing a single department at each university, or a few departments/institutes within one faculty. Consequently, the cases aim mainly at providing illustrative knowledge on how individual researchers deals with their career, recruitment etc. The cases shall thus not be considered as representing areas of sciences, specific universities (types of universities) or types of companies.

The research questions are related to how people at universities and companies execute their policies and strategies towards career paths of researchers. We have investigated this from three main perspectives:

- A strategic management perspective; staff with responsibility for the overall operation of recruitment, employment and career planning
- A day-to-day manager perspective; middle management staff with responsibility for implementing recruitment and career strategies etc. in order to guide the employees/the researchers
- A researcher perspective; staff who is the target group for the designed career policies, as well as having their own career ambitions

1.2 Selection of cases

As qualitative information is desired in this study, we aimed for in-depth understanding of the individual cases rather than carrying out a larger number of case studies. The case studies contain information about researchers' careers at universities and in research-intensive companies in Denmark, Sweden and the Netherlands. We considered carefully which cases to select, and in which countries besides Denmark. We arrived at Sweden and the Netherlands as comparative geographical locations for the foreign case studies. The reason is that the previous project that DFiR undertook, *Viden i verdensklasse*, included these two countries as comparations to Denmark. We simply assumed that there would be a certain added value to again make comparations with these two countries.

We have used the following criteria to select the Danish universities:

- *Size and institutional organisation:* The universities should be multi-faculty universities.
- *Indication of a Ph.D. career policy*: Number of Ph.D. students was used as an indicator of the size of the training environment as this is most likely an indicator of having a human resources policy for Ph.D. careers.
- *Scientific attractiveness*: Number of publications and international ranking were used as indicators of the scientific level of a university and, thus, could function as a proxy for the attractiveness of the university from the perspective of the scientific staff. However, for a researcher, the attractiveness will presumably depend more on the scientific level of the specific research centre (department or faculty) rather than the entire university.
- *Attractive labour market for researchers:* Location is an indicator of the size of the labour market (job opportunities) within and outside universities. From a career perspective, Copenhagen might have an exceptional attractiveness as five out of eight Danish universities are situated in the metropolitan area of Copenhagen.

In selecting the foreign university cases, we used the same criteria as in Denmark, but admittedly, we were dependent on where we had reliable contacts and confirmation that the institution was willing to participate in the study.

The study includes the following university case studies:

Case	Faculty	Department	Number of interviews	Period for the interviewing
Denmark				
University of Copenhagen (KU)	Humanities	• Arts and Cultural Studies • Cross-Cultural and Regional Studies • Nordic Studies and Linguistics	7	July-September 2018
University of Southern Denmark (SDU)	Health Sciences	• Clinical Research	8	July-September 2018
Aalborg University (AAU)	Social Sciences	• Business and Management	8	July-September 2018
Technical University of Denmark (DTU)	–	• Electrical Engineering (DTU Elektro)	7	July-September 2018
The Netherlands and Sweden				
University of Amsterdam (UVA)	The Faculty of Social and Behavioural Sciences	• Amsterdam School of Communication Research (ASCoR) • Research Institute of Child Development and Education (CDE) • Psychology Research Institute (PsyRes) • Amsterdam Institute for Social Science Research (AISSR)	10	July-September 2018
Mid Sweden University (Miun)	Faculty of Science, Technology and Media	–	10	July-September 2018

We used the following criteria to select the company cases:

- R&D intensive companies, which can be measured by R&D intensity and total investment in R&D
- Companies with a separate R&D department
- Different industrial sectors, i.e., representing products based on new technology such as KETs and more traditional technologies

Again, we were dependent on the companies' willingness to participate in the study. We selected the following companies:

Company	Short profile	Number of interviews	Period for the interviewing
Denmark			
Grundfos	• An international company in the industrial engineering sector • Considerable R&D intensity compared to the size of the company but also by collaborating with universities. Situated in Central Jutland	7	July-September 2018
Vestas	• International company addresses the markets for wind turbines and wind farms • Develops, designs and manufactures its products and is heavily engaged in R&D • Headquarters in Aarhus	7	July-September 2018
The Netherlands and Sweden			
ASML (NL)	• One of the country's leading technology companies with 19,000 employees and offices in 16 countries worldwide • R&D and manufacturing locations in the Netherlands, the USA, China, Taiwan and South Korea • Main customer groups are makers of memory and logic chips	7	July-September 2018
SCA (SE)	• 2.6 million hectares of forest holdings in northern Sweden • The largest private forest holding in Europe • Solid-wood products, pulp, kraftliner, publication papers and renewable energy • Cooperates closely with Mid Sweden University and is therefore a highly relevant company case	6	July-September 2018

The ten case studies are found as appendixes.

1.3 Method

Our working method included desk research about the respective selected cases, and interviews. We underline again that as this is a qualitative study, it is difficult to generalise from the findings beyond the investigated cases, and even to the whole investigated organisations – the results are for example not representative for all faculties and disciplines at a given investigated university, and not all disciplines are covered by the case studies. This limitation is always a consideration when doing qualitative studies, but we hope that the reader will find the results to be of good value nonetheless.

Both desk research and interviews were organised according to a work structure with a set of areas for investigation, presented in Figure 1.

Figure 1 Main research topics and work structure

Main research topics	Desk research	Interview with:		
		Researcher	Management	Strategic management
	Research and interview topics			
Structured career path	• Formulated career paths	• An individual structured career path	• Tools to fulfil the aim of structured career paths. • Implemented career path	Policies for • Management career • Specialist career • Vertical versus horizontal mobility • International mobility
Career strategies	• Research strategy • Economic condition • Employment structure (ages, sex etc.)	• Relevance and benefit of a research career	• The actual support for a research career • Formulated career plans	• Models for research careers strategies and planning
Recruiting	• Strategies and policy documents • Guidelines • Evaluations	• Experiencing the recruitment process • (Mis-)match between own ambitions and requirement and offered terms of employment	• Implementation • Qualifications • Skills requirements • Decision making	• Overall chose of research • Recruiting strategies and system • Implementation of strategies • Follow up systems • Challenges and opportunities
Skill requirements	• Strategies and policy documents • Guidelines	• Requirements clearly formulated	• Qualifications • Skills requirements	• Overall policy
Development of the employees	• Formulated procedures and tools	• Relevance and impact	• Guiding process and implementing initiatives to support the researchers	• Models for developing career strategies and planning
Transparency	• Strategies and policy documents • Guidelines	• Understandable and transparent systems for recruiting, career strategies/plans and development of employees	• Compliance between management system and practice	• Management and implantation system

Interviews were of a semi-structured character, with a set of prepared questions that allowed for spontaneous follow-up questions to be asked depending on the answer given. Often, the interviews took the format of a conversation, in which the main topics were covered one by one. The interviews normally lasted 45–60 minutes. At the universities, around ten members of staff were interviewed per case, and at the private companies, some six-seven members of staff were interviewed. Extensive notes were taken during the interviews. We have guaranteed anonymity to the interviewees and will thus not reveal their names. Once the case study reports were drafted, our appointed main contact at the university or company at hand (typically one of the management staff members) got the opportunity to read the case study and make a fact check. Despite reminders, not all contact persons did so. The case studies of SCA and University of Amsterdam are not fact checked.

This study was conducted during May–November 2018 through cooperation between Technopolis Group (main contractor) and the Danish Technological Institute (sub-contractor), where the former was responsible for case studies in the Netherlands and Sweden, while the latter was responsible for case studies in Denmark. Analysis and authoring of the synthesis chapter was jointly made. DFiR's members and staff provided valuable input and feedback on several occasions along the way.

Leif Henrik Jakobsen led the Danish sub-team, and Göran Melin led the sub-team at Technopolis Group and also functioned as overall project leader. The team at Technopolis Group and the Danish Technological Institute wishes to thank all interviewees and other informants for participating and generously sharing their views and experiences with us.

Denmark

2 Summary of findings at Danish universities

2.1 The selected universities

The four Danish university cases aim at representing a diversity within the university sector assuming that we will be able to identity different career paths and approaches to encourage the careers of researchers. First, the universities represent single-faculty and multi-faculty universities, different scientific areas, reputation, and ambitions. Second, the selection of the universities has also taken into consideration structural differences regarding the universities' different operational and economic conditions, e.g., access to external funding or being located in a region considered/not considered as an attractive labour market with many job alternatives for researchers.

The point of departure for the university cases is the individual university and the selected faculty, but the empirical observation is based on data and interviews representing a single department at each university. Consequently, the cases mainly represent a number of departments at different universities in different structural and organisational settings.

In short, the four universities can be characterised by the following different settings for the empirical observations:

Aalborg University is a relatively young university with a dedicated educational ambition based on the Problem-Based Learning method, which also is a part of their reputation. Regarding recruiting, the number of enrolled students at Aalborg University has increased in the recent years, and consequently, the university has faced an increasing need for teaching capacity.

At the University of Copenhagen, the case study is anchored within the Faculty of Humanities. Even though the academic environment appears to be attractive and the number of PhD fellows and postdocs is relatively high, the departments are challenged by few vacant positions for assistant professors and associate professors.

The University of Southern Denmark is a relatively young multi-faculty university. The Department of Clinical Research is located in Odense and has close working relations with Odense University Hospital. These working relations are found both within education and research and can be seen as a symbiotic relation as the two organisations are very integrated functionally, which means that research at the Department of Clinical Research depends on empirical data at the hospital and the hospital benefits from highly specialised research-based expertise from the university.

The Technical University of Denmark has as a vision of being an international elite university performing excellent research. The Technical University of Denmark is dedicated to training talents and (international) recruiting talents. A large share of the university's total revenue originates from external funding enabling the university to host many research and innovation projects.

All in all, the universities are quite different in their structural and organisational settings. This can be used to understand similarities and differences in the applied career paths, etc., among the departments.

2.2 Career paths

All the universities, with the University of Southern Denmark to some exception, apply the official job structure outlined in Danish legislation,[1] which includes two main career paths with a common point of departure as PhD fellow and subsequent temporary positions as postdoc. The first career path includes

[1] https://www.retsinformation.dk/Forms/R0710.aspx?id=172954

three main positions, first as assistant professor, followed by associate professor and professor. This career path is also called 'faculty staff' with an obligation to teach and carry out research. The second career path dedicated at doing research includes positions as researcher and senior researcher, but a professorship is rarely a possibility in this career path.

A closer investigation of the applied career path, however, reveals different ways of adjustments in connection with the official career path. Among the researchers, we have identified four kinds of adjustment behaviour.

The first adjustment can be characterised as improving academic qualifications and competences while a career is on hold. After finishing a PhD, researchers aiming for an academic career will strive for a position as assistant professor, but often there will be no vacant position. Postdocs can be assigned to a temporary research project with an opportunity to improve their academic qualifications by publishing research papers and keeping a tight relationship to the academic world, which also is a gateway to information about new research projects and vacant positions. This strategic move is often observed at the University of Copenhagen and the Technical University of Denmark.

A second adjustment can be described as to keep a career afloat while hoping for the next step in the career to open up. Thus, a researcher can get into a situation where he or she is waiting for the next advertisement for, e.g., an associate professorship when the position as assistant professor has come to an end. In principle, the researcher will have to leave the university, but if the researcher wants to maintain relations with the university as well as having a career outside the university it can be challenging to establish this relationship. Furthermore, the management, research group manager, or head of department often wants to keep the researcher. A temporary solution is a fixed-term appointment in an administrative position or as a teacher. This form of adjustment performance is seen quite often.

A third adjustment behaviour can be to sidestep or bypass the career path. In a situation of uncertainty or poor chances of finding a vacant position as assistant professor, a researcher who has had several subsequent postdoc positions can feel desperate about the next career move at the university. In such a situation, a career move can be first to go for an assessment for promotion to associate professor, and, secondly, establish a large externally funded research project holding the post as project manager. If this move is successful, the researcher can ask for (apply for) a fixed-term appointment that relies on the project, as associate professor for a period of two years, for example. This career move is probably rare, but it has been observed at the University of Copenhagen and similar initiatives were observed at the Technical University of Denmark.

A fourth adjustment behaviour could be to 'speed up' a career or apply a 'fast track' where researchers are supported in reaching the next career step faster. Personal ambition can be the motivating factor, but the universities might also have an ambition to push some talented researchers forward in their career. The Technical University of Denmark has introduced a (informal) fast track-initiative aimed at identifying young research talents and accelerate their careers. At Aalborg University, they need to expand the faculty staff volume. Consequently, the traditional paths are processed without 'delay' which has the effect that young researchers rarely hold a postdoc or other types of fixed-term appointments.

A research manager at the University of Copenhagen was concerned about these 'unfortunate' career conditions for early career researchers and characterised the research labour market as 'avantgarde' in terms of a precariat as the demand for labour mobility, by geography and by task, is even higher than seen on the labour market in general.

Tenure track can be considered as official responds the above presented adjustment behaviour, but tenure track system only reflects challenges related to a position as assistant professorship. So far, the tenure track system is only used at the University of Copenhagen. However, it is being considered as a possibility at Aalborg University.

Early career researchers will typically have a career plan where they can fulfil their research ambitions, and some will aim at a position as professor. However, to fulfil the career plan, the researchers will typically focus on the next career step, and consequently, their career plans are not very concrete.

Some early career researchers find the working conditions rather stressful. The main reason for this is that the research career is not only about doing research but also about attracting funding, teaching, communication, as well as being obliged to carry out some administrative tasks. Typically, the early career researchers are worried about all these very time-consuming duties, and, consequently, the lack of time to do research.

The early career researchers are often concerned about the work-life balance. Even though the research managers are sympathetic regarding the workload and the researchers formally live up to his or her 37-hour contract per week, a research career needs funding and the researchers compete with each other. Consequently, a research career can be characterised as being attractive for people who are motivated to do research and interested in putting many hours into their research. This may have negative impact on the private life.

The management at the universities seem to be aware of problems related to the workload and the work-life balance, and at Aalborg University they aim to balance the workload especially at the beginning of the research career.

At the University of Copenhagen, we observed that the early career researchers, before entering a research career, had been made aware of the challenges and difficulties ahead. However, their experience is that it was even worse than expected. Even though it is very common to collaborate and form networks, eventually everyone will be fighting for himself or herself. As an interviewee said, “It’s the law of the jungle”.

Others think that the flexibility in the job is a positive feature, making the job suitable for family life even though the job takes a lot of time and there is an extensive overlap across job and spare time.

2.3 Recruitment and competence requirements

At all four Danish universities, the procedures for recruitment are based on official regulations with an obligation of international advertisement and an assessment of academic qualifications. However, some generally formulated skills requirements might be part of a formally described career path or recruitment procedure. The challenge is to bring the skills requirements into a form which applicants can understand and navigate after when developing their careers and when applying for vacant position.

All in all, the early career researchers thought that the recruitment process is fair and transparent. When they applied for a position, they knew what was expected of them, and what they could expect in the recruitment process.

The description may however sometimes be rather vague. For example, at the University of Copenhagen, the formal description required for a tenure track only gives some indication as “teaching qualifications are not mandatory, but documented teaching qualifications and experience are an advantage” and “outreach qualifications, including the ability to attract external funding, are an advantage”, as it is often put. Furthermore, to become an associate professor, an assistant professor will have to meet eight different criteria which, in addition to the tenure track assessment, include a high level of ambition as well as criteria such as ‘academic citizenship’. By academic citizenship, the management wants to emphasise that the researchers must be good colleagues or team players as well as loyal to the university. In other words, they must support the overall research strategy and assist their colleagues.

According to the interviews, the evaluation of qualifications is a stepwise process where the main required qualifications are academic merits based, for instance, on an evaluation of the number of publications, co-authorships, citations, etc., followed by an evaluation of teaching qualifications/experiences and experiences with study administration.

Outreach qualifications are also evaluated, but this element does not seem to be clearly defined as the interviewed managers and young researchers have a different understanding of what constitutes outreach qualifications.

The interviewed managers indicate that excellent academic qualifications are still crucial, but outreach qualifications have become a more critical criterion for two main reasons. First, external funding has become more decisive for research and excellent skills for preparing applications are requested. This also includes a widespread network as networks can mean access to (potential) partners for large research project applications. Second, the university appreciates researchers who can do more than research, such as facilitating or creating a dynamic research environment by forming (informal) groups of researchers.

Some research managers said that quality should be valued before quantity and recruitment and evaluation of candidates should be less focused on the number of published papers. Instead, they value for instance a completed professional postgraduate teacher training course and they prefer someone who has shown collaborative skills and responsibility and is full of initiative, for instance, having experience with coordination, conferences, or development issues.

These expectations are only clear to the early career researchers to some extent. When asked about developing qualifications for a position as an associate professor, they stated that teaching competences are important to some extent because teaching is a significant part of the job. However, one researcher stated that it is more a question of having teaching experience than being good at it, and therefore most researchers will be able to live up to this expectation. Besides teaching, the researchers mentioned other skills requirements such as professional postgraduate teacher training, administrative tasks, peer reviews, and conferences. They also said that the most important thing is to show convincing research at a high academic level. This includes publishing papers in scientific journals and preferably some of them in high-ranking journals.

Nevertheless, some researchers found that these expectations are not always concrete, and that especially the requirements regarding publishing papers was unclear in terms of the required number of papers and the ranking of the journals. To them it was not transparent what is expected either formally (the specific number of papers) or informally (what features are taken into consideration).

If the university knows a qualified potential candidate with certain relevant experience, it is possible to ask for this experience or certain qualifications in the job advertisements, which gives this candidate an advantage. From the research manager's perspective, this is also a recognition of the researcher's work and competences and it gives a good social working environment to know that the chances of keeping one's job are better. It is also very common that qualified potential candidates are identified among PhD fellows or postdocs already associated to the university. In fact, spotting talents and encouraging these talents to apply for a vacancy or to be enrolled in external funded research projects, are typical tasks for research managers.

However, when recruiting for fixed-term appointments related to externally funded projects, the recruitment process does not need to follow the official procedures. If the research team is included in the application for external funding, a positive evaluation of the project is considered to include an evaluation of the team members' qualifications, and a team member can be given a fixed-term appointment without applying the formal recruitment process. Early career researchers are aware of the mechanisms for fixed-term appointments, where ability to develop networks or having been tightly associated to a research group, is decisive for being enrolled in temporary research projects.

2.4 Development of employees

When it comes to development of academic qualifications and other competences, we observe many similarities between the four Danish universities. Typically applied instruments are:

- Performance and development reviews performance and development reviews (in Danish MUS)
- Courses within project management/leadership, self-management, pedagogy (teacher training), etc.

- Career and talent development initiatives

In practise, development of the employees at the four Danish universities is based on two overall principles. The first principle is 'self-management' where the individual researchers must be confident about their own competences and should have the courage to be responsible for developing their own research. It is up to the researcher to be investigative and decide which requirements are to be achieved to reach the next career step.

The other principle is the research group as the main setting for the development of any researcher. The researchers are associated to a research group, and this is something that seems to be of paramount importance to the career and competence development of the individual researcher. In the research group setting, the early career researcher is in a direct working and learning position to senior researchers (associate professors or professors). The research managers characterise this type of guidance as mentorship, employee-to-employee training, or apprenticeship. Furthermore, the research groups are in some cases also the key platform for defining a common research strategy and organising research and education. Consequently, each research group has a significant impact on defining the specific skills requirements and function as a forum for developing the competences of young researchers.

This relationship is typically informal as the senior researchers do not have any personnel responsibility for the young researchers nor are they involved in the performance review or receive any feedback from these reviews. One research manager emphasised that the research groups typically represent a research culture with a common responsibility to train and assist younger researchers. Even though this training and assistance seem to be very individual and informal, the researcher emphasised that they do care about each other.

There seems to be substantial differences in how the research groups perform, and consequently how the career development activities work. According to a young researcher, career development can turn out to be rather coincidental. Consequently, a good relationship with the research leader is essential.

All in all, the actual development of the competences of the early career researchers appears to be very informal. Moreover, the research group has a lack of power or economic resources to help any development of a young researcher with other than writing applications or being introduced to relevant networks.

2.5 Transparency

The issues concerning transparency relate to an understandable and transparent system for career strategies/career paths, recruitment and skills requirements, development of employees as well whether the compliance between the institutional policies or management systems is in accordance with practice.

The career path is based on the officially defined job structure which is generally known and highly transparent. However, we have observed cases where a candidate with some attractive competences but without the requested academic qualifications has been offered a fixed-term appointment as an affiliated professor, from which position the requested qualifications can be established, assisted by the university. In another case, an individual researcher with assistance from a research group obtained an external grant from a fund and had an assessment for promotion to associate professor, and was employed as associate professor in a temporary position while waiting for vacant permanent positions. Such practice is apparently not very transparent.

The recruitment at all four Danish universities follows a set of formal guidelines specifying the recruitment procedures and some general skills requirements for each type of job. The guidelines for recruitment and the way they are applied regarding job advertisement, the procedure for assessing qualifications and competences are easily understood and fair. However, who makes the decisions and how decisions are made, and the exact formulation of the skills requirements, are less transparent.

The recruitment processes are generally well-described for permanent positions (assistant professor, etc.). However, fixed-term appointments, typically time-limited project positions such as postdocs, can

be occupied without public advertisement, and consequently, there is little transparency in the hiring process, and applicants who are hired are mostly the ones who are already in the environment or are associated with a research group.

Skills requirements are generally included in the descriptions of each of the academic positions in the job structure, and these requirements are generally known. However, describing the general skills requirements ignores the fact that actual strategic decisions (research strategy, allocation of resources. and recruiting strategy) have an impact on the required qualifications and competences. These strategic decisions will typically be reflected in the formulation of job advertisements, e.g. by developing a very broad job description to get many applicants versus as narrower job description which could give preference to one specific candidate. An applicant might find it difficult to understand the context behind the formulation of the job advertisement.

All in all, the recruitment process appears to be sufficiently transparent; research managers are concerned about developing clearer and more precise qualification criteria or descriptions, and the early career researchers think that the recruitment process is generally transparent. However, early career researchers often find that the procedures related to allocation of resources and the decision on job vacancies, the formulation of job advertisements, and the appointment of members of the committee to evaluate job applicants, are not regarded as transparent enough.

2.6 Key observations

- Early career researchers are typically very dedicated in doing research.
- Early career researchers will typically be employed at temporary positions, and often in several positions before an opportunity for a permanent position appear, all in all forming a quite stressful and uncertain working situation.
- The recruitment process to permanent positions is generally very transparent while recruitment for fixed-term appointments is often based personal relations or networks, and less transparent.
- Academic skills requirements have to a wide extent been supplemented by soft skills requirement, e.g. leadership/project management, preparing application for funding, etc. but the soft skills requirements are not always well communicated.

3 Summary of findings at Danish companies

The research careers in the Danish private sector are illustrated by two internationally oriented manufacturing and research-intensive companies, Grundfos and Vestas. Grundfos and Vestas operate within industrial engineering and address the markets for pumps technology and wind turbines (wind farms) respectively. Both companies develop/design and manufacture their products and are heavily engaged in research and development (R&D) and are both characterised by having separate R&D-departments.

3.1 Career paths

Grundfos and Vestas have established separate units dedicated to R&D, and in both cases, we find defined career paths.

Despite well-structured career paths in Vestas, career planning is not a major concern for the interviewed researchers. The prospect of promotion does not appear to overshadow the opportunity to work on interesting and challenging projects with a large research component. While the management representatives emphasised the importance of employees switching between three career paths, the employees said that they would only change to another path if they felt a concrete need for competences that could be acquired in one of the other career paths or if they were explicitly encouraged to change path by their superiors.

Careers in Vestas are not articulated as research careers, although research is a significant activity for employees pursuing a specialist career. However, the rationale of the research differs significantly from that of university research, since research in Vestas (like in all corporate settings) should always lead to commercially viable products or activities. It is exactly this characteristic that motivates specialists according to the interviewees, regardless of their department and seniority. It inspires them to know that their work will be used to make products that will later be used in different wind turbine solutions, products, or making codes that can be used to optimise processes or develop technical issues.

The fact that research in Vestas is carried out in teams is a motivation factor for the employees according to the senior specialists as well as their superiors. This is appreciated by the employees, and one interviewee with experience from completing a PhD at a university prior to being employed by Vestas referred to the individualistic culture in university research as the main reason for wanting to make a career shift to the private sector.

At Grundfos, one director observed that very few newly recruited employees enter Grundfos with a set career plan and career planning is not common among the specialists who have entered a career path from the outside. Instead, they appear to be happy to get an opportunity to work within their specific scientific field – most are satisfied with being challenged by their daily tasks and do not prioritise promotion. This was confirmed by the specialists (one lead specialist and two senior specialists), who did not have a clear idea of progression in a career path when they were first recruited. Consequently, the initiative to draft a career plan usually comes from the specialist's closest superior.

The main career motivation comes from the challenging tasks that specialists carry out in their daily work. Compared to a promotion, the possibility of having impact on the development of new products and processes is a very important driver for the young Grundfos specialists. The senior specialists have chosen Grundfos over a university career for different reasons, but agree that they are motivated by the collaborative work environment and by the fact that the research should always aim at an impact in the form of new or improved products or services. At Grundfos, teamwork is widespread and the research is mostly applied. There is a purpose and a use for the research they conduct.

Grundfos actively aims at having strong links to universities, mainly the engineering or technical universities in Denmark, but also a few universities around in Europe. Consequently, a PhD degree is greatly valued – 1/3 of the employees in the Core Tech unit are PhDs – but the specific subject is not always important. Grundfos highly values the network that PhDs from universities can bring with them

as well as their understanding of the academic world. Furthermore, a PhD degree is proof that the candidate is able to explore his/her subject in depth. Moreover, specialists in Core Tech are urged to publish articles in relation to research projects as this paves the way for future even closer links to academia. The interviewed specialists confirm that this is indeed attractive to people driven by a scientific/technical interest. One senior specialist who recently finished an industrial PhD, said that he was pleased with the support he received from Grundfos, in particular because he had access to carrying out experiments.

3.2 Recruitment process and competence requirements

Both companies, Grundfos and Vestas, have formulated procedures for recruitment and for assessing the competences of the applicants. Internal recruitment or promotion pay a significant role, however, external advertisement is still a part of the recruitment as internal applicants will compete with external applicants.

According to the Vestas management, personal qualities and attitudes are quite decisive when recruiting to a vacant position provided that the academic qualifications or achievements are considered relevant and sufficient. The interviewees talk about 'the right employee qualities'. Qualities evaluated in the process include technical knowledge and competences, leadership potential, and business understanding, where the latter is crucial. Candidates should be agile since the business environment in Vestas is highly changeable. In addition, interpersonal skills and cultural understanding are valued highly, since all large projects are carried out in teams with a 'people leader', a project manager and any number of international specialists.

The chief specialists, who are in part responsible for the recruitment process, find that while the process facilitates fairness and transparency, it can be quite inflexible given the number of tests and interviews that even well-known internal candidates need to go through.

All the interviewees at Grundfos thought that the recruitment processes work satisfactorily. Use of case assignment in the process was emphasised as a good tool to demonstrate that the candidate is actually knowledgeable within his or her field of research.

The director/senior managers expressed different preferences for hiring international candidates for positions in Denmark – some of them preferred to hire Danish candidates from the university departments that they are familiar with, while others emphasised that international candidates, including people from cultures very different from the Danish culture, add to a desirable diversity. Likewise, the approach to international recruitment varied according to the directors'/senior managers' individual preferences. Some preferred to "cast the net out widely" by using social media like LinkedIn, while others relied on their professional network or experience with candidates from certain universities.

3.3 Development of employees

Development of employees in Vestas includes annual reviews where every employee is assessed and evaluated according to their performance, staff development interviews, and continuing professional development processes to monitor the employees' development. Furthermore, Vestas has talent programmes for employees across the company (not only in R&D), which include periods abroad.

Following the recruitment, Vestas has a well-developed introduction programme comprising e-learning and face-to-face course modules introducing topics like the Vestas code of conduct, Vestas company information, safety, IT-systems, introduction to wind turbine technologies and sales techniques. In addition, there are in-company networks and networking events to enable the candidates to get to know the entire organisation. There is also a system of mentors ('Buddies' in Vestas terminology) in place to ensure ongoing balancing of expectations.

Whereas these activities focus on developing the business skills of the employees, there does not appear to be a strong focus on developing their academic skills once they are recruited. The managers (chief specialists) explained that the employees, together with their closest superior, are responsible for their

professional development by being proactive, meeting with the right people, being business oriented, and expressing if they would like to advance or change paths. If the employees would like to advance, they can ask their superiors for help if they cannot identify what competences they need to improve. However, the main attitude is that the employees have the main responsibility for their own professional development.

Consequently, even though Vestas offers training in the shape of courses, the corporate preference is for an 'exposure approach', i.e., exposing people to new environments and giving them responsibilities whilst supporting them and helping them to learn and grow.

One of the areas where the employees get an opportunity to develop is in collaborative projects that involve universities. However, the interviewees expressed a certain frustration about these projects. The main challenge, as they see it, is that the involved researchers have entirely different rationales guiding their involvement depending on whether they work at Vestas or a university.

Grundfos supports employees by applying two formal processes: (1) The People Development Dialogue (PDD) which is an annual dialogue focusing at the employee's wishes, plans, and potential for professional development possibilities, and (2), The People Performance Dialogue (PPD) which is an annual dialogue about the individual employee's performance.

It seems that career development is a dynamic process that evolves from the annual development dialogue. Here the employee can explore the options for his/her possible future career moves within the organisation, whether is it a development within an existing position or a horizontal or vertical move.

Grundfos offers different measures to support the development of the specialists, such as support for developing their own ideas for technological advancement or establishing closer relationship with the academic world, as well as more general competence development. The young researchers (specialists) are generally satisfied with the support they are offered to develop their skills as their career development is based on an open dialogue and an opportunity to pursue academic and technical areas of interest. A director stressed that specialists can spend up to 80 per cent of their working time on development projects.

3.4 Transparency

Generally speaking, we observed a coherence between the required competences and skills and the actual valued competences and skills in the recruitment process.

Based on the interviews with senior specialists at Vestas, the requirements for progressing to the next career step do not appear transparent and tend to rely more on personal contacts and the ability to be in the right place at the right time. The interviewees explained that their own initiative is crucial in this respect and that it is necessary to use in-company networks to get a sense of the right timing. Furthermore, they also observed that in their experience the process of recruiting internal candidates is not always transparent to the candidates themselves or their colleagues.

Grundfos is always interested in finding the best possible match for the position in question, thus there is no incentive to be unclear about the skills requirements in the recruitment process. The young specialists at Grundfos all seem to feel understood, supported, and challenged in their work. Career planning does not take up a lot of their energy, and they all agreed that the challenging work tasks are what motivates them and that pursuing their interests will lead them through their career at Grundfos.

3.5 Key observations

- Employees working with R&D are typically very dedicated to their work, however, career planning is rarely a major concern.
- Typically, R&D is commercially oriented, however collaboration with universities is appreciated, and Grundfos even appreciates when employees publish research findings in public scientific fora.
- The career path is clearly defined and based on permanent jobs.

- Open job advertisement is commonly used recruiting young candidates to the R&D department, however, internal promotion of talented staff members to leading positions is commonly used.
- Developing and monitoring the competences and the performance the employees are key elements to identify and promote talented employees.
- Recruitment and promotion of employees have to meet the needs of the company, and consequently, the recruitment process might not be fully transparent.

The Netherlands and Sweden

4 Summary of findings at Dutch and Swedish universities

4.1 The selected universities

University of Amsterdam (UVA) is a well-known and highly attractive large university located in one of Europe's central capitals, while Mid Sweden University (Miun) at least by perception is located in the peripheral north of Sweden – in fact it is located right in the middle of Sweden with campuses in Sundsvall and Östersund – but even to most Swedes, this is regarded to be in the north.

It should be explained that Miun was selected because it is a middle-sized university with some high-standing research fields, especially in the technological area, which makes it a relatively good comparison with one or two of the Danish university cases (Aalborg University and University of Southern Denmark), which are also middle-sized universities with some strong research fields and located a little bit beyond the capital region (this point applies to some of the campuses of University of Southern Denmark but not all). Miun also has a history of mergers; the two campuses were separate university colleges until 1993. A third campus in Härnösand was in contrast closed in 2016. As a sign of Miun's relatively good research level, it has attracted substantial external research funding the last years. Also, Miun has very well-developed collaboration with the surrounding regional business community and well as with society at large.

UVA on the other hand is the foreign university that compares best with University of Copenhagen, and possibly and in part with the Technical University of Denmark as well.

4.2 Career paths

Overall the early career researchers at UVA praise the level of independence and freedom they enjoy in their position. They enjoy high level of autonomy when it comes to the type of research they want to conduct, how they conduct this and with whom. Moreover, the degree to which they can independently plan their work, outside of their teaching obligations, is highly valued. Especially those researchers who have recently started a family are appreciative of the flexibility their positions allow them in relation to take paternity/maternity leave, collecting their children from day-care or the ability to work from home when their child is ill.

There is however a clear difference between those who sit on a permanent contract, and those who are employed on a temporary contract. Although all interviewees at UVA express that there is a certain degree of work pressure and stress that comes with the job, the extent and impact thereof are much greater for those on a temporary contract. For them, the career is very much about securing a permanent position. Only then can the career really kick off. A key to succeed attracting a permanent position is to attract external funding. During the interviews, the researchers stated that the pressure to attract external funding is high. It is seen as fundamental in attaining a permanent position but also as an important component to make further career progress. The management staff shared the researchers' frustration regarding the large effect external grants have on the likelihood of being hired and being offered a permanent contract. This circumstance means that at this faculty at UVA, there is additional criteria at play besides the formal requirements of specific qualifications and merits, criteria which are not spelled out to text in job advertisements or other formal documents.

The early career researchers at Miun did not feel the same pressure to attract external funding, at least not in order to get hired on a permanent contract.[2] They generally felt that their current position had fulfilled their expectations. The middle management staff noted that many researchers choose to stay because of the positive work climate and the fact that they want to focus on "free" research rather than the more product-oriented research conducted within the industry.

All of the researchers at Miun were required to carry out other duties in addition to doing research (mainly administration, writing applications and teaching), something that most of the researchers saw as a double-edged sword. On the one hand it takes away time from their research and publication-writing, on the other hand the administration is part of the job and teaching experience is required to become senior lecturer and professor. One of the researchers meant that in an international perspective, these activities could have a negative impact, since on an international level recognition is solely based on the number and quality of the publications.

4.3 Recruitment processes and competence requirements

Researchers at UVA recalled the recruitment process during which they first joined the faculty positively. Generally, the requirements of the position were clear, and the criteria were clearly stated in the job description or became more evident during the interview rounds. When they were hired either from another university or after fulfilment of their Ph.D. their expectations of what the job would entail matched the reality once they assumed their position. There were different procedures for different positions, as this is not decided upon centrally but is left to the department head and the appointed hiring committee. Most of the vacancies to which the interviewees replied were fairly open in terms of research directions as long as they were in line with the department's/institute's focus as well as in terms of competences or skills.

If anything, the researchers expressed mixed views on the fact that hiring committees can consist of colleagues who they work with on a daily basis. Some praised this, as they felt they would know them best and experienced the subsequent informal atmosphere of the interview as pleasant, whilst others found this to be less professional and objective due to the familiarity between recruiter and candidate. In any case it was clear that being able to fit in to the research group both socially as well as with respect to one's competence, mattered.

Middle management staff at recruiting level as well as top level management staff essentially echoed what the researchers said. Altogether there were few discrepancies between the views of early careers researchers and management at UVA with respect to the recruitment processes and competence requirements. As noted in the previous section, the problems seem to start occurring at the next level, when moving from the postdoc phase of the career into the phase when a permanent position is sought for.

In some contrast, at Miun, the researchers' experiences of the university's recruitment process varied. Some had gone through a formal process, while others had been recruited through contacts. Some felt the process was smooth, while others found it messy. Several researchers felt that the formal recruitment process was very lengthy, especially compared to the industry. Most of the researchers thought that in many cases there was already a specific candidate in mind, in which case the position was tailored to fit this candidate and the formal recruitment process became more of a facade. However, the researchers recognised that this does not only apply to Miun, but to other academic institutions as well.

The middle management staff said that the university must struggle to some degree to attract research staff, since (naturally) the bigger and more well-known universities attract the most promising researchers. They thought that Miun had become more dependent on external funding regarding

[2] We do not want to give the impression that external funding is not important at Miun. In 2017, 39 percent of Miun's total research volume (in SEK) came from external sources, and the goal for 2018 is over 50 percent.

recruitment to research positions than before – a view confirmed by Miun's annual reports. Since it is hard to secure funding for more than a couple of years at a time, this has led to more short-term positions. The strategic management staff, on the other hand, said that internal or external funding had no real impact on the recruitment of permanent staff, but recruitment of postdocs requires projects with external funding. One strategic management interviewee said that it becomes harder to get enough good qualified applicants the higher the available position is.

It seems clear that at both universities, some candidates are employed through a rather 'easy' process with little formalities. These candidates are surely known to the recruiting department. A public advertisement is in these cases only posted to fulfil formal legal requirements of the procedure. In other cases, the recruitment process is more elaborated. Although there seem to be some exceptions, the recruitment process is typically regarded as open and the requirements as clear.

4.4 Development of employees

The overall impression of the researchers at UVA on their own career development is that they have to advance this themselves. When prompted with several different examples of more formal career development support such as trainings, structured sessions with more senior staff or online tools, the majority of them indicated that such support structures were not offered or that they were not aware that they were available. When the researchers anyway were aware of support practices, they stated that "you have to figure it out yourself". At the same time, the researchers were overall satisfied with the available resources such as IT, research infrastructure (labs or special test facilities), network opportunities and opportunities for collaborations, to name a few. In addition, the atmosphere in the departments and research groups was also generally viewed as positive, stimulating and collaborative, despite the occasional competition over grants and/or positions. The management representatives at UVA essentially confirmed the researchers' view.

Although it is also at Miun much up to the individual researcher him- or herself to advance the career, support instruments are a bit more known to the researchers and thus also more used, if not right at the beginning of a career, after some time. This relates also to the career progress in a wider sense. It seemed as if the younger researchers had less knowledge of their career path and whether there are any formal career development processes in place at Miun. The researchers who were a bit further in the career (senior lecturers) had a good idea of their career path and had participated in formal career development processes at the university, such as pedagogical training, supervisor training and research manager training.

The middle management at Miun said that there is no direct support for researchers in their career development, but mainly small pushes here and there for them to take their next career step. For example, the middle management staff try to encourage their research staff and the doctoral candidates to take up temporary positions abroad to enhance their careers. In any case both researchers and management shared the view that there are sufficient career support instruments in place, even if one person wished for a closer mentorship and another more formalised career planning processes. As an example of barriers towards improving career support, one strategic management interviewee pointed at individual factors as possible obstacles, such as the attitude and objective of the research group leader.

4.5 Transparency

There were mixed views at UVA on the topic of transparency within the faculty, which appear to be divided along departmental lines. Some researchers indicated that they had rather negative experiences with the way in which the management communicated on matters of contract extension, minimum criteria to keep their position and other related issues. They indicated that this had negatively affected their sense of job stability. When asked whether they knew what the requirements were to be promoted, they answered that they were familiar with the set of criteria for a specific position, but that almost everyone in the department met those standards. Hence, what would then determine someone's

promotion remained vague. This experience was not shared by all of the researchers, but the majority thought that more and clearer communication would be desirable.

Other researchers had a very different experience on this matter. They applauded the level of transparency and 'openness' of their superiors in being straightforward and realistic about their chances of being promoted/attaining a permanent contract. Some of the management representatives confirmed this open approach as being very helpful in reducing some of the insecurity researchers deal with.

Regarding the transparency of the recruitment process, the researchers at Miun felt that the requirements for positions were clear when they applied. Some of them pointed out that Miun has formal documents which clearly state the requirements for the different research positions. Most of the researchers thought that the instances when there is already a specific candidate in mind and the position and advertisement are tailored to fit this candidate, made the recruitment process at Miun less transparent and fair. Nevertheless, most of the researchers saw no need for changes regarding transparency, and one researcher noted that the transparency had continuously improved over time.

Indeed, transparency generally seems to be at satisfying level at Miun. The criteria for hiring research staff is stated in the job advertisement, including a reference to the university's appointment procedure, which lists all criteria. The recruitment processes follow the university's appointment procedure. Apart from the fact that all recruitment goes through the Human Resources (HR) department – a difference from UVA – the applicants for higher research positions (senior lecturers and above) are reviewed by an employment council and through external peer-review, while candidates for temporary positions are reviewed by research colleagues. Finally, the whole recruitment process is documented and reviewed before the hiring decision is made. Like the researchers, the management staff considered the recruitment process transparent and fair and saw no need for changes. However, several of the interviewees noted that the transparency efforts of the current process had caused the process to become slower and lengthier.

4.6 Key observations

- There are occasionally 'hidden' criteria at play with reference to the research career and how to develop one's career. While the formal requirements like publications and teaching experience are known and openly printed for example in job advertisements, at UVA, criteria related to social competence and ability to attract research funding also matters.
- At UVA, early career researchers on temporary positions feel significantly more stressed than peers on permanent contracts.
- Both UVA and Miun apply what can be seen as dual recruitment processes; one which is targeting unknown candidates outside of the department/faculty, also internationally, and one which is targeting known and already identified candidates, typically internally.
- Some career support instruments exist, like training of one or the other kind, and development talks and mentoring. It is however much left to the individuals themselves to take action and make use of such instruments.
- The level of transparency in the recruitment processes is generally seen as high.

5 Summary of findings at Dutch and Swedish companies

5.1 Career paths

While both ASML and SCA have several career paths for staff with research training and research background, it is clearer and more structured at ASML. There, there are three distinct paths. At SCA there is only one distinct path, but there are in fact many possible career paths for employees with research background, and the employees have substantial possibilities to transfer into new areas and take on new challenges depending on their interest and ambition level.

All young researchers at ASML that were interviewed stated that they discovered ASML when looking for a new job outside of academia. The reason for them to leave academia was the difficulty of getting a permanent contract in academia and the high competition for research funding. One of the young researchers has still published several papers while being at ASML. The only difference from academia, he said, is that he needs to provide the company with a business case for this research before they will support him. Similar to what the researchers at ASML said, among the reasons for moving from academia to the industry, the researchers at SCA mentioned a desire to get a permanent position, making greater impact with their research, try something new and get a chance to focus on research rather than applying for funding. As a reason for applying to SCA the researchers explained that the company simply had interesting opportunities within the right field.

The young researchers stated that the work-life balance at ASML was much better compared to work in academia, and they considered the company a family friendly work place. The views from SCA adds on to this; most of the researchers at SCA felt that their work-life balance had improved since leaving academia for the industry. They felt that in academia it was more competitive, more result based and there was a constant pressure to publish. SCA was seen as a family-friendly workplace. Parental-leave is considered natural. SCA also supports its employees by providing them with extra funds, on top of the parental allowance.

There is certain top-up of benefits also at ASML. One reason why it was considered attractive to work at ASML were the employee benefits. The employee benefits ASML provides differ per country (Netherlands, USA and Asia) and are highly competitive. ASML also makes a tailor-made compensation and benefit package based on the individual situation of the employee.

Because innovation is so important for ASML, employees get a lot of room to be creative and ‘do their own thing’. This is considered attractive by young researchers. Furthermore, interviewees recognised ASML as a company where you can continue learning. The complexity of the ASML products and the sheer size of the company ensure a steep learning curve for starters. It takes about a year before people feel they know their way around. The fact that people are being challenged was also considered one of the reasons why people stay at the company. Finally, the young researchers appreciated the multicultural environment that is offered by ASML and the region where ASML is located. All interviewees recognised that when many positive factors came together this helps the company to be innovative.

Research opportunities are good also at SCA. According to our interviews with researchers at SCA, the majority of the researchers’ time at SCA goes into doing research, although one of the researchers was also involved in support work for the factories. Most of the researchers mentioned that they were required to be quite broad in their research and to go beyond their specific areas of expertise in many projects.

Most of the researchers felt that their current position had fulfilled their expectations and none of them had considered leaving their research career for another job.

5.2 Recruitment process and competence requirements

As a global company, the recruitment policy of ASML is fully global. The company language is English and vacancies are advertised worldwide. The company has assembled an international network of universities and uses this network to reach out to potential new employees. There is a specific team at the HR department for university relations that tries to get in touch with universities that are of strategic importance (e.g. have technical faculties).

There are several ways through which a person can apply for a job at ASML. The regular process is by applying via the website, where a person can apply for a specific vacancy or submit an open application. Then follows a screening based on the resumes and motivational letters, checks against vacancies, and several personal interviews with a line manager and/or a recruiter. Most times, candidates also must make an online assessment in between interviews.

For people with a PhD degree, there are special recruiting events. The company annually organises a PhD masterclass, where people with a PhD degree are invited to come to the Netherlands and get to know the company. ASML also visits different universities to recruit locally. Furthermore, ASML facilitates learn-work trajectories for students at different levels (from vocational schools to bachelor).

SCA has no written recruitment policy. Open positions are generally advertised externally in all kinds of media and through employees' networks. There are job descriptions that clearly state the requirements for the different positions. These requirements are presented in the job advertisement and during the interviews. For example, an R&D engineer needs to have a Master of Science in Engineering and preferably a PhD, but job experience can substitute a PhD degree. There are however specialist positions that do require a PhD degree. Substantial emphasis is put on the applicant's personal traits, such as communication and teamwork skills, as well as experience of (or interest in learning more about) the industry.

Certain positions are only advertised internally, and on occasion some positions are not even advertised at all, but filled by current employees. When recruiting personnel with an international background, SCA does not advertise internationally, but mostly use social media or employees' networks. A newly formed recruitment unit assesses the applicants together with a recruitment manager.

5.3 Development of employees

There are standard procedures at ASML that require managers to have a formal meeting with each employee on his/her development action plan three times a year. Informal discussions take place on an irregular basis. Furthermore, there are several informal networks that an employee can join, such as the young ASML club, and all kinds of supportive structures, such as coaches for people with autism.

The amount of time employees can spend on development activities depends on what is considered to be necessary for them at that moment. This can for example be coaching on the job, but can also be a training of multiple days. There are no standard rules on the amount of time someone is allowed to spend on development activities. Young researchers rely on their managers to help them with their development action plan and getting the right support to reach their goals. The support staff receive in this regard appear to differ from manager to manager. All interviewees at ASLM considered the available support for employees to be sufficient. Managers emphasised that the support someone receives is dependent on the initiative of that person him-/herself.

SCA has some formal career development processes, although none of them is specifically aimed at researchers. One researcher mentioned that every year the managers can appoint certain persons to participate in a business development programme, which is a one-year project management course. The middle management staff try to encourage their employees to take up positions within other units of the company in order to enhance their careers.

All of the researchers at SCA felt that they were provided with sufficient resources to develop as researchers. Among the most important circumstances needed to develop as a researcher, the researchers mentioned time to monitor the trends and developments within their field, as well as an understanding from the management that although not everything you do will make more money for the company in the short-term, but can still be of value for the company in the long-term. The management staff also thought that the company provides sufficient support to their employees to develop as researchers. The strategic management interviewee noted that, apart from the discussions at the performance reviews, the company has different training programmes and offers good opportunities to attend international conferences and other events. According to the most recent employee survey, the employees of the R&D centre think that the organisation has improved considerably over the past three years regarding career development, although there is still room for further improvement.

5.4 Transparency

ASML has specific people within HR that are responsible for the transparency of the recruitment process within the company. For each applicant, it is obligatory to move through the different recruitment steps and for managers to administer what decisions are made. An interviewee stated that more internal transparency regarding the recruitment process is preferable. This could for example be on why certain applicants are being selected and others not, but also feedback for ASML recruitment-staff on their execution of the interview.

The researchers at SCA also appeared to be content with the transparency and fairness of the recruitment process. One researcher stated that he was informed about the number of applicants to the position, how many got selected to interviews, and he also got continuous update on the progress of the recruitment throughout the process. Another researcher noted that as a private company SCA has no obligation for external transparency, but internally they talk about the recruitments and as a colleague you can follow the process. The researchers felt that there was no need for changes regarding the transparency of the recruitment process. The recruitment process was also seen as transparent and fair by the middle management staff, and they did not see any need for improvements.

5.5 Key observations

- At both ASML and SCA, there are good opportunities to develop a research career, if the employee so wishes. There are also several paths that one can trait along, depending on interest.
- The research staff are most satisfied with their job; they are happy to have left academia and often think that in industry, they have good opportunities to do research that interests them, without the need to attract funding. They say that in academia it was more competitive, more result based and there was a constant pressure to publish.
- There are career development instruments at both companies, both in terms of reviews and talks with managers, and of training programmes. Some additional support for participation in conferences or events also exist.
- Both companies are seen as family-friendly and catering for a good work-life balance, and they give certain types of additional support to the staff, both economic and ‘moral’, on top of the monthly salary.
- With few exceptions, the level of transparency in the recruitment process was regarded as high.

6 Discussion

We wish to end with a couple of brief points for discussion.

In general, the universities apply a formalised career structure which essentially has the same character regardless of which university we look at. A closer investigation of the applied career path, however, reveals different ways of adjustments in connection with the official career structure. The aim of the adjustments is typically to promote talents quickly or to keep talents associated to the university in hope for a permanent position. This adjustment behaviour might be seen as a way of applying flexibility that might serve noble purposes, but it is not very transparent. It is clear that the universities use various temporary positions in order to both further test and train early career researchers, and because there are specific and clearly defined tasks that need to be carried out during a certain period, but after that period, there is no longer any need. The latter can for instance be in externally funded projects. The use of temporary positions can be regarded as legitimate in many of these situations. It is also a fact that the universities are sometimes restricted by law or other legislation to increase the number of permanent positions. Then temporary positions may be the only solution to get certain research done.

But we suspect that there is also another reason for the widespread use of temporary positions at universities. We suspect that the universities are poor at planning their research activities in a longer-term perspective, and this results in an unwillingness to employ researchers on permanent contracts. The universities do however not say "no thank you" to the early career researchers either; instead their hope for a permanent position is kept alive through repeated fixed-term contracts. So, while there are some legitimate circumstances where fixed-term contracts can be used, there is to some extent also an ongoing mis-use of them, and we think this is partly because there is a certain component of bad management at play. Why is it so that universities among all kinds of R&D organisations need to have large amounts of temporary contracts when other R&D organisations do not? Are universities worse at organising their research than private companies are? Or research institutes? The very volume of fixed-term contracts at universities seems unjustified, and therefore unreasonable.

Tenure track is, perhaps, a solution. Recruitment of new employees ought to be done consciously, and the tenure track system is offering both long-term planning possibilities for the employee and for the university, as well as an exit if expectations are not fulfilled. If tenure track was used more, the use of repeated temporary contracts could perhaps be diminished. After a postdoc period – preferably after *one* postdoc period – the universities ought to make up their minds; "do we want this person to work here?" Such a demand for good management and a longer planning horizon is no different from what is demanded of other employers in our societies.

It is also worth reflecting on the 'false' view by academic researchers of working as a researcher in industry. Researchers in academia seem too often to think that moving to industry means giving up lots of freedom and that industry does not do real research; that it is more of product development. A bit quietly they may also think that it is tougher working conditions in industry, with more strict performance requirements, hard deadlines and budgetary pressure. Such beliefs are only to a small degree true. Essentially all researchers in this study who work in industry are very happy that they made the move from university. They often think, in stark contrast to what their peers in academia believe, that they are *more* free to carry out research in industry than they were at university. They mean that in industry they are given decent preconditions to do research, since they are not obliged to do other kinds of tasks like teaching or administration. Also, they are very satisfied with the fact that they are relieved from the expectation to (constantly) apply for external funding. The companies value their research staff much, and often provide very good working conditions with good opportunities to develop if there is an interest from the employee.

A shift in attitudes among researchers in academia towards moving to research positions in industry would not only be justified, but it also connects to the issue with too frequent use of temporary positions

at universities. Would there be fewer early career researchers who bared with the insecurity of repeated fixed-term positions at university, then there would be a stronger incentive for the universities to apply better recruitment strategies and provide permanent positions instead of temporary positions.

Appendix A University of Copenhagen

A.1 Introduction to the University of Copenhagen

The University of Copenhagen (UCPH) is a multi-faculty university consisting of six faculties, 36 departments and more than 200 research centres with approx. 9,000 employees – of whom some 5,000 are researchers. UCPH has more than 3,000 PhD students. In 2017, the university had a total revenue of DKK 8.4 billion of which 25 per cent were allocated to education and 68 per cent were spent on research. 34 per cent of the research funding consisted of core funding while the other 34 per cent consisted of external funding.[3] In an international ranking of universities, UCPH is the highest ranking Danish university together with the Technical University of Denmark.[4]

The UCPH case study deals with the Faculty of Humanities and the three departments Department of Arts and Cultural Studies, Department of Cross-Cultural and Regional Studies and Department of Nordic Studies and Linguistics.[5] Within each of the three selected departments, the research is organised in specialised units:

- The Department of Arts and Cultural Studies covering six research areas organised in five research groups[6]
- The Department of Cross-Cultural and Regional Studies covering 27 research areas organised in 11 centres[7]
- The Department of Nordic Studies and Linguistics covering 11 main areas of research organised in 13 centres and 12 research groups, and the department also participates in five cross-departmental centre collaborations[8]

Apart from the formal organisation, the departments also participate in a number of research networks. All in all, their research is anchored in units (research groups or centres) which, on average, have approx. 20 employees including administrative staff. According to the interviews, each unit oversees their own specific research strategy and research activities.

As the number of research entities corresponds with the total number of employees, the three departments have 124, 209 and 250 employees respectively, see Table 2. The job structure of Danish universities is regulated, and the job structure of the three departments is in line with rules.[9]

Regardless of the size of the department, the relative number of employees holding a position in the department is almost the same in the three departments. Moreover, the job structure in the three departments is very similar not only by the type of job positions but also by the relative distribution of employees by position. This profile of the job structure, called the hourglass model, is typically found at universities. The hourglass model indicates an insufficient supply of researchers passing through training positions as assistant professors, which might have a negative impact on the future research environment as few young researchers will qualify to become an associate professor or even a professor.[10]

[3] https://introduction.ku.dk/

[4] http://www.leidenranking.com/ranking/2017/list and https://www.topuniversities.com/university-rankings/world-university-rankings/2018

[5] The other case studies only include one department but due to challenges identifying sufficient numbers of persons holding the position of Assistant professor, this case includes three departments.

[6] https://artsandculturalstudies.ku.dk/research/

[7] https://ccrs.ku.dk/research/centres-and-projects/

[8] https://nors.ku.dk/english/research/centres-and-groups/

[9] Agency for Modernisation (2015): Circular concerning protocol on certain terms of employment of academic staff at universities

[10] DFiR Brief (2016): Mister vi næste generation af excellente forskere? Notat 7

Table 2 Number of employees by position within the three departments in focus

Positions	Department of Arts and Cultural Studies		Department of Cross-Cultural and Regional Studies		Department of Nordic Studies and Linguistics	
Professor, including Emeritus Professor and Professor with special responsibilities	6	4,8%	8	3,8%	18	7,2%
Affiliate Professor	0	0,0%	10	4,8%	1	0,4%
Associate Professor	35	28,2%	49	23,4%	73	29,2%
Assistant professor (hereof tenure track)	0	0,0%	4 (1)	1,9%	2 (2)	0,8%
PhD & Postdoc	30	24,2%	40	19,1%	31	12,4%
Senior Adviser	0	0,0%	2	1,0%	5	2,0%
Research Assistant	0	0,0%	6	2,9%	9	3,6%
Teaching Associate Professor	19	15,3%	13	6,2%	0	0,0%
Teacher's Assistant	0	0,0%	12	5,7%	1	0,4%
Part-time Lecturer	15	12,1%	26	12,4%	46	18,4%
Administration	17	13,7%	25	12,0%	32	12,8%
Others	2	1,6%	14	6,7%	32	12,8%
Sum	124	100,0%	209	100,0%	250	100,0%

Source: https://artsandculturalstudies.ku.dk/staff/, https://ccrs.ku.dk/staff/ and https://nors.ku.dk/english/staff/

The job structure also illustrates that all departments have a high number of PhDs and postdocs. An alternative research career is to become a senior adviser (or researcher) but this job position is barely used (cf. Table 2).

To comply with the obligation to offer education, all departments have employees holding a position, such as teaching associate professor or part-time lecturer, dedicated only to teaching representing between a fourth or a fifth of all employees.

A.2 Recruitment and career routines and policies in place

UCPH applies the official **job structure** for academia, which includes positions dedicated to research as a professor, associate professor, and assistant professor, where the position includes an obligation to do research and teach students. Being an assistant professor is not a permanent position but rather a research training position lasting for up to four years and qualifying for a permanent position as associate professor, and, afterwards, potentially a professorship.[11]

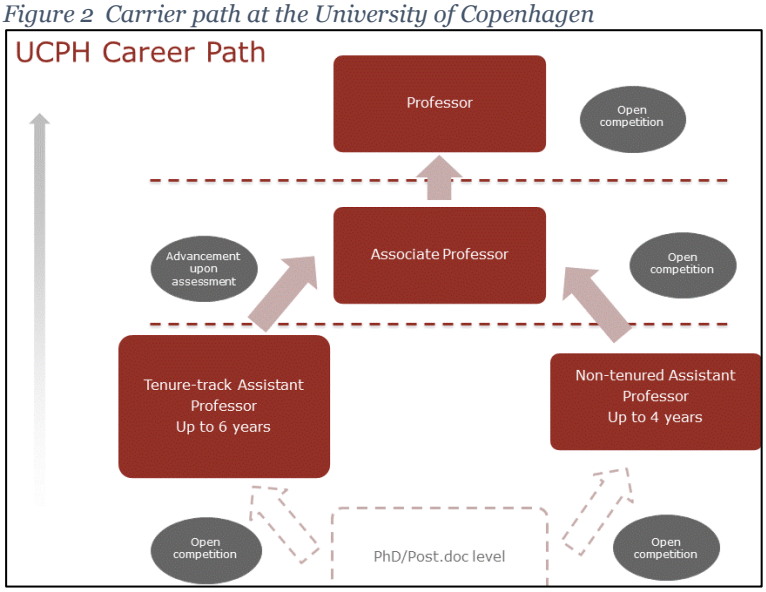
UCPH has two career paths from assistant professor to associate professor. One way is to apply for a vacant position as an assistant professor. Another way is the tenure track, where an assistant professor, after a maximum of six years, is transferred to a position as an associate professor, provided that the candidate is deemed academically qualified, see Figure 2.

[11] Agency for Modernisation (2015): Circular concerning protocol on certain terms of employment of academic staff at universities, and https://jobportal.ku.dk/videnskabelige-stillinger/karriere-paa-ku/

To qualify for a research career, a candidate must hold a PhD. A postdoc position will typically reinforce the research qualifications of a potential candidate for a position as assistant professor. However, a postdoc position can only be for a fixed period of up to 4-6 years at the same university.

Furthermore, a postdoc position will typically not include teaching students, and, consequently, not supporting a candidate in obtaining improved teaching competences. A teaching position is not considered to be a career path, but for a short period, and, in combination with a PhD or postdoc, a temporary teaching position can have a positive impact on obtaining the required teaching qualifications to be able to apply for a position as associate professor.

Figure 2 Carrier path at the University of Copenhagen



Source: https://employment.ku.dk/tenure-track/tenure-track-at-ucph/Tenure_track_career_path.GIF

According to the interviews, the Faculty of Humanities have adapted the **tenure track career path** for some years, and they intend to expand the tenure track to include the position as a professor as well. Applying the tenure track is motivated by being able to offer a permanent post which is considered to be more attractive when the Faculty of Humanities wants to attract international talented scholars. In other words, it is a way to be more competitive on the international labour market for young researchers. the Faculty of Humanities also hopes that the tenure track will have a positive impact on the university's gender balance.

A tenure track programme has been established:

> *As a programme aiming at an open-ended appointment, successful applicants are first offered a contract as an assistant professor for a term of six years, in which the assistant professor is expected to acquire the qualifications of associate professor. At the end of the six-year term, the assistant professor is promoted to associate professor if an expert review confirms that the associate professor has acquired the international level of scholarly excellence characteristic of associate professors.*[12]

As an element of the tenure track programme, assistant professors are offered a mentor to guide them to meet the required academic standards by the end of the tenure track period. During the tenure track period, their academic progress is evaluated by (1) an annual performance review, (2) a mid-career

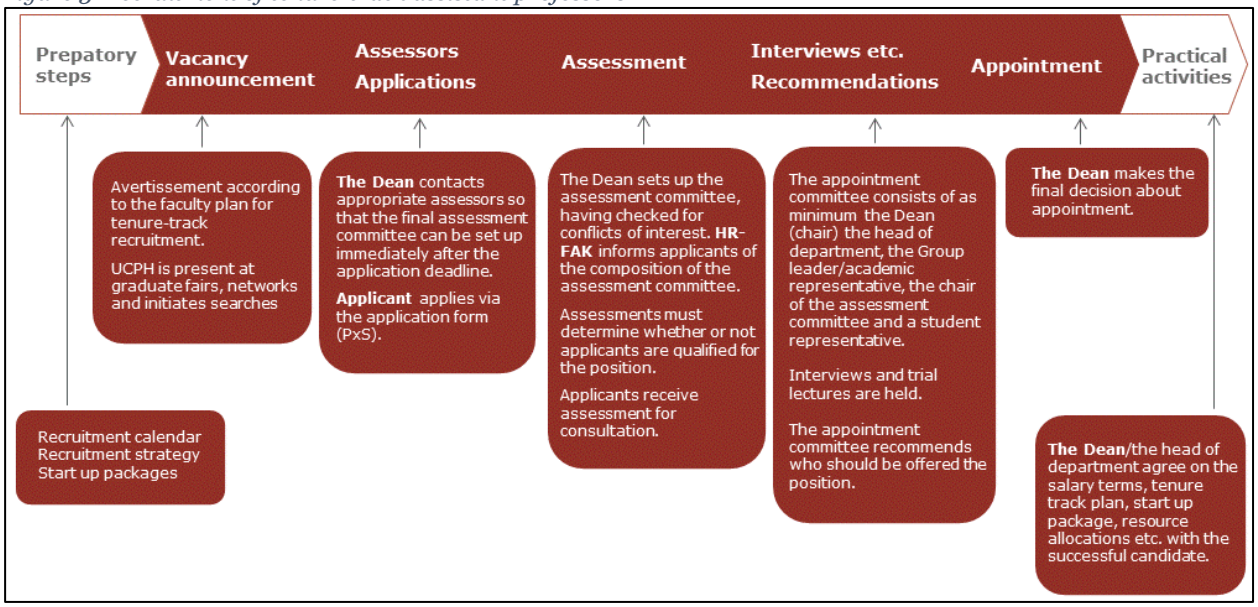
[12] https://employment.ku.dk/tenure-track/tenure-track-at-ucph/

appraisal, and (3) a final tenure assessment. A panel of – preferably external/international – expert scholars will do the final assessment.

The tenure-track programme also includes a predefined **recruitment procedure**, see Figure 3. The applicants will have to meet the following qualifications:[13]

- Must hold a PhD or have served as a postdoc or assistant professor and be able to demonstrate documented international scholarly achievements
- Teaching qualifications are not mandatory, but documented teaching qualifications and experience are an advantage
- Out-reach qualifications, including the ability to attract external funding, are an advantage

Figure 3 Recruitment of tenure-track assistant professors



Source: https://employment.ku.dk/tenure-track/tenure-track-at-ucph/Recruitment_of_tenure_track_assistant_professors.GIF

To become an associate professor, an assistant professor will have to meet eight different criteria which, in addition to the tenure track assessment, include a high level of ambition as well as criteria such as academic citizenship. By academic citizenship, the management wants to emphasise that the researchers have to be good colleagues or team players as well as loyal to the university. In other words, they must support the overall research strategy and assist their colleagues.

The tenure-track recruitment procedure is based on a number of **overall recruitment guidelines** including:[14]

- Any decision on recruiting is based on an evaluation of a range of personal (e.g., age and gender) and economic conditions, future tasks to be performed, and the demand for further research and education.
- The management is responsible for preparing the job advertisement. The management will consult relevant employees.

[13] https://employment.ku.dk/tenure-track/tenure-track-at-ucph/

[14] Retningslinjer vedrørende rekruttering og ansættelse på Københavns universitet; https://personalepolitik.ku.dk/pph/dok/retningslinjer_vedr_rende_rekruttering_og_ans_ttelse_p__k_benhavns_universitet.pdf; aligned to the government order https://www.retsinformation.dk/Forms/R0710.aspx?id=140435

However, researchers can, without any job advertisement, be temporarily employed on projects, if the project is academically evaluated and funded by private or public funds.[15]

A.3 Research career in practice

This section focuses on the employees' evaluation of and experience with research careers of young researchers, the recruiting process, and how UCHP and the three case departments support young researchers in their research career. The interviews were conducted with the management of the Faculty of Humanities, i.e., the associate dean and a research managers and young researchers from each of the three departments amounting to a total of seven interviews.

A typical career path for a young researcher consists of the following steps: First, the young researcher could be associated with a research project as a student, followed by a PhD study for three years, and postdoc for typically 3-4 years while working on two or more projects. Second, if a position as assistant professor is advertised and the researcher applies for the position successfully, he or she can foresee another 6 years in research and hope for an associate professorship.

A.3.1 The research career

The career path (job structure) described above is applied in principle, and the young researchers strive for a position as assistant professor and hope for a successful academic career that should bring them to a post as associate professor. However, both the managers and the young researchers have realised that, due to economic constraints, the number of vacancies for assistant and associate professorships is extremely limited, and seems to in the future as well, see also Table 2.

An interviewed research manager estimates that only 20 per cent of all young researchers will pass straight through the career path, the ideal job structure, as described above. Most of the young researchers will be in a situation where temporary posts and ad hoc project funding will define their research careers.

Consequently, most young researchers are extremely focused on 'staying in business' by holding temporary posts or project assignments to maintain and develop their research competences. Their hopes and dreams for the future are that they will the lucky one to successfully apply for a post as an assistant professor, or if they are already an assistant professor for a post as associate professor. Young researchers will always be striving to get on to the next position level. The interviews illustrate how a bottom-up strategic research career can be formed by young researchers striving for the next post.

A.3.2 Striving for a post as assistant professor

The young researchers express in the interviews that they apply a career strategy with a clear aim and use of similar instruments:

- The ***aim*** is to build up or improve their research and teaching competences. However, all the criteria that are part of the recruiting process for the post as assistant professor are in focus. The expected outcome is that she or he would be better qualified to apply for a position as assistant professor.
- The ***main instrument*** they use is ***funding,*** primarily external funding from public and private funds. Access to external funding allows researchers to establish temporary research projects, and, typically, young researchers are employed in fixed-term jobs. External funding is used for employing PhDs as well as postdocs. A PhD post will typically be advertised, and a normal recruiting process will be activated. For postdocs, it is essential to be part of an application for funding as a positive evaluation of a research project is also a positive evaluation of the research staff. Consequently, 'the project' can become a fixed-term appointment of the young researcher without any advertising process. Metaphorically, a young researcher expresses it as jumping from hillock to hillock, and if you are not successful with your 'next hillock', your career as a researcher can come to a sudden end. For this reason, young researchers prefer fixed-term appointments lasting at least one year. In

[15] https://www.retsinformation.dk/Forms/R0710.aspx?id=140435

addition, young researchers typically aim at an extended fixed-term appointment with an additional appointment as a teacher.

- The ***main tactical tool*** is ***networking*** and personal relationships are the crucial factor for success. By knowing people, by belonging to a research group and constantly expanding your network, the likelihood of being part of research project increases.

All in all, young researchers find this stage of their careers very difficult. Before entering the first stage of a research career, the young researchers have been made aware of the challenges and difficulties ahead. However, their experience is that it has been even worse than expected. Even though it is very common to collaborate and form networks, eventually everyone is fighting for himself or herself. As an interviewee said, 'It's the law of the jungle'. The management is aware of these 'unfortunate' career conditions. A manager characterises the research labour market as 'avant-garde' in terms of precarisation as the demand for labour mobility, by geography and by task, is even higher than seen on the labour market in general.

A.3.3 Striving for a post as associate professor

As an assistant professor, the young researcher will be very dedicated to gaining the required qualifications to become an associate professor. The driving force for the young researchers is a deep-rooted academic interest in a research topic, or as an interviewee stated, 'It is a privilege to do research'. Or as another young researcher stated, 'It is difficult not to do research, and, if I did not have the opportunity to do research at the university, I would spend my spare time on doing research.'

Having research ambitions, the young associate professors will, however, meet some challenges as research is not only about research it is also about funding, teaching, communication, as well as being obliged to do some administrative task. All in all, the young researchers are worried about all these very time-consuming tasks, and, consequently, lack of time to do research. Some young researchers find the working conditions rather stressful, and it can even have a negative impact on their research and private life (work-life balance). However, at the same time, the young researchers are optimistic as they appreciate their jobs and the very flexible working conditions.

When the appointment as an assistant professor comes to an end, new challenges appear. Lately, very few associate professors have been appointed. If the young researchers are held back in continuing their research career due to no advertised positions, there are some possibilities for 'side-stepping' and keeping their research career alive for a period:

- An academic assessment of the research competences to be at the level of an associate professor. With this assessment, the young researcher can obtain a fixed-term appointment as an associate professor. This temporary appoint is presumably conditional on external funding of a large research project (e.g., for a two-year period involving several researchers) in which the associate professor will have a leading role. From this position, the young researcher can apply for a permanent position as an associate professor without going through the training process in a position as assistant professor. However, a fixed-term appointment as an associate professor does not seem to be very common. Furthermore, it probably takes considerable resources and support from a research group to develop a successful application for funding.
- After ending the appointment as assistant professor, the young researcher can, if the faculty or department agrees to keep the researcher associated with the university in the expectation of a job advertisement of an associate professor, hold a fixed-term appointment in an administrative or teaching position.

Having the career path in mind, the research management is anxious about the declining optimism among young researchers, and especially about the high dissatisfaction level among postdocs. Due to the limited number of vacant positions for researchers, the management always recommends that young researchers, and especially PhDs and postdocs, have a 'plan B' for an alternative career in other sectors or abroad.

The management fears that future young (potential) researchers may soon find a research career less attractive, which will have a negative impact on the number of talents that will prioritise a career as a researcher.

A.4 The recruitment process

Overall, the Faculty of Humanities applies the guidelines for recruiting assistant and associate professors as outlined by the university (cf. see section A.2).

According to the interviews, the evaluation of qualifications is a stepwise evaluation where the main required qualifications are academic qualifications, based, for instance, on an evaluation of the number of publications, co-writers, citations, etc., followed by an evaluation of teaching qualifications/experiences and experiences with study administration.

Next, the out-reach qualifications are evaluated, but this element does not seem to be clearly defined as the interviewed managers and young researchers have a different understanding of the content of what constitutes out-reach qualifications. Out-reach qualifications may be clearly emphasised in job advertisements. Out-reach qualifications appear to include the applicants' vision for their own research (e.g. a research plan), the ability to attract external funding, connections with networks, researchers as well as personal qualities.

The interviewed managers indicate that excellent academic qualifications are still crucial, but the out-reach qualifications have become a more critical criterion for two main reasons. First, external funding has become more decisive for funding university research and excellent skills for preparing applications are requested. This also includes a widespread network as networks can mean access to (potential) partners for large research project applications. Second, the university appreciates researcher who can do more than research, such as facilitating or creating a dynamic research environment by forming (informal) groups of researchers.

All in all, the recruitment process appears to be transparent, and the research managers are preoccupied with developing clearer and more precise qualification criteria or descriptions. As a general guideline of the UCPH, the management is also concerned with having qualified applicants as well as gender balance (at least one female and one male applicant) for each job advertisement.

The young researchers also find that the recruiting process is generally transparent. However, the procedures related to the allocation of resource and the decision on job vacancies, formulating job advertisements, and the appointment of members of the committee to evaluate job applicants are not very transparent. All in all, these strategic decisions are in the hand of the faculty management and the departments, but it frustrates and creates uncertainty among the young researchers, especially assistant professors applying for a job as an associate professor. They find that they have worked hard and contributed to the development of the department, and then they are not informed about such strategic considerations or as an interviewee stated, 'It is strange to apply for the job you have had for six years.'

However, when recruiting for fixed-term appointments related to externally funded projects, the recruitment process does not need to follow the official procedures. If the research team is included in the application for external funding, a positive evaluation of the project is considered to include an evaluation of the team member's qualifications, and the team member can be given a fixed-term appointment without applying the formal recruitment process (cf. about networking).

A.5 Other initiatives for the further development of employed researchers

Overall, the interviewees stated that there is a common interest in developing young researchers in terms of a research career and a good working environment. However, the interviews identify two organisational layers that impact on the career development of the researchers.

First, UCHP (the faculty and the departments) has initiated different initiatives to support the development of employed researchers, e.g. **performance reviews** and meetings/workshops about developing a research career. According to the interviews, the main official instrument is the personal

performance review, which is a dialogue between the head of the department and the young researcher. It is not prerequisite for the dialogue that the parties have a direct working relationship. Consequently, the dialogue is mainly about general working conditions, such as the cooperation with and relationship with senior researchers/mentors, need for training courses, etc., and possible job opportunities, i.e., considering alternative opportunities to a career at the university. All in all, it is more about opportunities than about the research the young researchers are doing or intend to initiate.

According to the young researchers, the personal performance review is a relevant instrument to discuss overall career ambitions. Typically, the dialogue can give inspiration but concrete actions or initiatives to support or build up competences and a career are rarely an outcome of the review.

Second, the research group with which the young researcher is associated seems to be of paramount importance to the career and competence development of the individual researcher. In this setting, the young researcher is in a direct working and learning position to senior researchers (associate professors or professors). However, this relationship is typically informal as the senior researchers do not have any personnel responsibility for the young researcher nor are they involved in the performance review or receive any feedback. All in all, the young researchers think that the actual development of their competences is very informal and there is a lack of power or economic resources to help any development of a young researcher other than writing applications or being introduced to relevant networks.

Even though the management pays attention to **gender balance** and maternity leave is regulated by the employment contracts, the number of female researchers at senior level is still low. Some researchers argue that time will solve the problem while others point to some structural problems. When on maternity leave, the young researcher will be facing the challenge of maintaining contacts and networks which is crucial for forming research projects and be at the right place at the right time for being part of an application for funding research projects. All in all, a researcher on maternity leave will have to spend extra time to come back into the research environment and be a part of a research group. Moreover, as female researchers typically have longer maternity leaves than men, they more often experience that their 'career is passing by when on maternity leave'. Furthermore, some leaders among the management group recognise that the gender policy/strategy does not seem to be very up-to-date and the follow-up is weak.

A.6 Coherence between competence/skills requirements, actual valued competences/skills in the recruitment process, and transparency

We have observed that the coherence between the formal competence requirements and the actually valued competences in the recruitment process seems to be challenged due to the changing framework conditions for doing research at a university.

The first observation is that a classic research approach will value excellent research competences very high, and the department in focus also values excellent research competences. However, running a business largely based on external funding of research and education funding based on the number of attending students, the departments are obviously very concerned about recruiting young researcher that can support their 'business model' in their recruiting process. At present, a mismatch between the formal skill requirements and what is actually requested does not seem to have any negative impact on attracting excellent, qualified researchers.

The second observation is that the recruitment process appears to be very transparent. However, describing the different steps in the process ignores the actual strategic decisions (research strategy, allocation of resources and recruiting strategy) have an impact on the requested qualification and competences. These strategic decisions will typically be reflected in the formulation of job advertisements e.g., developing a very broad job description to have many applicants versus as narrower job description which could give preference to a specific candidate. An applicant might find it difficult to understand the context behind the formulation of the job advertisement.

Further, the university is organised as an organisation with formal management with the managerial responsibility (managerial right) to run the 'business' and with the power to make strategic decisions.

The case departments (and perhaps the university as such) seem to be trapped in a cultural dilemma between the formal management responsibilities of designing the needed profile for researchers to be employed on the one hand and the young researchers on the other hand except there is a more extended degree of transparency in order to match the research and recruiting strategy of the departments with the young researchers choice research topic (freedom of research).

A.7 Summary and final conclusions; lessons learnt

The three case departments have very few job opportunities for assistant and associate professors. The departments have and will also in the future apply a tenure-track programme to enhance the job security and attractiveness of being a researcher. Nevertheless, tenure-track programmes do not solve the problem with few new job opportunities.

Consequently, young researchers aspiring to be a university researcher will search for any opportunity to stay at the university hoping to be employed on a permanent basis even though the management of the departments recommend that they look for other career opportunities.

The formal career routines almost seem to have been set aside by a practice which can extend the period of being employed at the university. First, it is common practice, especially as a postdoc, to be employed in connection with a temporary post or project assignments to maintain and develop research competences. The informal organisation of the research in research groups and networks support or assist the young researcher in being included in research projects, and associate professors and professors also benefit from having access to a pool of young researchers. The negative side of this practice is that too many young researchers are kept in a position of hoping for a permanent position as a researcher which may end up being futile.

An assistant professor ready to apply for a position as an associate professor but with no job vacancy as an associate professor in sight will be facing a situation where they will have to leave the university and in the worst-case scenario a career as a researcher. The departments try to keep these persons associated with the university by temporary administrative posts for a time. A more individual approach can be to establish an externally funded research project and be employed as an associate professor in a fixed-term appointment.

I both cases, such approaches to a research career bring hope for a future appointment to become an associate professor. However, the departments accept such approaches without giving any guarantee of a continued research career.

Even if a department has a vacancy for an associate professor, the formal job routines have to be followed as well as the departmental aim of having a long list of potential candidates and wanting to select the best candidate. Consequently, where the formal or informal career policy meets the formal recruitment policy, the young researcher may have to face the fact that his or her research career has come to an end. On the one hand, the young researchers have examples on how other universities give preference to their own candidates and hope that this will also be the case for them. On the other hand, the departments fear that they will be blamed for favouritism.

In this case, some of the challenges related to the career of a young researcher appear to be in the cross field between training as a researcher at one university as a precondition for continuing a career at the same university. There are few permanent vacancies but many temporary jobs and a research environment nursing the young researchers to continue their research career but without any guarantee that they will be preferred for the next vacancy as an assistant or associate professor.

Appendix B University of Aalborg

B.1 Introduction to Aalborg University

Aalborg University (AAU) was established in 1974 and is therefore a relatively young organisation. In 1995, AAU opened a campus in Esbjerg merging with Esbjerg Engineering College.

Moreover, after a period where the university gradually had expanded its activities in the Copenhagen area, AAU established a campus in Sydhavnen in Copenhagen in 2012. Aalborg University is a multi-faculty university with five faculties.[16] Aalborg University has greatly improved its international ranking the last few years, and 'Times Higher Education World University Ranking' ranks Aalborg University as number 194 in its current world university ranking.[17]

Aalborg University is known for its problem-based and project-oriented teaching method called 'Problem Based Learning'. The Problem-Based Learning method is, among others, characterised by interdisciplinary cooperation with the business community and teamwork and stands as a strategy pillar at Aalborg University.[18]

In 2017, Aalborg University employed approx. 3,430 persons counted as fulltime equivalent (FTE) and is thereby one of the largest employers in North Denmark. About half of the employees (1,734 employees as fulltime equivalent) hold an academic position as a researcher or a teacher and 359 (FTE) are employed as PhD fellows.[19] I 2017, the total revenue of Aalborg University was DKK 2.8 billion of which most came from government support to education and research and approx. one fifth came from external funding of research.[20]

This case concentrates on the Faculty of Social Sciences with six departments of which the Department of Business and Management is in focus.[21]

At the Department of Business and Management, research is organised in 10 research groups, and the Department of Business and Management also participates in five research networks.22

The Department of Business and Management employs about 180 persons of which approx. 75 per cent are employed in academic positions, see Table 3.

At the Department of Business and Management there are 58 assistant professors, research assistants, postdocs and PhD students. They are potentially in the 'pipeline' to become the next generation of researchers at the department.

[16] https://www.en.aau.dk/about-aau/organisation-management/

[17] https://www.en.aau.dk/research/ranking/

[18] https://www.en.aau.dk/about-aau/aalborg-model-problem-based-learning

[19] https://www.aau.dk/om-aau/aau-i-tal/forskning/ In 2017, the total number of enrolled PhD students were 838 persons

[20] Aalborg Universitet (2018): Årsrapport 2017

[21] https://www.en.fak.samf.aau.dk/

[22] https://www.business.aau.dk/research/ l

Table 3 Number of employees by position at the Department of Business and Management, 2018

	Number of employees	Per cent	
Professor, including professor MSO and professor emeritus	27	16%	53%
Associate professor	42	24%	
Assistant professor	22	13%	
Senior adviser	2	1%	12%
Researcher	0	0%	
Research assistant	16	9%	
Postdoc	2	1%	
PhD	18	10%	10%
Academics	12	7%	25%
Technical staff/administration	32	18%	
Others	0	0%	
Total	173	100%	100%

Source: Aalborg University, the Department of Business and Management

B.2 Recruitment and career routines and policies in place

The career and recruitment routines at Aalborg University are based on legislation.[23,24] Several institutional programmes support the recruitment and career development that take place in the departments and research groups. The programmes include AAU Career,[25] AAU Research Academy[26] and AAU Talent Management Programme.[27] According to an interview with the Vice Dean of the Faculty of Social Sciences, the university also focuses on describing the organisational structures and expectations related to and supporting research careers.

The strategic ambition of Aalborg University is 'to provide the best possible conditions for all staff as regards talent development, career development and competence development'.[28] One of the key strategic actions in the university strategy 'Knowledge for the world' aims at developing the research groups into more strategic entities with a clear plan with regards to publications, funding applications, talent development, career promotion, the linkage between research and educational activities, and the knowledge collaboration with the surrounding society.

The following description of the job structure, career paths, and recruitment routines and other policies is primarily based on interviews with the research management.

The typical career path for researchers at Aalborg University follows the traditional career path as outlined in official legislation, see Figure 4.

[23] Personalestyrelsen (2007): Cirkulære om stillingsstruktur for videnskabeligt personale ved universiteter, and https://ufm.dk/uddannelse/videregaende-uddannelse/personaleforhold-pa-de-videregaende-uddannelsesinstitutioner/overenskomster-aftaler-og-stillingsstrukturer

[24] The official guidelines (skills requirements and employment conditions) are outlined in AAU Handbook indchttps://www.haandbog.aau.dk/digitalAssets/344/344467_oversigt_over_reglerne_vip_1.4.2015_til_aau-haandbogen.pdf

[25] https://www.careers.aau.dk/

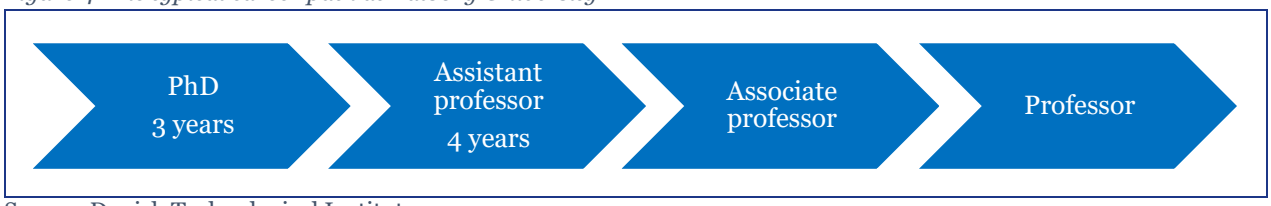
[26] https://www.hr.aau.dk/AAURA/

[27] https://www.strategy.aau.dk/digitalAssets/321/321714_aau-talent-management-programme-2017---eng-final.pdf

[28] Aalborg University strategy 2016-2021: Knowledge for the world. http://www.e-pages.dk/aalborguniversitet/383/

A typical research career path at Aalborg University begins at PhD level with a three-year PhD fellowship associated to a research group. From here, those who want to pursue a research career can apply for a position as an assistant professor. After having gained seven years of experience (3 years as a PhD student and approx. 4 years as assistant professor), the assistant professor can apply for a position as an associate professor and eventually for a professorship. Achieving the distinction of professor is done by illustrating intellectual leadership and having a high academic impact in a given field.

Figure 4 The typical career path at Aalborg University



Source: Danish Technological Institute

At the Department of Business and Management, there is a good mix of associate professors and professors who have worked at Aalborg University for their entire academic and research careers and those having experience from other Danish and international universities. If the ambition of a PhD fellow is a research career and he/she has shown research talent, the Department of Business and Management will work actively together with the fellow to nurse this career move, e.g., by ensuring they have a competitive profile for an assistant professorship or a postdoc position.

The number of vacant positions at the Department of Business and Management illustrates the possibility of a relatively straightforward career path. The last few years there have been about 25-30 vacant positions as assistant professors at the faculty and a total of about 80-90 vacant academic positions.

A tenure track programme at the Department of Business and Management has been considered, but so far there has not been a tradition (or a need) for such an initiative.

Moreover, the Department of Business and Management prefers to recruit to the position of assistant professor as they focus on building the next generation of research talents. An implication of the strong vision within education (The Problem-Based Learning method) is that no researchers at the department follow a career path as researchers without teaching obligations, only two senior advisers – and only two – hold a position as a postdoc. Achieving a postdoc is often an opportunity – or a necessary platform – to establish even stronger academic qualifications before applying for a position as an assistant professor.

Aalborg University has officially written policies on recruitment,[29] and the departments follow the legislation concerning recruitment of academic staff at Danish universities. At Aalborg University, there are policies specifically on assessment committees and assessment of candidates for academic positions. The Department of Business and Management has the responsibility to fill vacant positions according to its future requirements and strategy. The Dean of Social Science and the Head of the Department of Business and Management decide which positions may be advertised. The Head of Department and manager of a research group will prepare the job advertisement according to the skill requirement and ensure that the job advertisement appeals to many candidates regardless of nationality, age, and gender. However, gender balance is not a key issue when recruiting at the Department of Business and Management, as the management finds that the balance between the sexes is quite equal.

According to Aalborg University policy all vacancies must be official, open, and posted in English for international candidates to ensure fairness in the recruitment process and open possibilities to employ the most qualified candidates. The Department of Business and Management uses the platform

[29] https://www.handbook.aau.dk/document?contentId=339148
https://www.handbook.aau.dk/document?contentId=339145

Akadeus.com, which is a website for vacancies at business schools worldwide, for their international job postings.

Furthermore, all job applications are reviewed by an academic appointment committee consisting of representatives from Aalborg University and two other universities to ensure that the selected candidates are in fact the most qualified candidates. Based on interviews with the candidates, a hiring committee representing the Dean of Social Science (only professorships), the Head of the Department of Business and Management, and relevant researchers will review the academic and personal competences of the candidates.

An important career development activity is the annual performance and development review (MUS in Danish). These individual reviews about the researchers' careers are primarily conducted by the Head of Department or section heads. There are formal guidelines for the individual development reviews.[30] PhD fellows at the Department of Business and Management will typically have a close relationship with their supervisor with an opportunity to be guided in questions related to developing their academic qualifications and career plans.

Aalborg University also offers other career development activities, some of which focus on potential PhDs while others (such as those offered by AAU Research Academy and the AAU Talent Development Programme) focus on young researchers aiming to clarify their career plans or encourage them to enhance their academic qualifications.

For PhDs who would like a job outside academia AAU Career offers a range of activities and career-related events. They offer career counselling, career fairs, courses and workshops related to careers outside academia for young researchers in particular. Furthermore, AAU Career can help find a mentor with relevant contacts to industry.

In August 2018, Aalborg University launched AAURA (Aalborg University Research Academy), a career promotion and competence development platform targeting researchers who have obtained their doctorate (PhD) no earlier than ten years before joining AAURA activities.[31] AAURA consists of a number of activities to strengthen a researcher career, including career development planning, project management, personal leadership, co-funding, fundraising, professional communication, and network building. The AAU departments finance AAURA.

Finally, Aalborg University has talent programmes for particularly talented young researchers. The selected research talents participating in the AAU Talent Management Programme receive a grant of DKK 3 million over a three-year period.[32] During the programme, the research talents will complete a research project. This presents an opportunity for the selected candidate to develop his/her research ideas and leadership skills in the specific research project. The research talent must complete formal research leadership training within the 3-year period. In total 28 junior researchers have been accepted into the Talent Management Programme.

Besides the AAU Talent Management Programme, the Faculty of Social Sciences offers a talent programme targeting young researchers with a special potential providing them with funding to strengthen their competences following a specific career development plan and share experiences with their peers.[33]

The Faculty of Humanities and the Faculty of Social Sciences have established a network for PhD fellows called NERDS (the Never-Ending Research Development Society) in Aalborg and Copenhagen. This network is managed by the PhDs themselves and aims to facilitate debates and exchange of experiences about career on their own initiative. The network receives financial support to pay for inspirational talks.

[30] https://www.handbook.aau.dk/document?contentId=344270

[31] https://www.hr.aau.dk/AAURA/

[32] https://www.strategy.aau.dk/digitalAssets/321/321714_aau-talent-management-programme-2017---eng-final.pdf

[33] https://www.fak.samf.aau.dk/forskning/forskere/samf-talentprogram/

B.3 Research career in practice - empirical findings

In addition to the above more formal presentation of the research careers at Aalborg University, the case is also based on eight qualitative interviews with two representatives from the management of the faculty and the Department of Business and Management and three paired interviews with an associate professor/professor (research manager) and an assistant professor (young researcher).

The research career path described above is recognised by the young researchers and the management. The three interviewed young researchers hold a Master's degree from Aalborg University. As students, they became gradually engaged in research as they participated in research projects or their supervisors or heads of department encouraged them to apply for a PhD fellowship to become a researcher. The young researchers appear to have had a rather straightforward career path in terms of successfully moving from one step to another step of the career ladder. However, as assistant researchers, they are concerned about the possibility of being offered a position as an associate professor.

The research managers also confirm that researchers at the Department of Business and Management typically follow the traditional path without 'delaying' their careers by holding a postdoc or other type of fixed-term appointments. Furthermore, an alternative career as a researcher (senior researcher) is rarely used as public sector services are not very present at the Department of Business and Management.

The main reason to this straightforward career path is, according to the research managers, mainly because Aalborg University has doubled the number of enrolled students over the past decade, therefore the demand for qualified academic staff has increased. Furthermore, it was also indicated in the interviews that recruitment of academics to Aalborg can be a challenge. However, the Department of Business and Management is not struggling to attract research staff as they can also attract researchers from abroad. However, some job positions require excellent Danish languages skills as most courses are in Danish.

"Consequently, Aalborg University has a tendency to produce its own associate professors and professors," as a research manager states. The interviews with young researchers and research managers confirm this statement. At the same time, they say that the candidates must meet the skill requirements of the job they have applied for and that the best qualified candidate for the position is selected. Moreover, the management stresses that "the current practice at the department is that all positions are posted internationally and applicants are in fact to a very large extent international candidates." The three most recent job announcements from the Department of Business and Management, generated over 100 applicants and 90% of these were international job applicants. Thus, there is great international competition for the positions at the department.

Moreover, persons from industry rarely apply for a position at the Department of Business and Management and the other way around. One representative of the strategic management argues that it should be easier to switch over from the private or public sector to a position at a university and says, "We should aim at welcoming this kind of career path, especially at AAU, where we consider ourselves as very oriented towards the corporate world and have good relationships and cooperation with companies." However, candidates with 10-15 years of industry experience, according to the interviewed managers, will rarely be successful in terms of becoming professor and only in few cases associate professor.

The Department of Business and Management has a decentralised management structure. Particularly the research groups are the key platform for defining a common research strategy and for organising research and education. Consequently, each research group has a significant impact on defining the specific skill requirements and as a forum for developing the competences of young researchers. Additionally, the university strategy supports the development of competences trough specific arrangement such as the AAU Research Academy, AAU Talent Management Programme as well as the formulation of actions plans at research group level with regards to publications, funding applications, talent development, career promotion, the linkage between research and educational activities and the knowledge collaboration with the surrounding society.

The interviewed research managers, who are associated with the individual research groups, emphasised that the research groups typically represent a 'research culture' with a joint responsibility to train and assist younger researchers. Even though this practise seems to be very informal, the management stresses that there are specific and formalised requirements regarding the universities' research groups

The interviewed research managers are aware that the position as assistant professor can be challenging with a considerable workload. They aim at giving the young researchers sufficient time for teaching, including a teacher training course, and to do research (prepare articles, participate in conferences, etc.), and they minimise their administrative workload. However, they will gradually be introduced to all tasks including preparing applications for external research funding. A key instrument in the research groups to develop the competences of assistant researchers at the Department of Business and Management is half-yearly meetings to ensure progress in their competence development.

Furthermore, there is a general understanding that there are differences in how the research groups perform, and consequently how career development activities are planned. According to one young researcher, career development can turn out to be rather coincidental. Consequently, a good relationship with the research leader may be essential: "It is extremely hard to do it on your own, and to find out what it takes to reach the next career stage."

Young researchers associated with a well-functioning research group with excellent guidance of young researchers may not find some of the career development activities offered by general programmes, such as AAU Research Academy, relevant.

All in all, much of the responsibility for developing the young researchers' competences lies in the research groups which handle this responsibility in different ways. However, the management emphasises that there are specific and formalised requirements regarding the research groups and a number of strategic activities support the work provided by the research groups.

The interviewed researchers find the research career motivating because of their interest in a specific field. The possibility to engage in research in a field of one's own choice gives the researcher reason to call a research position "the greatest job in the world".

Regarding the work-life balance, the young researchers characterise the flexibility in the job as a positive feature, making the job suitable for family life even though the job is demanding and there is an extensive overlap across job and spare time. Many researchers at the Department of Business and Management also put more hours into their jobs than they are paid to do. Some researchers stress that the teaching obligations can be hard, because it takes many hours. A researcher says: "Teaching takes a lot of your time. 420 hours each semester. Only now [with 10 years of experience], have I stopped spending more time than estimated."

Another condition in the research career at Danish universities is that temporary contracts typically last for three to four years. The temporality means uncertainty about the future. However, it is emphasised that such an insecure job situation is not very common, as the young researchers, through dialogue with their research group leaders know that the Head of the Department of Business and Management wants to keep them at the university and therefore most likely will offer them tenure at one point. Beside the dialogue, this certainty is based on being one of the only teachers in a specific subject or in extensive help from the research leader to develop in the right way to rise through the ranks.

Even though the Department of Business and Management recruits in line with the official guidelines, there appear to be some unwritten skill requirements, which are often communicated through, for instance, the talent or career programmes as well as the research environment in the individual departments. The research groups also have an impact on the required qualifications and competences.

The strategic management emphasises the academic qualifications required for a position as an assistant professor and an associate professor. An assistant professor must hold a PhD and have specialised in the field of the subject that the position requires. An associate professor needs to document that his/her research has developed since the completion of their PhD and throughout their assistant

professorship/post-doctoral period and should be able to demonstrate ability to publish in highly-ranked journals. Also, to attain the level of associate professor, candidates need to have completed a pedagogical training course and are encouraged to have started attracting external funding.

Several research managers confirm that quality should be above the quantity of published papers. They also value a completed professional postgraduate teacher training course and they prefer someone that has shown collaborative skills and responsibility and takes initiatives, for instance, having experience with coordination, conferences, or development issues.

These expectations are only partly clear to the interviewed young researchers. When asked about the required qualifications for a position as an associate professor, they state that teaching competences are important to some extent because teaching is a significant part of the job (approx. 60 per cent of their time is spent on teaching and 40 per cent on the rest of their work). Besides teaching, the researchers mention other skill requirements such as professional postgraduate teacher training, experience with administrative tasks, peer reviews, and participation in conferences as elements that are considered. They also state that the most important thing is to show convincing research at a high academic level. This includes publishing a number of papers in scientific journals and preferably some of them in high-ranking journals.

Nevertheless, some of the interviewed researchers find that these expectations are not always concrete and they think that is not always clear what is expected of them. Some researchers think that especially the requirement regarding publishing papers is unclear in terms of the required number of papers and the ranking of the publishing journal, and they think that it is not transparent what is expected of them either formally or informally. They find that their research group and the professors are the best help when it comes to finding out what the next career step requires of them. However, the professors have sometimes different opinions of what is most important for becoming an associate professor. Some professors say quality before quantity while others say the opposite concerning publications. Exactly when it comes to the question concerning quality vs quantity, the young researchers that we interviewed asked for a clear strategy.

The Head of Department states that the department is aiming for more transparency and the Faculty of Social Sciences is working on defining a clearer policy which will include a formalised set of performance and qualification expectations relating to each academic job category.

B.4 The recruitment process

Formally, the recruitment process follows the official guidelines. Like other Danish universities, research positions are offered via open and international job advertisements. Job advertisements are typically drafted by the research manager of a research group and are aimed at the possibility of matching both the ambitions of the candidate as well as the needs of the research group/the university. Advertisement drafts are discussed with the Head of Department taking specific needs from study programmes into consideration.

If the university knows a qualified candidate with certain relevant experience, it is possible to ask for this experience or certain qualifications in the job advertisements. A researcher says: “Both sides were interested in the employment. A position was posted which was customised for me”, and the researcher continues: “I wrote my PhD here. Often they will create a job that they hope their candidate will apply for.” From the research manager’s perspective, this is also a recognition of the researcher’s work and competences and it gives a good social working environment to know that there are realistic chances of advancing to an assistant professorship. However, the Head of Department emphasises that these statements clearly reflect an old practice which is not the policy at the department today where all job announcements are open calls that are posted internationally. Job advertisements are also worded in relatively broad terms to attract as many qualified candidates as possible to a given academic field.

During the first stage, the academically qualified candidate will be identified by an academic assessment committee consisting of an internal and two external assessors.

Next, an independent appointment committee with a representative from the university (Dean or Head of Department) will assess all the candidate's competences (teaching skills, personal qualities, etc.), academic qualifications, as well as the candidate's motivation and ambition as a researcher. There are, as the management emphasises, standard guidelines and schemes for assessing the competences of the candidates and they are provided to the assessment committee prior to their assessment work. Some research managers state that they check the candidates' previous jobs and use personality tests, etc., while others do not recognise these recruitment instruments.

The interviewed young researchers think that the recruitment process is fair as the assessment committee ensures that all qualified candidates are considered. However, the second part of the process during which the new employee is selected by the department is less transparent, and one young researcher mentions that is difficult to know what the selection is based on.

B.4.1 Other initiatives for further development of employed researchers

Currently, the Head of Department is responsible for about 140 academic employees. When it comes to the annual performance and development review (MUS), the Head of Department is supposed to conduct reviews with all the employees, which is very challenging. Aalborg University is in a process of changing this set-up and introducing a section structure where a head of section will have this responsibility for approx. 35 academic employees.

According to the interviewed researchers, other factors can be an obstacle to developing a research career. To provide the young researchers with sufficient support to develop their careers, the young researchers agree that it is necessary to change the amount of teaching hours they are required to do, and that they need more financial resources to develop their networks and participate in conferences.

Regarding to the financial support, the Faculty offers a financial programme that supports participation in conferences, etc.

Overall, the interviewees' state that the possibilities to develop as a researcher are present, but very often the researchers need to make the first move or ask for support themselves. The young researchers state that there are various opportunities for guidance from colleagues, research leaders, and strategic leaders, and, usually they are prepared to guide them.

B.5 Coherence between competence/skills requirements, actual valued competences/skills in the recruitment process, and transparency

Overall, the Department of Business and Management follows the official guidelines for the academic job structure (career path), recruitment process, and career development, and recruitment is supported and nurtured by specific arrangements, platforms, and activities at university, faculty, and departmental level.

However, the guidelines are applied in an informal practice anchored in the individual research groups of the department. There appears to be some room for specific and decentralised competence and skill requirement as research groups or research managers (of a research group) can propose specific requirements when drafting job advertisements, and the impression from the interviews is that the research manager will not always have a general understanding of the skill requirements. However, to strengthen transparency in performance and skill expectations at the Faculty of Social Sciences, models for assessing academic performance have been in place for years and currently a model describing performance and skill requirements relating to each academic position is being created.

Furthermore, it is the impression of the interviewees that the research managers can also propose a list of required qualifications and competences for a specific vacant position to the Head of Department. As a young researcher (PhD fellow or assistant professor) associated with a research group, they also have an informal way of being told about the actual requirements of a job.

All in all, it is difficult to argue for any mismatch between competence/skill requirements as outlined in the formal documents and the actual valued competences/skills in the recruitment process. However,

there is a need for more transparent performance and skill requirements relating to each academic position and the faculty is therefore currently working on this.

B.6 5. Summary and final conclusions; lessons learnt

Aalborg University is a relatively young university where one of the key pillars in the strategic development of the university has been to develop the problem-based and project-oriented teaching method 'Problem Based Learning'.

The research groups have developed into a main strategic platform for organising teaching and setting the strategic targets for the research, education, and development of young research talents. The overall impression is that the research groups have had considerable freedom not only in terms of research but also in the way informal structures for career development and recruitment have developed. The young researchers have been enrolled in a social structure that supports the young researchers' academic development by personal guidance, information- and knowledge-sharing concerning research strategies and recruitment.

Despite the relative autonomy of the research groups, the career and recruitment routines at the Department of Business and Management are based on legislation on job structure and the general requested academic qualifications as well as overall recruiting guidelines

In the last decade, Aalborg University has doubled the number of enrolled students, and consequently, the demand for qualified researchers has increased. Recently, Aalborg University presented a new overall strategy for the university, and specific career development activities, talent programme and recruitment guidelines are in place at different organisational levels, and more specified and guidelines concerning academic expectations etc., are in progress of being created at the Faculty of Social Sciences.

Even though the established structures might be changing, some relevant lessons can be learnt from the research managers, the research group, and the young researchers.

Thus, a research career at the Department of Business and Management at Aalborg University appears to be straightforward as the young researchers' follow the typical career path and very few candidates are in temporary positions such as a postdoc position.

The research group works as a solid platform for guiding the young researchers in terms of developing their research competences and teaching skills. The research managers appear to take a responsibility for the individual researchers as well as for the entire group. The formal structure such as half-year meetings and the informal structure such as personal guidance and information on career opportunities in the group make the young researchers feel confident about their research careers.

The research managers have an eye on talents not only among PhD fellows but also among master students. The research managers encourage talent to apply for and enter a research career. Even though the research managers cannot guarantee a successful research career, there appears to be an informal 'contract' stating that the research managers should work actively to include young researchers with an excellent performance in the research groups.

At Aalborg University, the management is aware of securing a fair and transparent recruitment process. Any recruitment to a research position is based on an open and international job advertisement and the candidates' research qualifications will be assessed by an independent appointment committee. However, a well-functioning research group cannot rely on excellent academic skills alone but will also have to take personal qualifications and competences into consideration. The research managers typically help define these requirements together with the Head of Department, and they may differ from research group to research group. In this respect, the interviewed young researchers indicated that the skill requirement and the recruitment process can appear not to be transparent when applying for a vacant position.

Appendix C University of Southern Denmark

The University of Southern Denmark's (SDU) Faculty of Health Sciences is one of five faculties. According to the Faculty of Health Sciences its strengths are research in public health, biomedical, translational, and clinical research within illnesses that may strain the public, the individual and society. They aim to discover illnesses' biomedical foundation, occurrence and development in the population, their influence on quality of life and ability to function as well as the diagnostics and treatment.[34]

The faculty has eight institutes, one of which is the Department of Clinical Research. The Department of Clinical Research has 44 research units that correspond to different clinical departments and centres at Odense University Hospital (OUH). Furthermore, the department manages several health-related education programmes such as the master's programme at the Medical School as well as research undertaken at OUH. This collaboration is very important, and most researchers are employed part-time both places.

In total, SDU employed 3,772 full-time staff in 2017 (in full-time equivalents). The Faculty of Health Sciences employed 1,013 full-time staff, and the Department of Clinical Research employed 210 full-time staff.[35]

Table 4 shows the number of persons employed at the Clinical Institute. Since many are employed only part time, the total number of individuals is notably higher than the 210 full-time equivalent positions.

Table 4 Overview over number of staff in at the Department of Clinical Research

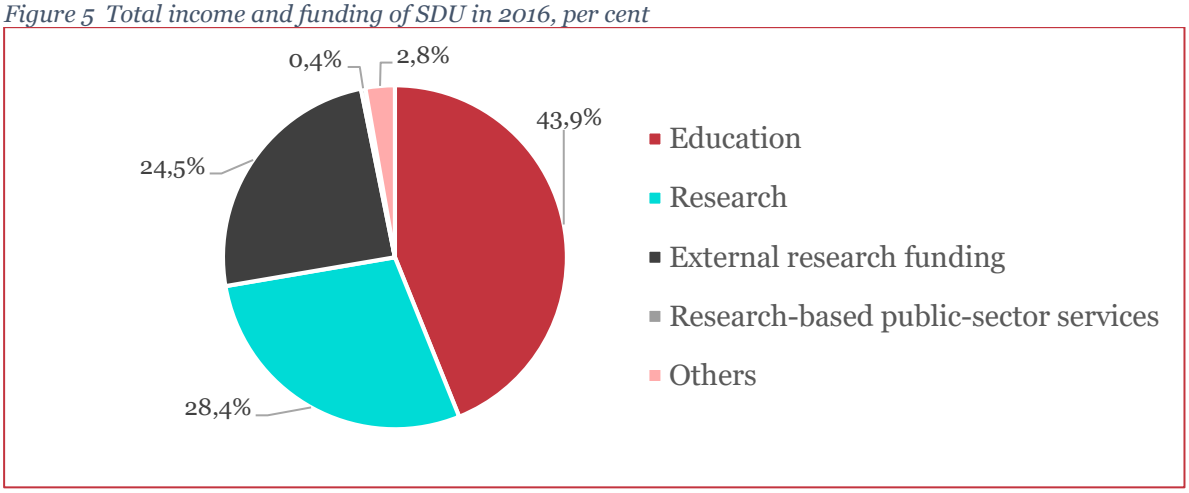
Position	Number	Percentage
Professor	111	14,7
Adjunct Professor	68	9,0
Clinical/external associated professor	157	20,8
Associated professor	43	5.7
Post doc/assistant professor	36	4,8
PhD students	301	39,9
TAP	14	1,9
Other	25	3.3
Total	**755**	100

Source: Material provided by SDU

The annual revenue of SDU was DKK 3.0 billion in 2016. The largest share of the revenue, 53 per cent, is dedicated to research originating from basic funding and external funding, see Figure 5. The second largest part of the revenue, 44 per cent, is allocated to education.

[34] SDU om SUND: https://www.sdu.dk/da/om_sdu/fakulteterne/sundhedsvidenskab/om_sund
[35] SDU statistics: http://statistics.sdu.dk/QvAJAXZfc/opendoc.htm?document=wbper cent5Cstatistiskper cent20per centC3per centA5rbog.qvw&host=QVSper cent40adm-qvia0b&anonymous=true

Figure 5 Total income and funding of SDU in 2016, per cent



Source: SDU (2017): Tabeller og tal, https://static.sdu.dk/Flexpaper/aspnet/Flex_document.aspx?doc=/sitecore/media%20library/Files/epage/Om_SDU/Dokumentation_tal/Tal%20og%20tabeller/Tal%20og%20tabeller_webpdf?sc_database=web&doc=/sitecore/media%20library/Files/epage/Om_SDU/Dokumentation_tal/Tal%20og%20tabeller/Tal%20og%20tabeller_webpdf?sc_database=web

C.1 Recruitment and career routines and policies in place

At SDU, across all faculties, it is expected that official regulations are followed. These include and surpass the 'Circular concerning protocol on certain terms of employment of academic staff at universities',[36] which contains the Danish legislation regarding recruitment of academic staff. The process from formulating a position and the responsibilities included in that position can be found in the recruitment rules and strategy.[37]

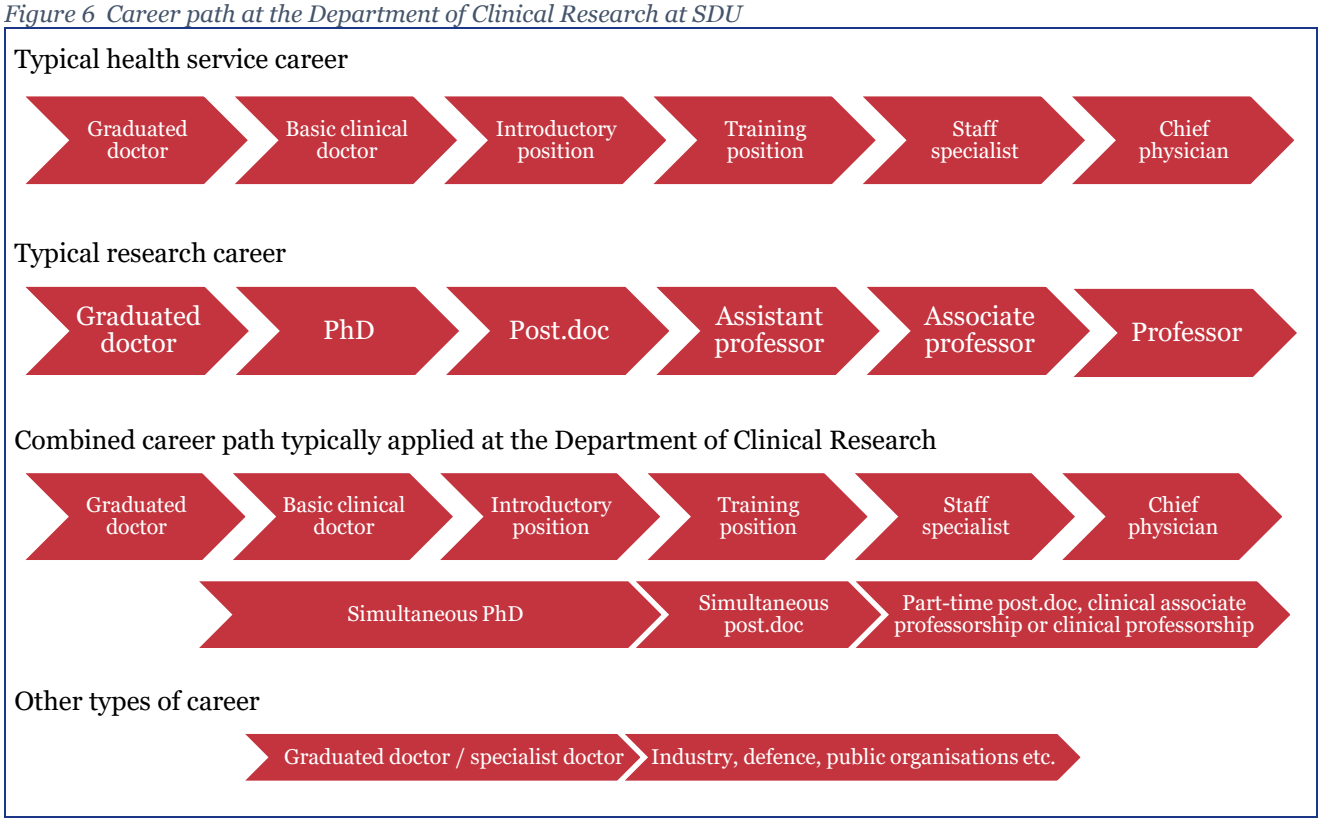
C.1.1 The typical career path[38]

A career path at the Department of Clinical Research at SDU may unfold in different ways because research in the clinical area is typically entangled with the more practical clinical education. As demonstrated in Figure 6, one option is a typical research career moving linearly from PhD to professor. However, a researcher can also combine a clinical career with a traditional research career where the researcher takes a simultaneous PhD, postdoc and part-time clinical associate professorship and a clinical professorship. Researchers are typically employed by a percentage by the university while they continue to perform clinical work at the university hospital, thus choosing a combination career.

At the Department of Clinical Research, the traditional research career path is, according to the head of department, rarely used, as the combination of clinical work and research is a strategic focus for the department and OUH as it adds value for the patients. Furthermore, it is difficult to fund research positions that do not involve part-time clinical work, as it is too costly for the university to keep up with such a number of staff, and few researchers choose this path since the salary is significantly lower at the university. People who only do clinical work for several years have fewer opportunities to become researchers eventually, since they do not live up to the demands regarding publications. Therefore, most typical research careers involve part-time clinical work and part-time research. These two elements are related, since the researchers work in the same area as their research, and their research subjects are often their patients.

[36] Uddannelses- og Forskningsministeriet: Bekendtgørelse om stillingsstruktur for videnskabeligt personale ved universiteter
[37] SDU: Fælles tværgående strategiske handlinger – Håndbog i rekruttering og om boarding af talentfulde videnskabelige medarbejdere p. 5ff
[38] This case focus at the career path of researcher holding an academic education typically within general medicine and do not include researcher with an education as midwife, ergo- & physiotherapist and the like.

Figure 6 Career path at the Department of Clinical Research at SDU



Source: Material provided by SDU

Aspiring young doctors may get a research year before writing a PhD during which they write a pre-graduate assignment to get a sense of the work of clinical research. This year further serves to demonstrate to the scientific staff and researchers whether the candidate is well-suited for making a career within research.

In contrast to a typical career path for researchers, the Department of Clinical Research mostly does not employ assistant professors, though theoretically it could. The reason for this is that first there is no tradition for doing so, and, second, most people who become clinical associate professors have taken a PhD or a postdoc and have since become a specialist doctor, and from there they go straight to chief physician and clinical associate professor. One of the interviewed professors stated that at the Department of Clinical Research they do not need another position that teaches medical students and does research.

As a clinical associate professor, most of the work is placed at OUH doing clinical work and teaching medical students. There is no requirement to do research for clinical associate professors. If they wish to do research, the university does not pay for it; they will have to acquire funds by applying for them elsewhere. The university merely pays for the teaching time and the clinical work. They have the possibility to become main supervisors and can use university resources. In such cases, they have a few different models they can use. One model is that they are employed to do clinical work and teach three days a week, and the last two days are 'days off' where they can do the research they like if they have found the funding themselves. Another model is that the researchers work full time in the clinic, and then do research when they finish their normal workday. One of the professors interviewed in this case said that this time is called 'leisure research' colloquially. Most the people in this position are first chief physicians and second clinical associate professors.

C.1.2 Recruitment rules and policies

SDU's recruitment strategy includes a thorough directory of elements that recruiters must use when finding and hiring new staff.[39] Thus, there are tools for making a preliminary analysis for deciding what type of profile (both regarding qualifications and personality) is requested. Personality tests and tools for leading the conversation are offered. Advice and strategies for planning the hiring process, advice and legislation regarding gender are also included. There are guidelines on how to compose the appointments committee and how to perform the interview for the job and maybe a visit to the research group the candidate will be affiliated with.

At the Department of Clinical Research, the recruiting is different according to the level at which you are being employed for. For PhDs and postdocs, most candidates apply for funding in collaboration with the main supervisor, hospital, and university. The candidates go through an approval process by SDU, and if they are approved, and if the application goes through for funding, the funding and the position goes to the person in question. In these cases, there is no need to publish the position publicly, because the funds are secured with the candidate in mind, and the position is only part-time at SDU and part-time at OUH where the research can be done either entirely at OUH or entirely at SDU or in any combination in between. The recruitment of a clinical associate professor is also a split recruitment. Thus, the person will be working for the hospital clinically and teaching for the university. Since the university is paying for the teaching, there has to be a public advertisement of the position. With regard to assistant, associate and clinical professorships, the department follows SDU policies of having at least three qualified applications and advertising both in Denmark and internationally.

SDU also has a policy for dual careers in case researchers are married and bring their spouses with them. In that case, help is offered to arrange a job for the spouse. Once the researcher is employed, there is a process for on boarding that the recruiter should follow. The procedure includes mentoring arrangements, Danish courses if needed, help with building networks, etc.[40]

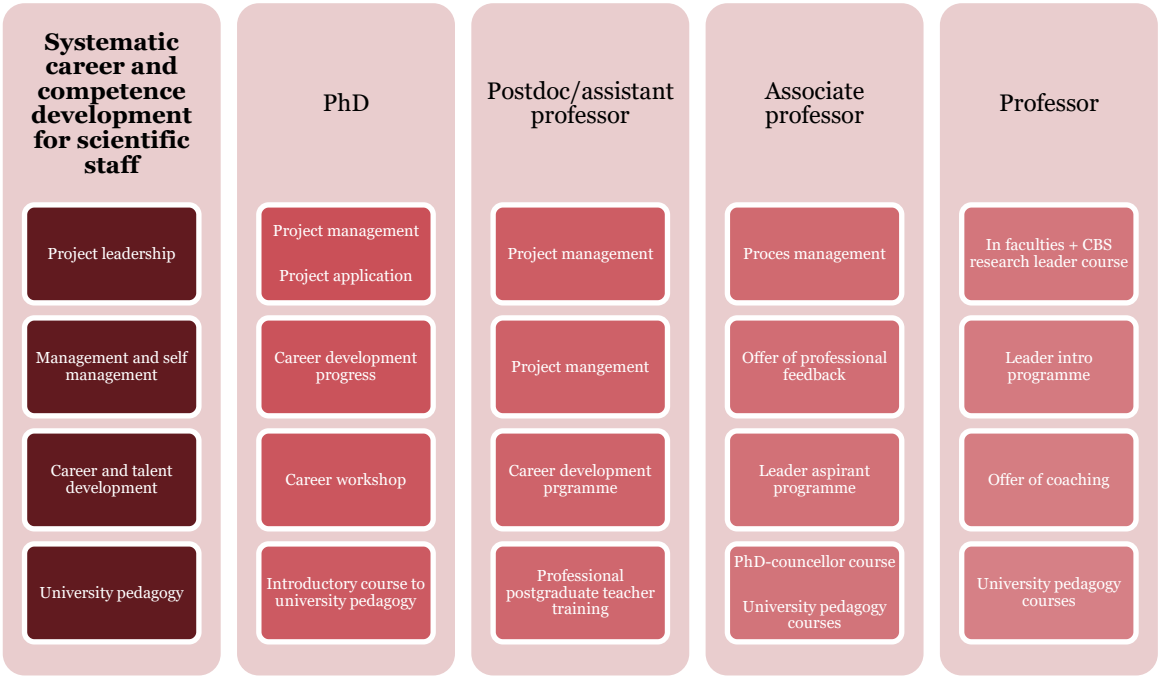
C.2 Systematic career development

Across all SDU faculties, there is a plan for systematic development of the careers and competences for the academic staff. Figure 7 illustrates the different possibilities for developing the career and competences of the researchers at SDU systematically in accordance with the structure of the different career steps. Thus, all steps have possible development tools for project leadership, management and self-management, talent development, and pedagogy that correspond to the needs of the level that the researcher is at a given time. This includes, for example, professional postgraduate teacher training courses for postdocs and process leadership courses. It is emphasised, however, that these are the only possible career development tools and that not all researchers make use of all of them.

[39] SDU: Fælles tværgående strategiske handlinger – Håndbog i rekruttering og om boarding af talentfulde videnskabelige medarbejdere

[40] SDU: Fælles tværgående strategiske handlinger – Håndbog i rekruttering og om boarding af talentfulde videnskabelige medarbejdere

Figure 7 Systematic career and competence development for scientific staff



Source: Material provided by SDU

Furthermore, SDU has a career development programme targeted at young researchers such as postdocs and assistant professors. Note that they rarely employ assistant professors at the Department of Clinical Research, but their postdocs are offered the same career development options as assistant professors at other departments. This group experiences a shift in their responsibilities since they are expected to self-manage to a higher degree than PhDs and postdocs. Therefore, SDU offers a programme that includes courses on publication strategies, academic networking and visibility, career paths and patterns as well as strategy planning. The programme is by application only, essentially meaning that it is not offered to everybody.[41]

C.3 The research career – split employment

In addition to the presentation above based on written material relevant to describing issues related to research careers, this case study is also based on eight qualitative interviews with two representatives from the strategic management (the dean and the head of the department) and paired interviews with a research manager (professor) and a young researcher (PhD/postdoc), in total three pairs.

Interviewees from all employment layers explained that most researchers in the Department of Clinical Research are in fact not employed solely by SDU. Instead, they are part of the dual career path, where they work in the clinical departments at OUH and are also employed by SDU to do research. Most of the interviewees said that there is not a very hard line between the two employment types, as their research often includes the patients they are treating at OUH. In some cases, a percentage of the employment is in either place, meaning that the researcher in question may have 10 per cent employment at the university and 90 per cent employment at the hospital. In other cases, the course of the career is more asynchronous, meaning that the researchers switch between their clinical and academic careers until reaching clinical professorship. In the clinical professorship, there is no longer distinguishing between the two paths as clinical professors do both clinical work and research.

[41] SDU HR-udvikling om kompetence- og karriereudvikling for VIP

The combined and even split employment at both SDU and OUH has several practical implications both for the researchers in question and the recruitment process.

The time spent at the hospital is attractive for the researchers. From a strategic point of view, the two-part employment model is very useful because the researchers develop double skills and it enables them to test their results in the clinic. The two-part employment model also ensures close collaboration across the two organisations, which is a part of the overall strategy, as pointed out by a representative from the strategic management. One head of department also stated that they prefer researchers who are grounded in clinical work so that the research they do is more practically applicable.

All in all, the clinical obligation is a dimension that makes the Department of Clinical Research different from other departments' research careers. This also means that the time devoted to research is around 10-20 per cent for the researchers in this department and this can limit what can be achieved compared to the researchers' initial expectations. One researcher says:

> *I thought I would get more research done. But with only 20 per cent time devoted to research, it is hard to keep up the efficiency. But perhaps that is self-evident.*

Nevertheless, the researchers stress that they would not do without the clinical part of their job.

C.4 Recruitment process and skills requirements

The professors in recruiting positions make a point out of hiring young researchers (PhDs and postdocs) they know from their medical education and training. Typically, professors will have included a specific young researcher (typically PhD-students and postdocs) in an application for funding and if the funds are successfully won, it is not necessary to advertise the position as the research aim and the person in question will be approved by SDU.

There are, according to an interviewed professor, mainly two types of recruitment. First, they typically recruit through personal acquaintance. Medical students can do a pre-graduate assignment where they get a taste of what research careers are like. If they have done well and are interested in the field, they are encouraged to proceed. They then proceed to write their PhD theses in the same research group they were part of as students. The second recruitment model targets people who have finished their medical training – PhD fellows. The recruiting professors from the university hospital know the young candidates, but they must have at least one publication on their CV before they can be employed as PhDs. Once the professors know who they want as their PhD or postdoc, they collaborate on writing a protocol, applying for approval from the faculty for the project and the proposed candidate and then apply for funds. Once all this has been approved, the position (as PhD or postdoc) does not have to be publicly advertised since the funds for the project are targeted at the proposed candidate. In this process, an assessment committee evaluates both the project and the candidate.

As mentioned above, the university is interested in employing young researches whose projects are already financed by external funding for PhD and postdoc positions, if the research is relevant and in line with other research projects of the university. It is an advantage for the university to have young researchers associated with the university who develop knowledge and publish papers without having to finance them. If a researcher has managed to raise money for a project, it can be very helpful when applying for a position at the university. One young researcher explained:

> *Based on my interests, I raised money for a research project by myself, then I contacted the university and sought employment with reference to my already planned project and financial resources.*

The department agreed and posted a job advertisement targeted at the specific project, but the process went through a public job advertisement. This example also shows that positions can be targeted and modified for specific researchers and specific research projects of which some of the interviewees knew several examples.

Another researcher, who was also encouraged to apply for a position, found the recruitment process uncomplicated and transparent and stated that after a conversation with the department "it was clear what the application should contain and what was to be prioritised". The researcher also had the opportunity to see the written assessment notes. Another researcher emphasised that the process is hard and difficult because obtaining the funds is difficult and hard work. The funds are necessary to get part-time employment at the university, and if no funding is obtained the researcher in question will merely work in their clinical career.

The researchers are expected to write applications for funds, teach, and train young students in the laboratory and write papers.

> *Teaching is highly prioritised at the university. If you can win your own financial resources, it is also highly prioritised. These things take time from your research, so it also has negative effects.*

… a researcher points out, but:

> *Any large funds you have raised yourself ease the way to be considered for a permanent position.*

This is in line with another researcher who stressed:

> *This is a world where you are dependent on your ability to raise the resources you need on your own. Otherwise it will be very difficult.*

It is also an advantage to take a year abroad to be a part of a research group abroad. A young researcher stated:

> *Mobility and international collaborations are highly prioritised in the allocation of positions and funds.*

Another researcher found it less clear what is expected of the researchers:

> *I don't think is clear. Sometimes I am still in doubt about what the structure around me expects.*

Therefore, this researcher makes sure to engage in dialogue with the Head of Department to gain knowledge on how to move up the career ladder.

As highlighted above, the combined career path of the Department of Clinical Research rarely includes clinical assistant professorship and consequently no applied recruiting routines will be presented in this paper.

For clinical associate professors, jobs are posted nationally aiming at a position at OUH. The candidates are assessed with a focus on both research-related qualifications and clinical qualifications. The most important qualifications are the clinical qualifications, since some of the clinical associate professors do not usually do research or apply for funding. The department value that the candidate is a talented clinician, preferably having training and experience in teaching, and it is an advantage if the candidate holds a PhD, but it is not decisive.

Clinical professorships are posted both nationally and internationally. The recruitment processes involve assessment committees from the hospital and the university. The hospital committee evaluates the clinical competences and the university committee evaluates the research-related competences by means of external reviewers. Typically, both research and clinical competences are important, but the research-related competences outweigh the clinical competences in a few of these positions. It is important to note that a clinical professorship is not solely obtained by a candidate who has been a clinical associate professor before. It can be an advantage, but it is not strictly necessary. It is important that the candidate has three main qualities, i.e. 1) research-related experience measured by a high

number and weight of publications, 2) experience in the clinical field in which the clinical professorship is, 3) pedagogical qualifications measured by teaching experience and courses. To live up to the research qualifications, it can be an advantage to hold a PhD, since PhDs learn to do research, apply for grants, and publish articles. To live up to the pedagogical qualifications it can be an advantage to come from a clinical associate professorship position, since clinical associate professors teach.

C.4.1 Time management

It is often expected that the researchers spend many hours researching, teaching, applying for funds, and publishing articles. This is apparent in some of the interviews with researchers. A research career is attractive for people who are highly motivated to do research and who are interested in putting many hours into their research. One researcher says about the average number of working hours per week:

> *Sometimes it is 50, sometimes 37. Never fewer than 37 hours. There are of course extra hours of interest.*

This is a recurring point in many of the interviews. However, for many researchers the number of hours spent on research is not merely from interest or motivation in the specific field, it is also necessary to put in extra hours. One researcher stated that to prioritise the family:

> *You cannot put as many hours into your research as before you had children. It has consequences for your research career because you will not get as much funding for your research.*

Even though the research managers show understanding and the researchers formally live up to his or her 37-hour contract, a research career needs funding and a researcher competes with other researchers.

Typically, anyone who chooses the research path must manage their responsibilities such as teaching and researching, as well as doing clinical work at the hospital. One researcher said:

> *I primarily work in the clinic, but it is hard balancing the time, working in two organisations. But I am interested in both fields.*

C.5 Development: network and research groups

Both researchers and research leaders underlined that the research group is of great importance for careers. A research manager explained that their task in the research group is to support young researchers in their careers, introduce networks and ensure that the researchers take part in projects so they can publish papers. Sometimes they make applications for funds together. One group won DKK 10 million together. In some research groups the support has a more general approach while in others it has a more individual approach.

SDU offers courses in teaching and project management, which the researchers think help to develop their skills. The researchers point out that the most important factor for developing as a researcher is networking, to know people working in the same field, and that senior professors take time and interest in discussing their projects. “This is where you truly develop”, one researcher said and continued, “Even though you are responsible for your own development, feedback is very useful”.

The above-mentioned elements are found in a good research environment, and the researchers stress the importance of internal collaboration and the importance of senior professors helping young researchers with new contacts and introducing them to other researchers with whom they can collaborate.

However, most progress happens at the researchers’ own initiative. If a researcher has career ambitions, the researcher needs to investigate what the requirements are, but some of them find that expectations are not always clear. One researcher said:

> *I don’t know, what is expected of an applicant for at clinical professorship, and if I decided to go for this position, I would contact [the department] and ask, how to*

> *reach my ambition. I think it would be individual what you have to do, so to ask them, is probably the right method.*

In line with this a research manager stated that it is up to the researcher to be investigative and find out which requirements must be achieved to reach the next career step. However, it is still the research managers' responsibility to assist them in this process. One research manager explained that the guidance is mostly based on encouraging talents to apply for positions at the next level, for example, as an associate professor if they are already an assistant professor. Furthermore, they may help them find a place to become a chief physician since they have to be based as a consultant physician to do their research as an associate professor.

Most clinical associate professors and professors do not experience systematic career development, because most of their development happens at the other half of their career track, meaning the clinical side. Clinical professors and research active associate professors can get courses in project leadership and related training in agreement with OUH and the head of department. One professor calls the position of clinical associate professor a 'side-line occupation' next to the chief physician position they also hold.

C.6 Coherence between competence/skills requirements, actual valued competences/skills in the recruitment process, and transparency

C.6.1 Career path

Seen from the outside, the career structure does not appear to be very transparent, as the academic career path is merged with the clinical career path. The form of the positions can vary and the demands for being employed vary too.

Postdocs are affiliated with clinical departments at OUH, sometimes with only 10 per cent of their contract dedicated to SDU, most of the clinical associate professors do not do research or apply for funds, and instead they teach and do clinical work.

In the Department of Clinical Research, it is only the clinical professors that do research, and they still keep half of their time to do clinical work. The demands for becoming a clinical (associate) professor include extensive clinical work and experience, as the candidates are chief physicians at the same time. It is not necessary to hold a PhD or a postdoc to become a clinical associate professor, nor is it necessary to have been a clinical associate professor to become a clinical professor. Though these experiences are welcome and will definitely be an advantage – not having them will not disqualify candidates. However, according to one of the interviewees, the practice of hiring scientific staff outside the combined career path is diminishing.

All in all, the required academic skills include abilities to do research and work clinically, and moreover a candidate will often meet very high demands within a medical specialty. As high-level skills are required, particularly clinically skills, the requested scientific skills are adjusted to this, such as the required number of publications.

C.6.2 Recruitment mismatch for PhDs and postdocs

When it comes to PhDs and postdocs, the recruiting strategy is less open to all than advertised. Officially, the recruitment process is open, international, and requires at least three applicants, and the tradition with creating positions targeted a specific talent has been phased out. This is what a representative for the strategic management level stated, but he later added that exceptions can be made. Interviewees from different levels said that there are currently no researchers from the Department of Clinical Research who are following the traditional research path. This in turn means that they do not have to post the job offer internationally or have three applicants. In fact, one of the professors stated that most people at the Department of Clinical Research who pursue a research career are internal candidates from SDU who have done a pre-graduate assignment. They have either been identified as talented by

researchers or wish to remain there and contact them. One professor also stated that posting positions publicly means that there needs to be full funding beforehand.

However, this is not the case when it comes to clinical associate professorships and clinical professorships. With these types of positions, the jobs are posted and go through all the relevant channels to live up to the transparency.

C.6.3 Transparency

Several researchers emphasised that the recruiting system is highly transparent and that they were aware of what was needed from them at all times. This seems to be true once the researchers get past the postdoc level, but before this level there is little transparency in the hiring process, and applicants that are employed are mostly the ones that are already in the environment. A few researchers in recruiting positions mentioned that the recruiting system is not completely fair and transparent when it comes to recruiting PhDs and postdocs, since they mostly recruit their own candidates without public job advertisement. One interviewee stated that the approach of hiring PhDs and postdocs from OUH is necessary due to their knowledge of the patients and their Danish language skills.

Moreover, the department hosts seminars and meetings at SDU where they talk about their research, and a few people normally contact them after these meetings to learn about a possible career. Physical presence, knowledge of the research, and preferably knowledge of the researchers and professors who are already there, seem to be a massive advantage, if not a necessity to gain access to a research career in the department. One of the professor's points out that this way of recruiting PhDs and postdocs tends to exclude candidates that are not already physically close to the research environment, and that explains why they have a low influx of PhDs and postdocs from other universities compared with other medical university faculties and why they have few international researchers.

In most aspects of recruiting, career development, and valued competences there seem to be a coherence between what the leaders, professors, and researcher's experience.

C.7 Summary and final conclusions; lessons learnt

At the Department of Clinical Research, researchers have a split career in which they are employed by SDU and OUH. The typical career path includes a research year whilst studying medicine (nursing, etc.), becoming a doctor, becoming a basic clinical doctor, and getting an introductory position whilst taking a PhD, having a training position whilst taking a postdoc, becoming staff specialist or specialist doctor whilst being either a part-time postdoc or clinical associate professor and potentially chief physician and clinical professor. Naturally, not everybody becomes chief physicians and clinical professors.

The career path within the Department of Clinical Research is not as fixed as it is at many other universities. The Department of Clinical Research does not employ clinical assistant professors. Instead, candidates work simultaneously as postdocs and staff specialists or specialist doctors and then move straight to being a part time clinical associate professor. The demands for employing clinical (associate) professors emphasise clinical research and have fewer demands on classical professorship regarding academic publications or having to have been at the previous academic step. Some clinical associate professors do not research, and some do it in their own time, while others have days off for research paid for by the region, hospital, or external funding. It is possible to become a clinical professor without having been a clinical associate professor. The criteria for obtaining these positions are dual since they are so closely connected to the clinical work at OUH.

The researchers in this case study think that the combination model for a medical career is attractive, even though it can be difficult to balance their time and take time for doing research. Furthermore, the faculty management thinks that the model is attractive, and they emphasised that they prefer researchers with ties to both a traditional medical career and the traditional research career, as this gives better value for patients.

The recruitment process is seen as fair and transparent for clinical associate professors and for clinical professors. There does not seem to be a dissonance between the policies and the practice. When it comes

to PhDs and postdocs the experiences are more varied. Research funding for PhDs and postdocs largely comes from the researchers themselves after having applied for various funds. This is also how many PhDs and postdocs are employed, i.e. by obtaining funding for their own positions. From the researchers' and the recruiters' point of view, very few positions are posted publicly, since that would require the main supervisor to have the funds to create a position on its own. The funding from the Faculty of Health is given as a one-year salary, not full PhD positions. Being able to find funding is sometimes what determines whether a PhD or postdoc is employed in a combined position or solely at the hospital. The research often takes place at the same location no matter whose name is on the contract, i.e. SDU or OUH.

The documents provided by SDU give the impression that the development of the employees is comprehensive. However, it seems that both recruiting managers and researchers feel that they themselves are primarily responsible for their development. Most of them are quite pleased with the courses they have received and emphasise networking as being really important for development. Clinical associate professors receive most of their career development from OUH, not from SDU.

Appendix D Technical University of Denmark

D.1 Introduction to the Technical University of Denmark

The Technical University of Denmark (DTU) is a mono-faculty university and is the largest technical university in Denmark with an ambition of being among the leading international universities. Among Danish universities, DTU is the highest ranked university measured by research publications, and when looking at proportion of publications in Top 10% journals, DTU ranks as number 109 in the world, in Europe as number 41, and in the Nordic region as number 1.[42]

The DTU's academic activities are placed in an organisation consisting of 19 departments and five research centres. The main services of each department include education, research, research-based consultancy, and innovation. Furthermore, each department also plans and organises the research and teaching within each of their academic areas.[43]

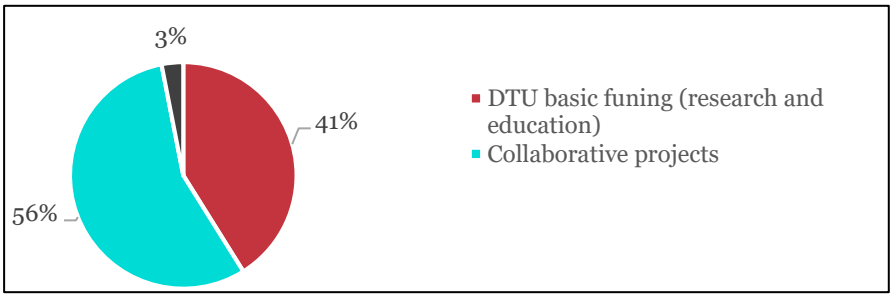
In total, DTU employs approx. 6,000 persons (full-time equivalents), of which 2,171 hold academic positions as researchers or educators, and 1,229 are enrolled as PhD fellows.[44] In 2017, the total revenue of DTU was DKK 5.1 billion of which 36 per cent came from external funding of research, 31 per cent was public funded research, 15 per cent public funded education, and 18 per cent consisted of income from commercial activities, consultancy, etc.[45]

This case study focused on the Department of Electrical Engineering (DTU Elektro).

The research at DTU Elektro is organised in 14 research groups and research centres that address 19 different research subjects.[46] In line with the DTU strategy, DTU Elektro's main focus area is research, which also forms a platform for conducting teaching, working with innovation and offering research-based consultancy. These activity areas are also reflected in DTU Elektro's income distribution and job structure.

Figure 8 illustrates the total income in 2017, and the head of department estimates that teaching activities represent about 20 per cent of DTU Elektro's income, and 80 per cent of the total income of DTU Elektro relate to research innovation or commercial activities.

Figure 8 Total income and funding in 2017, per cent



Source: DTU Electrical Engineering

DTU Elektro applies a job structure in line with the official job structure for universities in Denmark.[47] However, the number of employees by type of job position also reflects the income structure, as just 21

[42] http://www.leidenranking.com/ranking/2017/list and http://www.dtu.dk/english/about/facts-and-figures/rankings
[43] http://www.dtu.dk/english/about/organization
[44] http://www.dtu.dk/english/about/facts-and-figures/human_resources
[45] DTU (2018) Årsrapport 2017
[46] http://www.dtu.dk/Forskning/Institutter-og-centre#Institutter-og-centre
[47] Agency for Modernisation (2015): Circular concerning protocol on certain terms of employment of academic staff at universities

per cent of the staff is faculty staff who have an obligation to teach as well as conduct research, see Table 5. Most of the faculty staff hold a permanent position and only 3 per cent of the total staff are assistant professors. Another 21 per cent of the total staff belong to the category 'research staff' whose main task it is to do any kind of research including innovation and consultancy. Most of the research staff has a position as postdoc and a fixed-term appointment. Members of the research staff can also be involved in teaching, but it is not an obligation. Furthermore, as a stand-alone category, PhDs account for 36 per cent of the total staff. PhDs are enrolled to be trained as researchers, and in many cases they receive this training by taking an active part in research projects

Table 5 Number of employees by position at DTU Elektro, 2017, in fulltime equivalents (FTE)

		Total FTEs	**Per cent**	
Faculty – research and teaching obligation	Professor, including professor MSO	12	4%	21%
	Associate professor	39,2	14%	
	Assistant professor	7,2	3%	
Research staff	Professor, including professor MSO	0	0%	21%
	Senior researcher scientist	8	3%	
	Researcher	3,1	1%	
	Postdoc	35,9	13%	
	Scientific assistant	12,6	5%	
Part-time research staff	External associate professor	0,2	0%	1%
	Teaching assistant	2,5	1%	
Other scientific staff	Visiting professor	0,2	0%	0%
PHD		99,1	36%	36%
Technical/administrative staff	Academics	24,3	9%	21%
	Technicians	14,3	5%	
	Others	20,4	7%	
Total		279	100,0%	100,0%

Source: DTU Electro, General HR data

Overall, the job structure reveals that the classical research career, illustrated by the faculty staff, is not the only career path as anyone can follow a career as researcher. Holding an academic degree and even a PhD, a career as technical/administrative staff cannot be considered a research career even though these staff members can be involved in research projects but without any obligation to attract external funding or write for a research publication.

D.2 Recruitment and career routines and policies in place

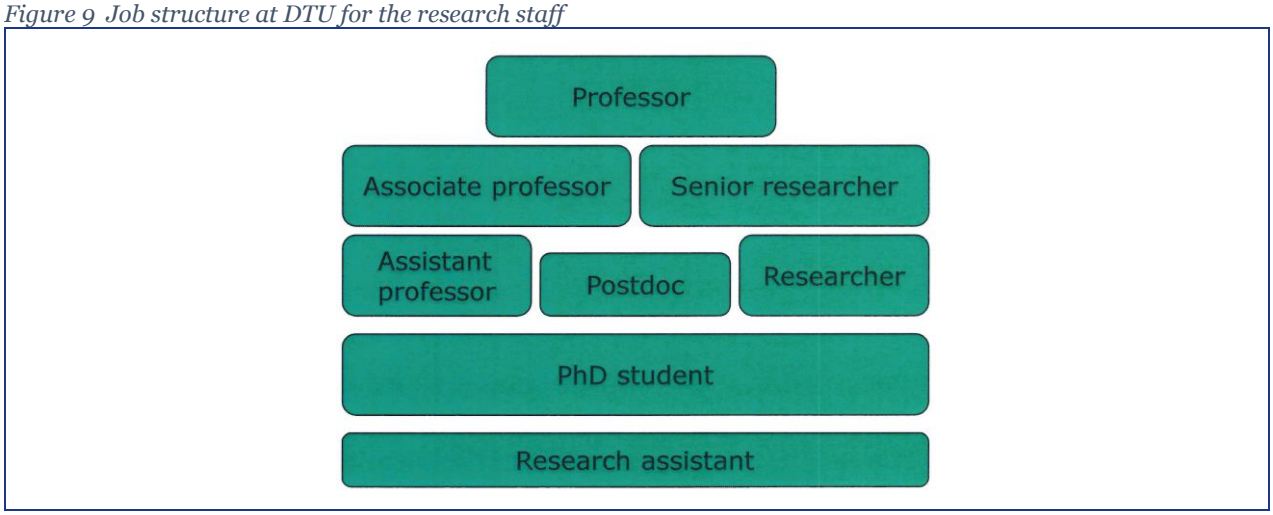
The overall framework at DTU for recruitment and career routines (DTU policies[48]) refers to government regulations regarding job structures[49] and recruitment.[50]

The job structure, as indicated in Table 5, consists of two main career paths, see Figure 9. The first career path is characterised as the 'traditional career path', which, after the basic education as a researcher (PhD grade), includes positions as assistant professor, associate professor, and professor, including professor MSO.[51] The position as assistant professor is a fixed-term appointment for a maximum of six years. During this period, the research skills of the assistant professor will be evaluated to match a position as associate professor.[52]

The second relatively new career path for universities was introduced in 2003 with the Danish university reform. The reform meant that sectoral research institutes were merged into the universities and their career paths became part of the job structure of the universities. Consequently, DTU has adapted a career path holding positions as researcher and senior researcher, where the position as researcher, similar to the position as an assistant professor, is a fixed-term appointment for maximum of six years.[53]

As Figure 9 indicates, and as emphasised in the interviews, a precondition for entering a research career is a PhD. Furthermore, a postdoc position, i.e., a fixed-term appointment for up to four years mainly dedicated to research, is an opportunity to gain further research competences. However, a postdoc position is not a required step in a DTU research career as a young researcher can bypass this position and move directly to a position as an assistant professor or researcher.

Figure 9 Job structure at DTU for the research staff



Source: Source: DTU Electro

The **skill requirements** for the two types of career paths are similar when it comes to research skills and dissemination activities.

[48] DTU (2016) DTU's politikker; http://emagstudio.win.dtu.dk/E-books/DTU/DTUs_Politikker_2016/

[49] Personalstyrelsen (2007): Cirkulære om stillingsstruktur for videnskabeligt personale ved universiteter

[50] Bekendtgørelse om ansættelse af videnskabeligt personale ved universiteter; BEK nr. 242 af 13. marts 2012

[51] Research professor with special responsibilities; temporary rank

[52] http://www.dtu.dk/Om-DTU/Job-og-karriere/DTU-som-arbejdsplads/Karriere/Adjunkt

[53] http://www.dtu.dk/om-dtu/job-og-karriere/dtu-som-arbejdsplads/karriere/forsker

Holding any positions within the 'traditional career path', an employee has an obligation to do research, teach, and be part of dissemination activities. Employment as a (senior) researcher includes an obligation to do research, be part of dissemination activities, as well as research-based public sector consultancy, while teaching is a secondary task.

Regarding research qualifications, DTU will evaluate an assistant/associate professor and (senior) researchers by the number of publications and citations/co-citations per publication, where the ambition of DTU is to be among best technical universities.[54] [55]

The senior positions as associate professor and senior researcher also require managerial skills regarding research management (managing large (collaborative) projects, guidance of other researchers, networking, preparing research applications to research funds, etc.).[56]

At DTU, the 'traditional career path' is used more often than the (senior) researcher career path. One reason for this difference is, as stated in the interviews, that the career path as (senior) researcher is not acknowledged internationally. DTU is aware of this situation and a strategic ambition is to make this career path more attractive as well as distinct.[57]

The **recruitment process** follows the official guidelines, but DTU aims to establish a balance between attracting international talent and promoting candidates from DTU's own network. In most cases, and especially for young researchers, the process will include an official, international job advertisement. First, the job advertisement will always be worded in such a way that it will appeal to a larger target group than the talent group at DTU. In many cases, the Danish labour market is also too small to offer a sufficient number of qualified candidates. Second, a research manager develops a job advertisement, and a committee of associate professors evaluates the job advertisement especially regarding academic skill requirements and gender balance (gender neutrality).

The next step is an evaluation of the candidates. For each job advertisement, an appointment committee (or an assessment committee for the appointment of academic staff) will evaluate the academic skills of the candidates. Afterwards, a hiring committee, which includes both academics and the management of a department/research centre, but not representatives from HR or similar departments, will interview the candidates. Typically, the committee will conduct two interviews with a candidate validating their academic and teaching skills, etc., as well as social skills and whether the candidate fits into or can contribute to the development of the department or research group. Tests may be used (such as a personality test, or the candidate will be asked to give a lecture, or participate in a 'working situation' with students).[58]

The overall personnel policy is a key element of the DTU different policies, which, among others, is based on decentralised management responsibility, where the individual 'principal investigator' (research manager) makes decisions in line with the overall strategy of DTU.[59] Furthermore, DTU applies a 'single point of responsibility' where each employee (researcher) refers to one personnel manager even though one researcher can work with different research managers.[60] Another overall principle is 'self-management' within the general framework of DTU and the specific department. Within this framework, the individual researchers have to be confident in their own competences and should have the courage to be responsible for developing their own research.[61]

[54] DTU (2018): Budget og Handlingsplan 2018 samt overslag 2019–2021

[55] DTU (2016) DTU's politikker

[56] http://www.dtu.dk/om-dtu/job-og-karriere/dtu-som-arbejdsplads/karriere/lektor; http://www.dtu.dk/om-dtu/job-og-karriere/dtu-som-arbejdsplads/karriere/seniorforsker

[57] DTU (2018): Budget og Handlingsplan 2018 samt overslag 2019–2021

[58] http://www.dtu.dk/om-dtu/job-og-karriere/rekrutteringsproces/udvaelgelsesprocessen

[59] DTU (2016) DTU's politikker

[60] DTU: DTU Ledelsesgrundlaget

[61] DTU (2014): MUS vejledning for medarbejdere

The personnel policy also applies other instruments that are relevant for the career of a researcher:

- Evaluation (Key Performance Indicators (KPI)) is deeply rooted as an instrument to encourage ongoing development and improvement of the research performance and secure learning from research project as well as to identify new knowledge and impact of research.[62]
- The Talent Management Programme was launched in 2017 and since then it has been continuously developed. The aim is to remove obstacles and support development of research talents. With the Talent Management Programme, DTU intends to develop different initiatives such as 'successful research career', 'development and retention of research talents' and 'professionalization of managing research talents'. So far, few researcher have enrolled in the programme. However, the intention is to select young research talents (selection on their research performance) and offer them further training to become an excellent researcher/researcher manager, including gaining excellent skills for writing research applications.[63]
- DTU Young Investigator Training is a new programme aimed at training and offering young research talent the best conditions to develop their research careers. DTU will launch the initiative as a one-year programme in which talent from across the departments can participate.[64]
- 'Fast track', mentioned in the interviews as a more informal initiative, aims at identifying young research talent and accelerating their careers. Research managers in the department will be career mentors to help the young researchers and ensure that the young researchers are offered different types of training such as the compulsory didactic course (UDTU). It is unclear how much this initiative is used, but there is an example of an assistant professor becoming an associate professor after one year in the interviews.
- Performance and development reviews (in Danish MUS) are also applied as an instrument for dialogue between the employee (the young researcher) and a research manager (the 'single point of responsibility', see above). The aim is to identify common solutions to problems/challenges related to career development and development of competences (academic as well as social and personal competences). The solutions include changing daily routines or participating in supplementary training.[65]

According to the interview with the managers, DTU does not have any specific written strategy for a research career or a formalised career path except what is described in government regulations and in DTU's talent initiatives.

D.3 Research career in practice – empirical findings

In addition to the above presentation based on written material relevant to describing issues related to research careers, the case is also based on seven qualitative interviews with the management of the department and paired interviews with a research manager and a young researcher, in total three pairs.

The interviewed young researcher and managers know the above-mentioned career path (job structure), and the different career paths as associate professor, senior researcher, and AC TAP.[66]

In principle, a researcher can shift between the different career paths at DTU. However, in real life, a researcher can easily move from a 'traditional career' (assistant professor) to a position as (senior) researcher or AC TAP than the other way around. The main reason is that a position as assistant

[62] DTU: Personalepolitik; http://www.dtu.dk/Om-DTU/strategi_aarsrapporter_mv/Politikker

[63] DTU (2018): Budget og Handlingsplan 2018 samt overslag 2019–2021

[64] DTU (2018): Budget og Handlingsplan 2018 samt overslag 2019–2021

[65] DTU: Personalepolitik; http://www.dtu.dk/Om-DTU/strategi_aarsrapporter_mv/Politikker and DTU (2014): MUS vejledning for medarbejdere

[66] AC TAP is a position where employees holding an academic degree can work with technical support to research but this career path is not considered a research career. Some AC TAP's can be involved in preparing publications but it is not an obligation for being an AC TAP.

professor requires teaching skills and a higher research quality in publications than a researcher can typically obtain in a position as (senior) researcher or AC TAP.

However, few young researchers aim at a position as a professor. The main challenge is to move to a position as associate professor or senior researcher. At this stage, many young (potential) researcher will meet the high skill requirements, no vacant posts and might consider a temporary position to be too uncertain. Consequently, many young researchers (PhDs) will go for a career in the industry, or more rarely, an international research career, as young Danish researchers, according to the research managers, are less mobile according to the research managers. At the same time, researchers at DTU find that a job in the industry offers a higher salary, and a position as researcher at DTU is quite demanding in terms of preparing high-quality publications, teaching, and applying for funding.

Moreover, the overall impression from the interviews is that the mobility among trained researchers between industry and academia is extremely low due to different skill requirements, and it is difficult to enter a research career without a long list of publications from a DTU viewpoint.

An ambition of doing independent technical research as an interviewee said "using your creativity more freely aiming at producing new technology but commercial products", seems to be a main driver for researchers at all career stages. With this in mind, young researchers will typically have a career plan where they can fulfil this ambition, and some will aim at a position as a professor. However, to fulfil the career plan, the young researchers will typically focus on the next career step, and, consequently, their career plans are not very concrete.

The key challenge for a successful research career at DTU is to meet the requested skill requirements out of which excellent research skills are the most important. However, the main strategic focus for DTU is to be an international, elite university and in this context formalised skill requirements are important. Nevertheless, DTU handles the job structure with considerable flexibility to attract talent.

Even though, DTU emphasises that researchers must have the requested competences linked to each stage of the career path, some examples illustrate how research careers can be handled with flexibility:

- A successful researcher in the industry was driven by an ambition to carry out independent research. As the researcher did not meet the skill requirements, the researcher was employed as an affiliate professor and given the opportunity to gain the skill requirements needed to become appointed professor.
- A very experienced researcher and manager from industry was recruited to DTU to a position as associate professor without being through a training position as assistant professor. His list of research publications was not sufficient but DTU valued his significant knowledge about applied research, industrial processes, and staff management coming into the organisation.

Overall, researchers from outside academia may be offered a teacher training course or become a visiting professor at another university to improve their research qualifications.

Finally, a researcher can move up the career path if the researcher can document excellent research publications and, as a further advantage, external funding. If the researcher receives a positive assessment for promotion to associate professor or to professor, a fixed-term appointment as associate professor or professor MSO is an option. However, it is not a guarantee of a permanent position, and without further external funding or a permanent appointment, the researcher can expect to move down the career ladder or leave for another position outside DTU.

Even though DTU has a formal and an informal career path, the research managers state that a research career is basically an individual matter. The research manager can encourage, and if asked, recommend and help a young researcher to join courses or programmes (see above). The management will particularly appreciate/demand that a young researcher stay at foreign universities, such as a three or six month sabbatical.

DTU is an internationally oriented university. The management believes that internationalisation is a benefit in terms of new input such as new knowledge/qualifications and methods. However,

internationalisation can also be a challenge due to culture differences, foreign researchers may only stay for a short period, but according to the manager this does not seem to be the case.

In addition to the above description of the DTU research careers, young researchers, especially in a position as assistant professors, appreciate the working conditions being very individualised and free (a possibility to follow your ambitions/academic interest), and flexible in terms of working hours. However, an assistant professor has to teach and do research, and preparing applications and doing administrative work is also time-consuming. Overall, teaching can be very time-consuming and the management is aware of the negative impact on research of too much teaching. Consequently, some young researcher find that time spent on research is limited and question whether there could be other ways of boosting their careers, such as by devoting more time to research.

D.4 The recruitment process

The overall principle, as stated by the research managers, is that any vacant position has to be advertised publicly, and the recruitment process must follow the official guidelines presented above.

However, the research managers are also involved in academic and industrial networks, and one of the objectives of networking is to spot talents and encourage these talents to apply for a vacancy or to be enrolled in external funded research projects.

In case of external funding, the application will typically include a list of researchers to carry out the project and in this situation fixed-term appointments need not be advertised publicly. However, DTU still cares about researchers with a high level of research competences. Formally, the researchers have to apply as DTU want to assess their academic qualifications. Even in the case where a research fund has approved the research team, DTU must approve the team too.

An independent appointment committee evaluates the academic competences. The committee will always have to match the academic level of the job position to be evaluated. For the assistant or associate professors, a committee will typically be formed consisting of one internal and two external associate professor/professors of which one should be a foreign researcher. The evaluation of the academic qualifications is based on the number of publication and their h-index as well as presentations at conferences.

A hiring committee will be established to assess other skills and competences where the objective is to assess whether the candidate will fit into the organisation. When recruiting assistant professors or associate professors, a research manager (Professor and/or Centre Leader) and the head of the department will always be members of the hiring committee.[67] In the end, the head of department decides whom to employ paying special attention who among the remaining candidates is the best match for the organisation. Or as somebody said:

> *If we have a mismatch, and after a short period have to say goodbye to a new employee, it is costly for our organisation.*

The hiring committee invites candidates with the requested academic competences for an interview. The aim of the interview is to review academic qualifications, teaching skills and particularly the candidate's personality focusing on the candidate's ability to cooperate, working approach (e.g. a systematic working approach and punctuality), research vision, and, potentially, ability to lead. The latter becomes more critical for associate professors/professor, as DTU expects that these positions will also will be a rallying point for a research group developing excellent research, attracting talents, and funding. The hiring process can also include a practical test such as giving a lecture, a day in the laboratory, etc.

[67] When hiring professors, representatives of the top management of DTU (the rector and one of the deans or the like) will also be member of the hiring committee.

The young researchers recognise the above description of the recruitment process and the required skills. When they applied for a position they knew what was expected of them, what they could expect in the recruitment process, and they think that the process is transparent and fair.

Overall, the research managers receive many applications. However, most of the candidates are not qualified, i.e., they do not have the requested qualifications or are irrelevant. As an internationally oriented university, DTU receives many applications from abroad where it is difficult to assess the applicants' education background. In total, more than 50 per cent of the applications that DTU receives are not relevant and in some case the share of relevant applications is less than 20 per cent.

D.5 Other initiatives for the further development of employed researchers

Overall, the development in the area of employed researchers is based on two principles.

First, each researcher is associated with a research group, and this organisational platform is the main setting for the development of any researcher. The main instrument for learning is that older and more experienced researchers guide younger researchers at any stage of their career paths. The research managers characterise this type of guidance as mentorship, employee-to-employee training, or apprenticeship.

Second, the individual researchers are mostly responsible for their own careers ('self-management') and thus also for developing their competences, performing according to the Key Performance Indicators (KPI) related to their job position, d what is agreed with their research leader or during a MUS.

The guidance is more formalised for PhD students who have an appointed academic counsellor compared to assistant and associate professors.

In addition to these principles, the employees have access to different courses and programmes (see above).

Overall, the research managers find that the opportunities and tools to support an employee to develop as a researcher are satisfactory. The main mismatch between exceptions and reality when starting out as researcher is that the working conditions are harder – a lot of time is spent at work - than expected and the salary is lower when compared to the industry.

The young researchers find that they are offered a lot of support to develop as researchers including courses and conferences. In line with DTU's overall career policy, the young researchers stress that a good, inspiring research environment and network (dialogue) with other colleagues is essential. Furthermore, researchers with a non-Danish background also appreciate a good mentor who can assist with all practical matter and understand the Danish system. Access to funding is seen as an obstacle as preparing applications can be very time-consuming, and lack of resources to establish up-to-date laboratory technology can cost time and a lot of frustrations.

D.6 Coherence between competence/skills requirements, actual valued competences/skills in the recruitment process, and transparency

Overall, there seems to be a significant match between the required qualifications and competences outlined in formal documents, and the actual valued qualifications and competences in the recruitment process. This viewpoint is largely shared among the researcher managers and the young researcher.

D.7 Summary and final conclusions; lessons learnt

Several factors can contribute to an explanation of the match between the requested qualifications and competences outlined in formal documents and the actual valued qualifications and competences in the recruitment process.

First, the job structure/career path and the recruitment process follow the official regulations of the universities, which gives an overall transparency. Second, DTU communicates a set of overall guidelines or ambitions of preferred performance such as DTU is an elite university, clear expectations regarding

conduct (self-management, mentorships, etc.), and all researchers are firmly anchored in a research group. Third, DTU cares about its employees, talented researchers, and, if possible, DTU can often find ways to recruit and retain talented staff if they contribute to the overall academic ambitions of DTU. Fourth, external funding is essential, and many efforts are directed towards writing research applications, but DTU seems to be quite successful while it is not a paramount issue.

Overall, the conditions constituting a research career at DTU seems to be very transparent, and consequently there is a common understanding among young researchers and the management about what constitutes a research career.

Appendix E Vestas

E.1 Vestas and the departments

Vestas is a global corporation in the energy sector with headquarters in Aarhus, Denmark. Vestas designs, manufactures, installs, and maintains wind turbines across the globe.[68] Vestas invests heavily in R&D and Product Development – in 2017, Vestas' R&D / Product Development investments accounted for 12% of its gross profits.[69]

The company was founded in 1898 by blacksmiths and started industrial manufacturing of steel products in the 1940s. The product range has changed several times, but with a product portfolio including wind turbines, Vestas went through mergers with other companies in wind energy to create the current company, which has sales offices as well as production facilities across the globe, and R&D facilities in Denmark, Germany, the UK, Portugal, and India. Vestas has installations (wind farms) in seventy-nine countries.[70] Vestas collaborates with Danish universities, notably the Danish Technical University and Aalborg University. Vestas currently has 21,844 employees, most of whom are men.[71]

This case study focuses on two departments within the Power Solutions Division: Innovation & Concepts, and Engineering. *Innovation & Concepts* is the most research-intensive department in Vestas and serves as an incubator for both incremental development and radical new ideas, technologies, and business. The strategic management representative estimates that 'proper research' amounts to 20 per cent of the work in the department, while the remaining 80 per cent consist of applied research and development-oriented activities. However, there is not a clear distinction between research and development in the company. Projects in this department usually focuses on a longer time horizon and last longer than projects in other departments and with a higher degree of uncertainty, but they are always linked to commercial goals and to future business for Vestas.

Engineering is more oriented towards the development of solutions and patents, hence, the department's research is more purpose-directed. The employees in the two departments usually have a Masters' degree in engineering or science when they are first recruited. Patents are a key instrument to ensure IPR and the freedom to operate. For both departments patents are an integral part of the R&D and product development work.

E.2 Recruitment and career routines and policies in place

Vestas has a highly-structured matrix of **career paths** for employees with an academic background, within which employees with an academic qualification navigate. Figure 10 shows the three main career paths, namely 'People and Business Leadership', 'Knowledge and Innovation Leadership' and 'Project Leadership'. Most academically trained employees are hired as 'professionals', the step below the career ladder from which they may move into one of the three career paths.

Most of the academically trained employees follow the 'Knowledge and Innovation Leadership' career path, while fewer join the 'People and Business Leadership' and 'Project Leadership' paths. This is logical because a manufacturing company needs more technical specialists than managers and project leaders. The 'Knowledge and Innovation Leadership' is the path where the tasks of the employees resemble that of university researchers the most. Vestas has a policy stating that employees are encouraged to move between the paths during their careers. This way they improve their knowledge and skills between

[68] Vestas' homepage: https://www.vestas.com/en/about/profile#!history

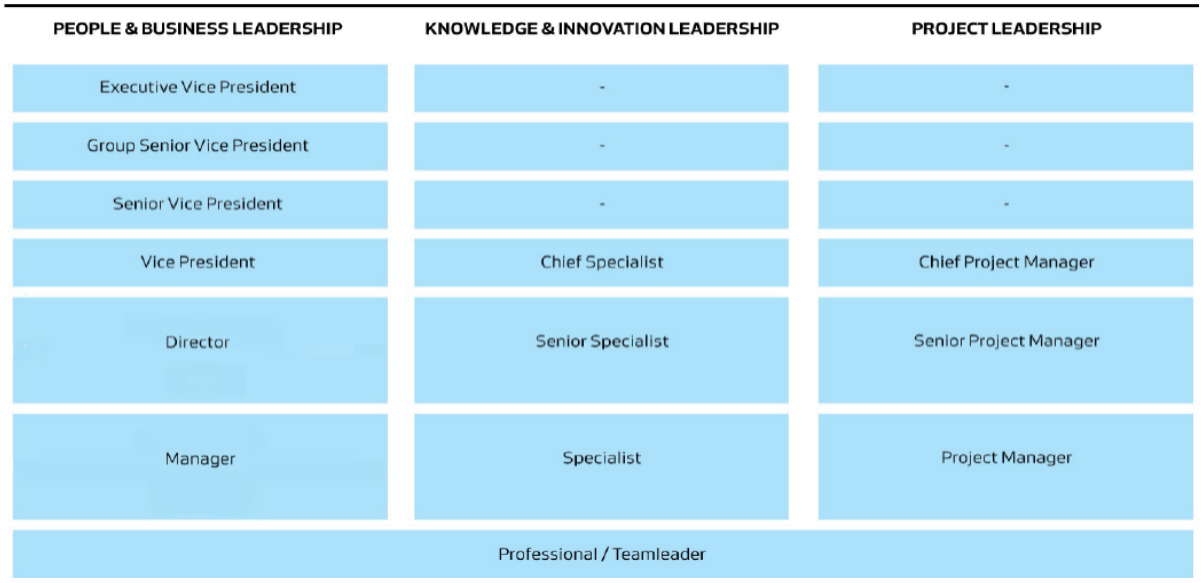
[69] Annual Report 2017, available at file: ///Y:/Projects/P2006657_Karrieer%20i%20forskningen/Materialer%20om%20Cases/Vestas/Materiale%20om%20karrier er%20og%20politikker/2017_annual_report.pdf

[70] Vestas homepage: https://www.vestas.com/en

[71] Source: The 2017 EU Industrial R&D Investment Scoreboard, http://iri.jrc.ec.europa.eu/scoreboard17.html

several areas. Hence, it is possible to move from, e.g. Manager to Specialist if the employee wishes to do so, has the right competences (including technical knowhow and relevant research experience) and there is a vacancy. The explanation for this policy is that all Vestas' employees at a certain professional level and above need to have an understanding of the commercial aspects of the business, they should be able to deal with large customers, they should be able to manage projects and understand the value chain, and have technical leadership abilities. One strategic management representative emphasised the importance of commercial awareness for reducing unnecessary costs incurred by projects which do not produce commercially viable results in the form of products or services. If a project manager has a good understanding of the business, he will make sure that projects are closed as soon as it becomes clear that the commercial potential is small or non-existing. All Vestas projects has a team composed of employees from all three paths. The three paths and the possibility of switching between them mean that a career can take many forms.

Figure 10: Vestas' career paths



Source: Figure provided by interviewees from HR

Employees following the 'Knowledge and Innovation Leadership' path take on the role of experts in technical and business development.[72] Assignments for specialists at the entry level of this path tend to be highly technical and narrow, and candidates usually have a Masters' degree in a relevant subject at this level. Nevertheless, some employees do have initial qualifications at a lower level (typically Bachelor in Engineering) and other relevant experience from the sector. Advancement from Specialist to Senior Specialist typically takes 3–6 years, while the timespan before advancing to Chief Specialist varies considerably more. As an employee advances to the levels of Senior Specialist and Chief Specialist, they need expertise in more technical fields combined with business understanding. To become a Chief Specialist, an employee must be able to combine different technology fields and be able to drive and develop technology strategies.

The 'People and Business Leadership' path resembles a traditional managerial career path. The first step after the professional level is manager progressing into director, vice-president, etc., with ever-expanding responsibilities. Vestas writes that "Our People & Business leaders are focused on delivering

[72] Description of the paths, Vestas homepage: https://www.vestas.com/en/career/your_career#!knowledge-and-innovation

results through the employees in their team: motivating them, steering them in the right direction, and developing their skills continuously".[73]

'Project Leadership' employees mainly lead projects and develop their skills in project leadership. One of the most important skills is the ability to lead projects with multiple people with various educational backgrounds so that the results meet the stakeholders' expectations. [74]

It is important to note that not all employees' progress to the higher levels – there is no guarantee that an employee will move all the way up through the career ladder. Representatives of strategic management highlight that employees may have reached a level of performance that would be required at the next step on the career ladder, but if there is not a vacant position they will not advance. In addition, many employees do not look for advancement but prefer to remain at the lower levels, such as specialist or project manager, because they prefer more technical assignments. Instead, there are only promotions when there are openings in the company due to retirement, promotion, or expansion. Furthermore, Vestas' policies require that employees should have at least a few years' experience before advancing regardless of their formal qualification. Consequently, the option for employees looking for advancement is often to look for jobs in other companies. The interviewees could not recall that an employee had gone back to university.

The representatives of strategic management emphasised that leadership and management skills are required in all three career paths. The higher the position, the more managerial responsibilities and leadership of colleagues at lower levels are assigned to the position.

HR and a recruiting agency handle the **recruitment process**. When the need for recruitment of a new employee is identified, a job advert is drafted and approved. Leaders should preferably already have a candidate in place, as Vestas prioritises successor planning, where leaders identify talented people that can potentially and eventually replace them when they themselves progress. However, internal applicants have to compete with external applicants. Applications are reviewed and selected candidates go through two interviews. The purpose of the first interview is assessing whether the candidate's skills and competences correspond to the position in question. The second interview involves finding out more about the candidate using personality tests. For this, Vestas uses a professional recruitment agency. Most candidates that are recruited have a master's degree or a PhD degree. Representatives from the strategic management place great emphasis on candidates having both the necessary technical and professional competences, business sense, leadership qualities and that they can work at a fast pace. Moreover, they place emphasis on various skills according to the position but often highlight understanding of value chains, commercial aspects about the products, agility, how to handle important clients and technical leadership. Gender and diversity is a focus point in the company's recruitment strategy in the way that the female candidate will be preferred in case of two equally qualified candidates. However, the strategic management representatives point out that the main recruitment base, i.e. graduates and postgraduates from engineering studies, is intrinsically male-dominated.

Career policies in Vestas include annual 'people reviews' where every employee is assessed and evaluated for their performance, staff development interviews and continuing professional development processes to manage the employees' development. Furthermore, Vestas has talent programmes for employees across the company (not only in R&D), which include periods abroad.

[73] Description of the paths, Vestas homepage: https://www.vestas.com/en/career/your_career#!people-and-business

[74] Description of the paths, Vestas homepage: https://www.vestas.com/en/career/your_career#!project-leadership

E.3 Presentation of empirical findings

The interviewees for this case study were one Director, one Vice President, one representative from HR and two Senior Specialists. Since Vestas is a company and not a university, they do not refer to their employees as researchers. Instead, job titles refer to the career paths described above.

E.3.1 Research careers in Vestas

As already indicated, the careers in Vestas are not articulated as research careers, although research is a significant activity for employees pursuing a specialist career. However, the rationale of the research differs significantly from that of university research, since research in Vestas (like in all corporate settings) should always lead to commercially viable products or activities. It is exactly this characteristic that motivates specialists according to the interviewees, regardless of their department and seniority. It inspires them to know that their work will be used to make products that will later be used in different wind turbine solutions, products, or making codes that can be used to optimise processes or find technical issues. Hence, the *impact* appears to be a strong motivational factor for the employees, who find that their ability to create an impact in the real world would have been more limited in a university setting. On the flip side, the interviewees believe that a university career would have offered more freedom to change the direction of research and pursue interesting side-projects.

According to the Senior Specialists, R&D processes are paced quite tightly in Vestas compared to the time available in university research. This is, however, not necessarily negative – one interviewee found the pace of work at the university too slow.

Finally, the fact that research in Vestas is carried out in teams is a motivation factor for the employees according to the Senior Specialists as well as their superiors. This is appreciated by the employees, and one interviewee with experience from completing a PhD at a university prior to being employed by Vestas referred to the individualistic culture in university research as the main reason for wanting to make a career change to the private sector.

Despite the well-structured career paths in Vestas, career planning is not a major concern for the interviewed researchers. The prospect of promotion does not appear to overshadow the opportunity to work on interesting and challenging projects with a large research component. While the career strategy and strategy management representatives emphasised the importance of employees switching between the three career paths, the employees said that they would only change to another path if they felt a concrete need for competences acquired in one of the other career paths or if they were explicitly encouraged to change paths by their superiors.

Based on the interviews with the Senior Specialists, the requirements for progressing to the next career step do not appear transparent but rely more on personal contacts and the ability to be in the right place at the right time. The interviewees explained that their own initiative is crucial in this respect and that it is necessary to use in-company networks to get a sense of the right timing.

E.3.2 The recruitment process

Vestas has an internal HR strategy describing the recruitment process. The main points are described on the Vestas website in the section addressing potential future employees.[75] The process always involves the HR department and the hiring manager. For positions beyond 'professional', i.e. positions covered by the three career paths, there will be two interviews, a personality test and an 'Assessment Center'.[76] This process applies to internal candidates as well as outside candidates. The Chief Specialists, who are in part responsible for the recruitment process, find that while the process facilitates fairness and

[75] See https://www.vestas.com/en/career/getting_hired#!recruitment-process which includes also a FAQ on recruiting.

[76] The Vestas Assessment Center is a separate assessment conducted by an external recruitment partner. An Assessment Center is '[…] a process of evaluation of behaviour based on multiple evaluation including: job related simulations, interviews and/or psychological test' (https://en.wikipedia.org/wiki/Assessment_centre)

transparency, it can be quite inflexible given the number of tests and interviews that even well-known internal candidates need to go through. They also observe that in their experience the process of recruiting internal candidates is not always transparent to the candidates themselves or their colleagues.

According to the management, personal qualities and attitudes are quite decisive when recruiting for a vacant position provided that the academic qualifications or achievements are considered relevant and sufficient. The interviewees talk about 'the right employee qualities'. Qualities evaluated in the process include technical knowledge and competences, leadership potential, and business understanding, where the latter is emphasised as being crucial. Candidates should be agile since the business environment in Vestas is highly changeable. In addition, interpersonal skills and cultural understanding are valued highly, since all large projects are carried out in teams with a 'people leader', a project manager and any number of international specialists.

E.3.3 The professional development of employed researchers

Following the recruitment, Vestas has a well-developed introduction programme comprising e-learning and face-to-face course modules introducing topics like the Vestas code of conduct, Vestas company information, Safety, IT-systems, introduction to wind turbine technologies, and sales techniques. In addition, there are in-company networks and networking events to enable the candidates to get to know the entire organisation. There is also a system of mentors ('Buddies' in Vestas' terminology) in place to ensure ongoing balancing of expectations.

Whereas these activities focus on developing the business skills of the employees, there does not appear to be a strong focus on developing employees' academic skills once they are recruited. The Chief Specialists explained that the employees, together with their closest superior, are responsible for their professional development by being proactive, meeting with the right people, being business oriented, and expressing if they would like to advance or change paths. If the employees would like to advance, they can ask their superiors for help if they cannot identify what competences they need to improve. However, the main attitude is that the employees have the main responsibility for their own professional development.

Consequently, even though Vestas offers training in the shape of courses, the corporate preference is for an 'exposure approach', i.e., exposing people to new environments and giving them responsibilities whilst supporting them to learn and grow.

One of the areas where the employees get an opportunity to develop is in collaborative projects that involve universities. However, the interviewees expressed a certain frustration about these projects. The main challenge as they see it is that the involved researchers have entirely different rationales guiding their involvement depending on whether they work at Vestas or a university.[77]

E.4 Summary and final conclusions

Vestas is a research-intensive company, but research is very much a means to an end and has no separate status in the company. Focus is on supporting Vestas' vision to be a "Global Leader in Sustainable Energy Solutions". Consequently, the company attracts academics who are drawn to making an impact and/or contributing to the company's business success rather than carrying out research for the sake of building knowledge.

The rationale is reflected in the career paths as well as in the recruitment process and strategies for employee development. They all emphasise the contribution to the business as the overarching goal and the strategies are shaped accordingly.

[77] It is quite telling that one of the interviewees described this challenge as Vestas' employees and university staff having entirely different KPIs (Key Performance Indicators). A lecturer or professor at a university would probably never describe the need to publish in peer reviewed journals as a KPI, even if (s)he knew the term!

The business-driven career paths place more emphasis on attitudes, personality traits, and business skills than a university career. Hence, despite the use of key performance reviews in the monitoring of careers, the fundamental criteria for progressing career-wise are less transparent to candidates and employees alike. Therefore, networks and a sense of timing appear to play a decisive role in career progression.

Specialists (regardless of level in the career path) are not encouraged to – or indeed given resources to – publish in scientific journals. The offer of career development in place appears to be largely guided by a need to ensure that the employees are familiar not just with the products and technologies but also with the business strategies and management systems of Vestas. Therefore, the option of crossing over to a university career hardly seems possible.

Appendix F Grundfos

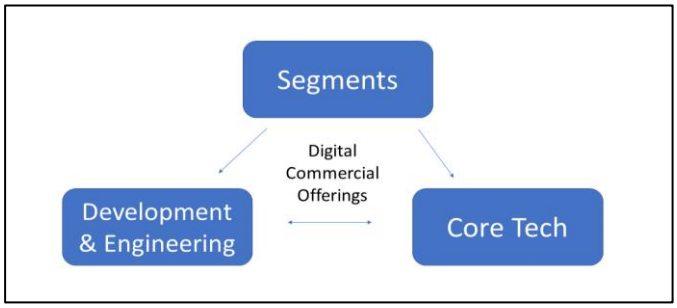
F.1 Grundfos and Core Tech – a unit within Business Development

Grundfos is a global company within water technology headquartered in Denmark. The company is a global leader within advanced pump solutions and is a trendsetter within water technology. Grundfos, which was founded in 1945, started out as a pump manufacturer and is now present worldwide. Grundfos employs more than 19,000 people worldwide, and of these, about 4,500 in Bjerringbro, Denmark. Having 'be think innovate' as their motto, Grundfos has innovation as a key value. This is also reflected in the annual 2016/2017 company accounts where the R&D intensity[78] is made up to about 5 percent, which ranks Grundfos among the most R&D intensive companies in Denmark.

It should be noted that the organisation is currently undergoing restructuring, so the following description of the organisation applies to the situation in July 2018.

In Bjerringbro, Grundfos has organised its research and development in a unit called 'Business Development'. The two main subunits within 'Business Development' are 'Core Tech' and 'Development & Engineering' (Figure 11). In addition, there are a number of units (called 'segments' working as profit centres) with commercial responsibility for existing and future products as these 'segments' are in charge of business development as well as the strategic orientation and prioritisation of future development. Outside the units there is a 'transversal' developmental unit called 'Digital commercial offerings', which is a part of a digitisation strategy that relies on resources from the other units.

Figure 11 Organisation of Business Development in Grundfos



Source: Interview with Senior Director of Technology

This case primarily focuses on 'Core Tech', since this is the most research-intensive part of Grundfos. 'Core Tech' has 91 employees in Denmark and three in Singapore, while Development & Engineering has approx. 600 employees distributed across Denmark, Hungary, Germany, China, and the US.

Core Tech carries out the research and development of new and emerging technologies, and most frequently recruits candidates with researcher competences. Core Tech collaborates closely with Development & Engineering, where new technologies are used to develop new products as well as improve the quality or efficiency of new products or reduce the costs of their application.

Both Development & Engineering and Core Tech collaborate closely with the other units (segments) that produce and market products.

F.2 Recruitment and career routines and policies in place

Across Grundfos, employees with a higher education background can follow one of three structured **career paths:**

[78] R6D intensity (%) = R&D investment / Net sales

1. Line management career path
2. Specialist career path
3. Project management career path

Career levels are defined according to the Mercer system as described below. Usually, employees stay on a career path. However, an employee can change career paths if he or she wants to, has the right experience and competences, and there is a vacant position on the career path the employee wants to move to.

The specialist career path has five levels, but the first level is practically never used as new employees usually enter at level 2 or above. In Core Tech, the titles associated with the five levels are:

1. Assisting Engineer – not used in practice
2. Development Engineer
3. Senior Development Engineer
4. Lead Development Engineer
5. Chief Development Engineer

However, even within Core Tech, the titles that are used in practice may vary depending on the employee's specialty (an employee at level 2 may for example have the title 'Materials Specialist'), but the levels cut across departments. Hence, the rest of this case report will refer to 'specialists' rather than engineers.

The positions are benchmarked using an approach called 'International Position Evaluation System' developed by Mercer, a global consultancy within business development and HR.[79] This approach is used by Grundfos to ensure that position levels are comparable across countries and sectors.

In Core Tech, approx. one third of the employees are 'Development Engineers', another third are 'Senior Development Engineers', and the last third are 'Lead Development Engineers'. A few are 'Chief Development Engineers'. Most are engineers or have a degree in one of the natural sciences, but there is no correlation between an employee's level of education and title. Thus, among the Development Engineers, there are PhDs as well employees with a bachelor or a master's degree.

The areas of responsibility, including responsibility for managing projects and leading teams, increase as one moves up the career ladder. Promotion requires a certain level of performance and experience, but a promotion will only take place if there is a vacant position on the next level.

The decision to promote an employee is based on two different processes:

- The annual 'Organisation Review'. This review involves top management in assessing the needs of the business in relation to existing and new markets and business opportunities. Based on the organisational needs, the need for changes in the staff mix is evaluated, and new positions are created where there are gaps.
- The annual 'People Review'. The performance of all employees in the career system (i.e. academically trained employees) is monitored with reference to Key Performance Indicators where the individual employee receives a score. In the People Review, the management in each unit assesses each individual employee on three dimensions:
    1) Performance score
    2) The employee's advancement potential (based on the managers' assessment), and
    3) The employee's (horizontal) growth potential describing whether the employee is assessed as having potential to work in a broader/other field

[79] See https://www.mercer.com/

- Based on the reviews, management decides who will be offered career advancement to the next level

Employees on a career path are supported in two formal processes: The People Development Dialogue (PDD)[80] and the People Performance Dialogue (PPD).[81]

The PDD is an annual dialogue between an employee and her/his superior. The PDD is used to discuss the employee's wishes, plans, and potential for professional and personal development possibilities in the short as well as the long term, and options for professional and personal development (training courses or formal education) are explored.

Similarly, the PPD is an annual dialogue, where the individual employee's performance is the discussion point with the objective of appreciating satisfactory performance and identifying ways to improve performance and possible obstacles impeding the employee's performance. In addition to occupationally specific competences, the employee's transversal competences are discussed based on a list provided by the HR Department, including entrepreneurial skills, communication, presentations, collaboration ability to serve as a role model, etc.

The Grundfos **recruitment policy** is based on a number of policies and principles which should be observed in all recruitment processes.[82] A gender policy is in place that is motivated by the fact that it is a challenge for an engineering company to recruit women at all levels. The company is strongly male dominated, e.g., in Core Tech the ratio is five women to 80 men. Grundfos' active gender diversity policy implies that when recruiting staff at lead level or higher, the recruitment manager is obliged to interview the two best qualified women independent of the rest of the candidate field. This is also required when they hire through executive search firms. In addition, a workshop for female students ('Female Frontrunners programme') has been conducted for students in science and engineering. About half the participants are now Grundfos employees.

Furthermore, Grundfos has launched a programme to draw attention to unconscious bias in recruiting, i.e., the tendency to recruit people that are like yourself. This programme implies that Grundfos leaders are aware of not just hiring the candidates with whom they can identify, i.e., same gender, background, educational background, etc.

In addition to internal promotion, the main recruitment channels are job sites and the company's own website. All vacant positions are advertised internally, and often (but not always) externally. In addition, LinkedIn is used actively. Moreover, Grundfos actively seeks to be visible to students when they are still at university by participating in career days, etc. A Graduate Programme[83] for new university graduates is in place, and nine graduates joined the programme in August 2018. The programme takes two years during which the graduates rotate between jobs and locations, after which they are guaranteed a permanent contract.

The first selection of candidates for a job interview is carried out by the hiring manger. In the screening process, the hiring manger will evaluate the applicants' employment and career path patterns, education, extracurricular activities, accomplishments, results, etc. When the hiring manager finds a potential match between qualifications and job profile, the applicant is invited for a personal interview with a HR representative and the manager.[84] This way the number of applicants is narrowed down, and some of them (the number may vary) proceed to the second stage. The second interview focuses on testing the depth of the applicants' technical knowledge (a case assignment), which may surprise some

[80] In other organisations known as appraisal interview, performance interview or personal development interview.

[81] https://www.grundfos.com/about-us/career/working-at-grundfos/development.html

[82] See also Code of Conduct of Grundfos. https://www.grundfos.com/about-us/sustainability-responsibility/ethics-and-integrity/code-of-conduct.html

[83] https://www.grundfos.com/about-us/career/global-graduate-programme.html

[84] https://www.grundfos.com/about-us/career/recruitment.html

applicants. The applicant is given time to solve a relevant problem and must present a solution to the case to the management and, in some cases, to potential future colleagues.

F.3 Presentation of empirical findings

The interviewees for this case study were the Senior Technology Director, a Director, two Senior Managers, a Senior Engineer, a Lead Scientist, and a Senior Specialist. Since Grundfos is a company and not a university, they do not refer to their employees as researchers. Instead, job titles refer to the career paths described above.

F.3.1 Research careers in Grundfos

As already indicated above, Grundfos does not use the terms 'researcher' or 'research career', even though work as an engineer/specialist in Core Tech is quite research-intensive. Furthermore, career advancement not only requires that an employee has the right combination of knowledge, skills, personal qualities, and attitude, but also, that there is a vacant position at the next level.

One Director observed that very few newly recruited employees enter Grundfos with a set career plan, and, according to the Director/Senior Managers, career planning is not common among the specialists who have entered a career path from the outside. Instead, they appear to be happy to get an opportunity to work within their specific scientific field – most are satisfied with being challenged by their daily tasks and do not prioritise promotion.

This was confirmed by the specialists (one lead specialist and two senior Specialists), who did not have a clear idea of progression in a career path when they were first recruited. Consequently, the initiative to draft a career plan usually comes from the specialist's closest superior.

All interviewees underlined that the main career motivation comes from the challenging tasks that specialists carry out in their daily work. Compared to a promotion, the possibility of having an impact on the development of new products and processes is a very important driver for the young Grundfos specialists. The senior specialists have chosen Grundfos over a university career for different reasons, but agree that they are motivated by the collaborative work environment and by the fact that the research should always aim at an impact in the form of new or improved products or services. At Grundfos, teamwork is widespread and the research is mostly applied. There is a purpose and a use for the research they conduct at Grundfos in the industry.

Grundfos actively aims at upholding strong links to universities, mainly the engineering or technical universities in Denmark, but also a few universities in Europe. There are several reasons for this:

- The universities are important recruitment channels.
- A good network with university researchers gives access to the latest research results, and the links mean that employees to a certain extent can pursue fundamental research while also working on applied research. This makes Grundfos attractive to candidates who do not want to cut their links to university altogether. Concrete forms of collaboration include:
  - research projects with representatives from Grundfos as well as the universities;
  - students doing an industrial PhD at Grundfos;
  - Grundfos employees matriculated as industrial PhDs working with research project at Grundfos;
  - Grundfos employees working part time as part-time university lecturers; and
  - Grundfos employees working for a limited time as visiting professors at universities.

Consequently, a PhD degree is greatly valued – 1/3 of the employees in Core Tech are PhDs - but the specific subject is not always important. Grundfos highly values the network that PhDs from universities

can bring with them as well as the understanding of the academic world. Furthermore, a PhD degree is proof that the candidate is able to explore their subject in depth.

Moreover, the specialists in Core Tech are urged to publish articles in relation to research projects, as this paves the way for a future even closer to universities, since publications are of great importance in the academic world.

The interviewed specialists confirm that this is indeed attractive to people driven by a scientific/technical interest. One senior specialist, who recently finished an industrial PhD, observed that he was pleased with the support he received from Grundfos, in particular because he had access to carry out experiments at Grundfos. The university institute to which he was attached underwent organisational changes, and the support from the university was limited. Another specialist, who did his PhD at university, opted for a career in the private sector because he wanted to work in teams rather than as a university scholar, and because he felt that in his field university research tends to be driven by the need to secure funding rather than scientific aspirations.

F.3.2 The recruitment process

As mentioned above, Grundfos is a private enterprise and is not under any obligation to announce vacancies externally, thus the process may vary from time to time.

According to the interviewees, the recruitment process has become more structured compared to earlier. The Director/Senior Managers point out that they consider all possible candidates regardless of application channel, such as:

- applications in response to announcements on job portals or links to job adverts on LinkedIn;
- unsolicited applications; or
- surplus applications from previously advertised vacancies.

All the interviewees find that the recruitment processes work quite satisfactorily. Both among Director/Senior Managers and Specialists, the use of the case assignment in the process is emphasised as a good tool to demonstrate that the candidate is actually knowledgeable within his field of research. The use of the Mercer system in the career structure is unfamiliar to most candidates, so that needs some explanation, but it is a minor point. Even though the individual recruitment processes varied among the interviewed specialists none of them found that the process was not transparent.

Overall, the Director/Senior Managers are satisfied with the academic level and other qualifications among the applicants for vacant positions. However, deep academic qualifications are essential, and, consequently, Grundfos prefers candidates that have focused on a specific education.

Grundfos receives a satisfactory number of applications for vacant positions (25-75 applicants per vacancy), which, according to the Director, can be explained by Grundfos being an international company with an excellent reputation.

The Director/Senior Managers expressed different preferences for hiring international candidates for positions in Denmark – some of them prefer to hire Danish candidates from the university departments that they are familiar with, while others emphasise that international candidates, including people from cultures very different from the Danish culture, add to a desirable diversity in a department. Likewise, the approach to international recruitment varies according to the Director/Senior Managers' individual preferences. Some prefer to 'cast the net out widely' by using social media like LinkedIn, while others rely on their professional network or experience with candidates from particular universities.

Since the corporate language is English, the language barrier is negligible. However, when overseas nationals are recruited, it can be (and often is) a challenge to obtain a work permit for them to work in

Denmark. Also, it is sometimes a challenge to retain employees from other countries, especially if they bring a spouse who should also be able to find a job as well as school age children.

F.3.3 Further development of employed researchers

As part of the organisation of the company and the various levels of positions, a key feature is that the job titles cover positions with different content. This means that a promotion is never solely based on the educational background or seniority of the employee. A promotion will occur if the company needs an employee for the level in questions, and if there is an employee that has proven to be ready to fill the position.

The PDD and the PPD form a platform to highlight where the employees (the specialists) have strength and weakness in relation to both academic qualifications and general competences. It seems that career development is a dynamic process that evolves from the annual development dialogue. Here the employee can also explore the options for their possible future career moves within the organisation, whether is it a development of an existing position or either a horizontal or a vertical move.

Grundfos offers different measures to support the development of their specialists even though these training and educational opportunities, according to the Director/Senior Managers, appear to be more dedicated to systematic development of technical competences than being designed to support a career move up the career latter or across in the organisation. Specialists can development their technical competences by the following measures:

- Specialists to propose and develop their own ideas for new technological development
- A closer relationship with the academic world, one opportunity could be industrial PhDs whenever there is a project with the possibility of a PhD and an employee with the wish to do one
- Posting to a university abroad
- Posting to another branch of Grundfos abroad
- Participate in conferences and fairs

Regarding more general competences Grundfos offers the specialists:

- Joining Power-up Grundfos is an internal talent development programme aiming at facilitating an accelerating development of picked talents
- Different types of courses such as project management/management, personal development, language, etc.

The specialists are generally satisfied with the support they are offered to develop their skills as their career development is based on an open dialogue and an opportunity to pursue academic and technical areas of interest. According to the Director, Grundfos will typically allocate up to 80 percent of the working time to be spend on development projects, characterised as 'hours spent on production', while the remaining 20 percent can be used for personal development such as education, courses, networking, etc.

F.4 Coherence between competence/skills requirement, actual valued competences/skills in the recruitment process and transparency

There is coherence between the required competences and skills and the actual valued competences and skills in the recruitment process. There is no obvious incentive to be unclear about the skill requirements in the recruitment process, since Grundfos is always interested in finding the best possible match for the position in question. If they have an internal candidate, they are not required to advertise the position outside Grundfos. Consequently, if there is a public job advertisement, they are seeking the best possible candidate.

In addition to the in-depth technical and scientific knowledge required for specialist positions in Grundfos, candidates should have competences that allow them to interact and create value in collaboration with other scientific or technical fields of work, since specialists need to bring into play their own expertise, but also understand and acknowledge the contribution of other types of expertise.

The young specialists said that the technical depth of the questions in the later stages of the recruitment process was surprising. However, it seems that this in-depth technical knowledge is almost a requirement to thrive as a Grundfos specialist. Consequently, this part of the recruitment process introduces the candidates to the essential values of a job in Grundfos.

Notwithstanding the requirement for in-depth technical knowledge, Grundfos wants the candidates to have good interpersonal skills, since it is important in the daily work routines. Furthermore, a job announcement will often mention entrepreneurship, flexibility, etc. Grundfos has various offers to their employees to strengthen their communication, entrepreneurial or presentation skills, but above all it is important Grundfos encourages, which a university like S University appreciates, that a specialist splits his time between a university and Grundfos. However, such combinations can run into difficulties as a Grundfos specialist can experience that their candidates bring a strong scientific background.

Furthermore, problems with meeting the required academic qualifications in terms of academic publications. The Directors would appreciate if this problem could be solved.

F.5 Summary and final conclusions; lesson learnt

Grundfos is characterised by being a harmonious working environment and has a career development process. It quickly becomes clear that young Grundfos specialists (young researchers) feel safe in their positions and are not too concerned about their current or future career progress. The main driver for the young specialist is the in-depth technical work environment that produces challenging work tasks. The young specialists all seem to feel understood, supported, and challenged in their work in Grundfos. Career planning does not take up a lot of their energy, and they all agree that the challenging work tasks are what motivates them and that pursuing their interests will lead them through their career at Grundfos.

The managing specialists in recruiting positions are aware that creating an impact on business through technological development is what motivates the specialists. Likewise, it seems the managing specialists in recruiting positions as well as the company itself have succeeded in creating a challenging and supportive work environment. Even if there is no obvious possibility of a promotion, they have the opportunities and tools to accommodate the needs of their employees in such a way that they stay motivated. This could play out as a salary increase, an internal horizontal move, or new projects.

Grundfos has different approaches to recruiting. They not only use different channels to announce their vacant positions, they also hire without announcing a vacant position. When they do not announce vacant positions, they hire university students, people from unsolicited applications or from applications received for another open position. At the same time, they are aware of gender imbalance as well as unconsciousness bias.

Appendix G University of Amsterdam

G.1 Background to the UVA

The Faculty of Social and Behavioural Sciences (*Faculteit der Maatschappij- en Gedragswetenschappen*, henceforth: FSBS) focuses on education and research regarding social and human-oriented themes. The faculty has a good reputation both in the Netherlands and abroad, especially due to four high-quality research institutes which are linked to the four research domains that fall under FSBS. The research institutes conduct fundamental research in the field of social and behavioural sciences, but also develop activities and practical applications to share their research with external partners. For this case study we have spoken with researchers, recruiters and management across all four research domains.

Table 6 UVA research domains and institutes

Research domains	Research institutes
Communication Sciences	Amsterdam School of Communication Research (ASCoR)
Pedagogical and Education Sciences	Research Institute of Child Development and Education (CDE)
Psychology	Psychology Research Institute (PsyRes)
Social Sciences (Anthropology; Geography; Physical Planning & International Development Studies; Politics and Sociology)	Amsterdam Institute for Social Science Research (AISSR)

Source: Website UVA

Around 8,000 students from the Netherlands and abroad study at the FSBS. The faculty offers 15 bachelor's programmes in the fields of Human and Societal Sciences and 79 master's programmes with various specialisations. In total, over 1300 employees are involved in education and research at the FSBS.

G.2 Recruitment and career routines and policies in place

G.2.1 Recruitment routines and policies

Recruitment at the UVA and the FSBS generally takes place through open advertisements posted on European or global fora for vacancies in the academic world. It is rather uncommon that vacancies are only shared internally. Whether a position can be created or not is determined at the level of the department (research domain) and is based on the availability of sufficient funds and the need to fulfil a research or teaching position.

After receiving written applications, the head of department appoints a committee that will carry out the interviews with the candidates. A committee is composed of the department head and other researchers from the same department, where the aim is to have a good balance in terms of gender and level of seniority within the committee. With the exception of recruiting full professors, the central HR management of the entire faculty is rarely involved in attracting new employees. This also means that it is up to the departments to come up with a profile for the candidate and select the criteria that they must meet.

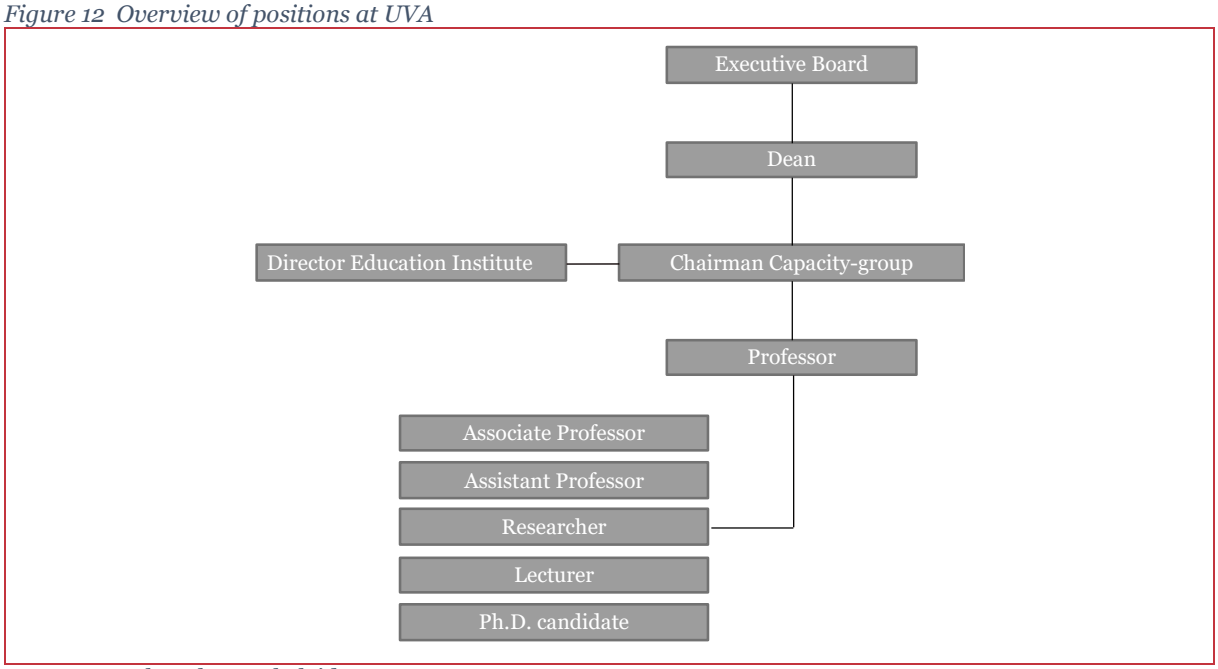
Currently the FSBS is setting up a more specific profile for its own faculty to better demarcate the faculty's specific characteristics to attract candidates with a better suited profile. Next to this, an appointed diversity officer is also working towards reducing possible bias in the recruitment process by

using different methods in attracting and selecting new candidates. However, interviewees indicated that they more often have over-qualified candidates and a wide pool to select from instead of having poorly qualified candidates or too few candidates at all.

G.2.2 Career routines and policies

The UVA has a structured career path that is common to the majority of other universities in the Netherlands.

Figure 12 Overview of positions at UVA



Source: UVA hooglerarenbeleid, 2011

The 'classic' career routine is to start as a Ph.D. candidate and move to a researcher position where people are employed on a temporary contract either on a specific research project or a freer position where they can follow their own research interests. In the Netherlands employers can only extend a temporary contract three times consecutively – if a fourth term is desired the employee cannot be contracted for at least six months by the employer before entering into a fourth temporary contract. Assistant Professor at the UVA is split up in Assistant Professor 1 and 2, with relatively small differences in salary, responsibilities and expected outputs. The same differentiation is applied to the position of Associate Professor. Both of these positions are often offered with a permanent contract, similar to the 'tenure-track' system that exists in the USA. The position of Full Professor is the highest academic position to be held.

G.3 Presentation of empirical findings

For this case study we have spoken to six young researchers, two recruiting research leaders and two members of management. We present their views below, structured along three different categories: the views on the research career, the recruitment process and the further development of employed researchers.

G.3.1 Views on the research career

Young researchers are somewhat divided as to how they arrived at their choice to become a researcher and work at a university. About half of the interviewees indicate that they realised during their master's phase that they would like to continue doing research and would actively pursue an academic career. The other half of interviewees, on the other hand, states a far less deliberate choice

either because they were asked (to apply) for Ph.D. positions or because they did not know what other career to pursue and this seemed a logical follow-up. As they progressed through their Ph.D., some considered other career options but were so far not persuaded to leave the academic world. However, one interviewee's contract had ended a few months before the interview took place and this researcher found a new job at a research institute, not affiliated to a university.

Overall the young researchers praise the level of independence and freedom they enjoy in their position. They enjoy high levels of autonomy when it comes to the type of research they want to conduct, how they conduct this and with whom. Moreover, the degree to which they can independently plan their work, outside of their teaching obligations, is highly valued. Especially those researchers who have recently started a family are appreciative of the flexibility their positions allow them in relation to take paternity/maternity leave, collecting their children from day-care or the ability to work from home when their child is ill.

> *The environment is extremely family friendly. I work home one day a week and there is broad acceptance in my department that young researchers also have family duties and responsibilities.*

When asked about balancing their work and their private life there is a clear delineation between researchers with a fixed contract and those on a permanent contract. Although all interviewees express that there is a certain degree of work pressure and stress that comes with the job, the extent and impact thereof are much greater for those on a fixed contract. One interviewee only recently came out of a long-term burn-out (caused in part by work insecurities) where others indicate that the uncertainty of not knowing whether they can stay in their position affects them and their families as a job-loss could mean that they would have to move to another university in another city or even country. In some instances, this is further aggravated by what some interviewees describe as meagre and careless communication concerning termination or prolongation of contracts.

> *It was not made clear to me what steps I would have to take to be able to stay or not, or whether there would be fiscal space for me to remain. Transparent communication, even if the message is negative, would have been very useful to me.*

In contrast other researchers found the communication within their department to be and straightforward.

The researchers state that the pressure to attract external funding is high. It is seen as fundamental in attaining a permanent position but also as an important part to make further career progress. The grant system in the Netherlands is highly competitive, resulting in many good, high quality applications not receiving any grants. This is not only frustrating to the researchers but also adds to their uncertainty as a certain degree of 'luck' is needed in order to secure research funds.

Research recruiters and management staff share the researchers' frustration regarding the large effect external grants have on the likelihood of being hired and being offered a permanent contract. Their views on the pressure and stress this brings to young researchers also aligns with the earlier presented perspectives. They further add that in their high-quality institutes this might even be a bigger challenge as the average pool of employers is composed of the best in the Netherlands, if not in Europe. Hence, in order to stand out or compete for the same grants, the quality bar is raised even higher.

One hiring manager says:

> *The term-limits on temporary contracts are pretty awful for academia. It is impossible to determine within two years who will become a successful researcher. Young people become the victim of this.*

This sometimes means that very good Assistant or Associate Professors go to other universities with a department that is less specialised or high-ranking than the institutes at the FSBS. Or it might mean

that they decide to move towards a career outside of academics. Although in terms of work environment this might mean a step down, it is very understandable and research recruiters also see that this can be more favourable than staying in the position at the UVA.

At the same time, the research recruiters find that there is a good atmosphere at their department and that researchers appear to get along well with one another, despite the fact that they are sometimes competitors.

G.3.2 Views on the recruitment process

Researchers view the recruitment process during which they first joined the faculty positively. Most researchers encountered vacancies as they were working towards their Ph.D. and responded to them during the final phase of the Ph.D. candidacy or when they had just finished. Few researchers have criticism or feedback on the process except that applying for jobs during the last phase of a thesis can be rather stressful, but they think this is not very different from other sectors where you have high-pressure jobs.

Generally, the requirements of the position were clear, and the criteria were clearly stated in the job description or became more evident during the interview rounds. When they were hired either from another university or after fulfilment of their Ph.D. their expectations of what the job would entail matched the reality once they assumed their position. Although most interviewees note that the agreed upon ratio of time dedicated to research vis-à-vis education often gravitates towards more time spent on education/teaching. The ratios differ per position and department and can vary from 30% teaching to 70% research to 50/50 balances.

There were different procedures for different positions, as this is also not decided upon centrally but is left to the department head and the appointed hiring committee. For some positions the process only entailed a standard application letter and a single round of interviews whereas other interviewees had undergone more elaborate procedures where, next to a letter, there were several rounds of interviews, assignments on research strategies or sample lectures.

Two out of the six interviewed researchers indicated that there were special skills or competencies required in order to be considered an attractive candidate for the job. These specific skills either focused on the ability to independently design and develop research curricula or to possess clinical skills to work in laboratories. Most of the vacancies to which the interviewees replied were fairly open in terms of research directions as long as they were in line with the institute's focus as well as in terms of competencies or skills. Demonstrating a strong Ph.D. thesis and publications in high-ranking journals were usually considered sufficient to cover the basic requirements for the position. However, as these criteria applied to a large number of applicants the subsequent selection of a candidate was not always clear or transparent. Researchers expressed their frustration about this point and one remembered having been told he was "too much UVA" and was therefore not selected initially. This researcher had completed his bachelor, master, PhD and first few years as a researcher at the UVA. However, officially this was no criterion and, in the researcher's view, this did not discredit any of the competencies that were listed for the position.

The researchers expressed mixed views on the fact that hiring committees can consist of colleagues who they work with on a daily basis. Some praised this, as they felt they would know them best and experienced the subsequent informal atmosphere of the interview as pleasant, whilst others found this to be less professional and objective due to the familiarity between recruiter and candidate.

Research recruiters confirmed that they have different procedures depending on the expected amount of vacancies and the type of research positions. Most vacancies are posted on global forums and are open to both national as well as international candidates. Research recruiters could not identify strong barriers or challenges associated with hiring or working with non-native researchers. They mentioned that sometimes they cannot teach all classes as some are in Dutch, and there could be some cultural differences which had to be overcome. At the same time the latter was also considered as a

positive feature that can be seen as an added value to a research group or department. In addition, non-native researchers often bring a different network and are highly motivated.

The research recruiters also indicated that they have little trouble finding sufficient, highly-qualified candidates. In the past this was different for specific domains and occasionally some positions require more effort to be filled, however on the whole, the pool of candidates is large and of sufficient quality.

When selecting candidates, the recruiters look at a number of criteria of which publishing in high-ranking journals and being able to successfully acquire research funding are the two most important. Next to these two, demonstrating good teaching skills as well as ability to fit with the group were also considered when reviewing a candidate's application. For some positions specific requirements might be necessary but this depends on the profile and the need within the department at a given time.

Recruiters were also aware that it can be frustrating for candidates when they meet the 'hard' criteria which are more easily demonstrable but are not selected. However, to make the decision-making process more transparent with respect to the softer criteria, such as fitting in with the existing research group or overall impression, was seen as very difficult by the research recruiters.

Management staff characterised the recruitment process as open, confirming that most positions are advertised outside the university or department and most often to a global network. Overall, vacancies do not have to be posted repeatedly, a first round tends to attract a sufficient number of qualified candidates.

Management staff also indicated that they do keep an eye out for talented master or Ph.D. students. However, this is not a formal, structured process where students are officially scouted or where particular internal routes or procedures are put in place. However, lecturers and Assistant/Associate or Full Professors do try to involve talented students early on in a research project so that they might be more interested to stay at the faculty for a further academic career.

They also stated that there are few challenges with hiring staff from abroad. There are incidental cases where things do not work out and the employee is asked to leave before completing the first term of their contract. The main reason for this is often a combination of cultural differences and not being explicit enough about the expectations on both sides of the table. This can be in part attributed to the open and free nature of many of the vacancies and the workplace a whole – leaving a lot of room for individuals to further carve out their role.

G.3.3 Views on further development of employed researchers

The overall impression of the **researchers** on their own career development is that they have to advance this themselves. When prompted with several different examples of more formal career development support such as trainings, structured sessions with more senior staff or online tools, the majority of the interviewees indicated that such support structures are not offered or that they were not aware that they are available. When the researchers were aware of support practices, they stated that "you have to figure it out yourself".

Some researchers, however, indicated that there are a number of informal support structures. In one department an informal mentorship-system is in place. Staff from all levels can indicate that they would like to be a mentor or mentee and are paired up. The outcomes or experiences of this system are not explicitly monitored or evaluated, but overall the staff involved appeared to be satisfied with the service.

In addition, the researchers indicated that there are several courses offered on skills that are common to the research practice. For instance, courses on how to best write a grant application or on English writing skills are taught to post-Ph.D. employees. Others also elaborated upon this practice within their own research group or department by holding sessions during which colleagues present their grant proposals to each other and defend them as if they were in front of the committee deciding on their submission.

The view persists that these activities are not as well-known amongst the researchers and all interviewees characterised the support system as one where you have to seek out support for yourself. Some services were found more relevant when leaving the university, such as *Jobtalk*, which offers three free career counselling sessions. Interviewees indicated that these are mainly used in the event of having to look for a job at another university or a different type of employer.

At the same time, the researchers were overall satisfied with the available resources such as IT, research infrastructure (labs or special test facilities), network opportunities and opportunities for collaborations, to name a few. Most researchers indicated that the budget to carry out research is sufficient, though everyone expressed that more budget would be welcomed. In addition, the atmosphere in the departments and research groups was also generally viewed as positive, stimulating and collaborative, despite the occasional competition over similar grants and/or positions.

There are three, connected issues that came up frequently during the interviews with the researchers, namely the (undue) influence of winning grants to ascertain one's position, the lack of stability and security, and communication. The researchers were cognisant of the limited research funds of the university and that they have to acquire part of their own research funding if they wish to continue carrying out research. However, the Dutch system is highly competitive and the way in which researchers are awarded a grant has been characterised as a 'lottery'. Interviewees explained this by stating that large numbers of grant applications of high-quality were rejected due to personal preferences or interpretations during the peer-review process. This circumstance added an element of 'luck' to the process which for many researchers meant a high level of insecurity.

The insecurity stems from the interlinkage between securing a grant and the increased likelihood of attaining a permanent contract. One of the prerequisites for many positions is the demonstrated ability to secure grants independently. As previously explained, a temporary contract can only be extended a maximum of three times, which means that repeatedly not winning a research grant decreases researchers' chances of a receiving a permanent contract. Considering that many of the researchers are (entering) a phase in life in which they would like to buy a house or start a family, this job insecurity puts significant pressure on them. Once a permanent contract is awarded researchers still experience pressure and stress but find this to be of less significance compared to the period before a permanent contract.

Finally, the researchers noted that the way in which the FSBS communicates about possibilities of attaining a permanent contract also influences how stressful this period can be. The interviewed researchers had mixed experiences with this. Some, who had been awarded a permanent contract, mentioned that they were in a 'privileged' position compared to their peers who were still on temporary contracts and that they had gone through one or two temporary contracts. Two of those interviewees had received prestigious grants from the Netherlands Organisation for Scientific Research (NWO), whilst one had won a different grant.

Other researchers, who did not yet secure a grant, had a more negative views on the communication within the faculty on this matter. When asked whether they knew what the requirements were to be promoted, they answered that they were familiar with the set of criteria for the position, but that almost everyone in the department met those standards. Hence, what would then determine someone's promotion remained vague, even when in one instance an interviewee repeatedly had asked for this in mid-term or annual reviews. This experience was not shared by all of the researchers, but the majority thought that more and clearer communication would be desirable.

Recruiters highlighted the formal and informal career support strategies that are in place, such as the writing courses and the mentorship possibilities within research groups. As heads of department they also noted that the career development of young researchers could be particularly difficult and competitive given that they were in top-notch research groups. Due to the unique and high-level facilities (brain-scans, sleep-labs, etc.) the faculty attracts high quality researchers. This means that the group as a whole is often at the top of the field which raises the bar if you want to stand out within the faculty.

Going the extra mile within the faculty not only means being ahead of the peers around you but also those at other leading universities.

The recruiters also highlighted a dissonance in the way researchers are expected to further their careers and on what this (partially) depends. Namely, a large share of the faculty's income is determined by the number of students it attracts each year. As such, good quality education matters and relates to how much funding the university receives. The courses are taught by Ph.D. candidates, Assistant Professors or Associate Professors. Yet especially the latter two are judged by their academic output in terms of publications and acquired grants. Hence, there is a challenge in reconciling both for the researchers and their employers.

Management staff mentioned that it is not easy to advance within the faculty and to attain a permanent position. This is in part due to the classical pyramid model in academia, with fewer positions at the top and a wide uptake of new students at the bottom. Management also stressed that the Dutch law concerning a maximum number of times (three times) that a temporary contract may be renewed is not suited to academia. Research cycles take much longer than two years (maximum time of temporary contracts) and thus it forces researchers to demonstrate potential in a relatively short period of time.

Especially the position of Researcher or Assistant/Associate Professor is tied to a lot of insecurity in terms of job stability. Management indicated that the financing mechanism of these positions is overly dependent on external revenues through grants and subsidies. Management was cognisant of the effects this dependence on external revenues had on its staff in terms of their mental health and performance. The organisation has taken steps to better support staff in this regard, but the structural, underlying cause remains unchanged and is beyond (direct) influence by the faculty's management.

G.4 Coherence and transparency

G.4.1 Coherence

Most interviewees indicated that the 'terms' under which they were employed aligned with their expectations a few years down the road. Many interviewees attributed this to the often 'open' and 'free' character of job descriptions. In addition, there are not many explicitly required competences and skills as these are often covered under requirements of a previous degree or research project. In some instances where specific skills were demanded, these were much in line with the field of research or the nature of the position itself, but placed more emphasis on the educational component or development of a vision for a more inter-departmental collaboration.

The main three components taken into account when considering promoting someone are 1) acquisition of external funding, 2) publications in quality journals, and 3) high quality teaching. In the majority of the cases, these are the main factors that are considered. However, when the overall quality of the candidates is very high, other factors become more important and are not necessarily explicitly named in vacancies or documents detailing requirements to get promoted. These are factors such as alignment of research interests with the department or contribution to development of new research lines. In some instances, there was a need for more support in curriculum development in which case candidates with fewer publications on their CV might get chosen over more advanced researchers in terms of publication and acquisition potential. This had sometimes led to confusion or frustration among the rejected candidates.

G.4.2 Transparency

There were mixed views on the topic of transparency within the faculty, which appear to be divided along departmental lines. Some researchers indicated that they had rather negative experiences with the way in which the management had communicated on matters of contract extension, minimum criteria to keep their position and other related issues. They indicated that this had negatively affected their sense of job stability, and one interviewee stated that "You get the impression that you care more about the university than the university cares about you".

Other researchers had a very different experience on this matter. They applauded the level of transparency and 'openness' of their direct superiors in being straightforward and realistic about their chances of being promoted/attaining a permanent contract. Some of the recruiters and staff of management confirmed this open approach as being very helpful in reducing some of the insecurity researchers deal with. The following words from a young researcher illustrates this:

> *I feel like a lucky duck, I am part of very good and interesting group and I can just knock on my programme director's door if I need to ask a question. I realise that this is not the situation for many of my peers.*

G.5 Summary and final conclusions

Overall most researchers were satisfied with their job and their career track in general. When they started working in academia they were aware that it is not a guaranteed, upward career trajectory. Most of them indicated that they enjoyed their work and were happy with the sacrifices they had to make in order to maintain their position. Although some had considered careers outside of academia, the drawbacks of their current position were not severe enough for them to seriously look for another non-academic job.

Researchers, recruiters and management staff attributed the relative job satisfaction largely to the open and independent nature of the position. Researchers have a large degree of autonomy in deciding their own research agenda and pursuing collaborations nationally and internationally. In addition, the freedom in terms of autonomous time planning is a significant benefit, especially with young children. This was mentioned several times as a 'perk' of the job. Next to this, the good atmosphere, with little competition and frequent collaboration and exchange between colleagues was mentioned as a positive element in the researchers' work environment.

Few negative commentaries came forward on the open recruitment process of the faculty. The decentralised structure appears to function well and there is no problem with attracting sufficient candidates, especially compared to ten years ago. Job descriptions are clear, and the interviewees expressed that for researchers it is clear what the requirements and conditions of the position are. The actual practise does not differ much from the expectations; some researchers mentioned that the share of time spent on education vis-à-vis research tends to be larger. Sometimes 'softer' criteria such as 'fit' with the research group or research agenda within a department are not stated explicitly. This was not considered a problem except when it is not communicated clearly in feedback towards rejected applicants.

In terms of further career development of researchers, the researchers themselves noted that there are few official support structures in place. This was confirmed by heads of department and strategic management as there are few official policies or guidelines put down on paper. There are a number of courses and trainings offered by the faculty which focus on practical skills such as grant writing or written English. The majority of the support is provided in informal networks within the department, some more formalised than others. Most researchers indicated that they were satisfied with the level of career support, although a few would have liked to be more aware of the different (informal) possibilities.

Both researchers and recruiters underlined the importance of communication. The high level of insecurity and instability that comes with an early career in academia requires that in areas where some certainty can be given, this is needed and valued. This applies to both the recruitment process as well as to employees who are looking to be promoted or seek a permanent position.

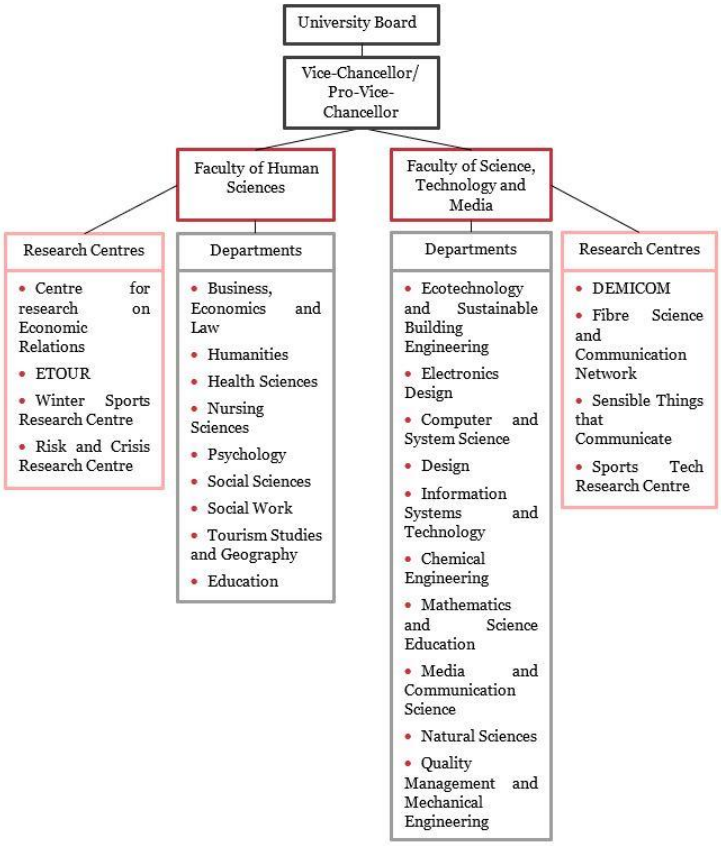
Appendix H Mid Sweden University

H.1 The university and the selected unit at the university

Mid Sweden university (Miun) is located in the middle of Sweden, with campuses situated in Sundsvall and Östersund. It is a middle-sized university with approximately 13,000 students, 200 PhD students and 1,000 employees. It offers 47 educational programmes and 37 master programmes. The university's turnover in 2017 was SEK 966 million. Miun is one of the leading universities in Sweden regarding distance education[85] and many of its courses apply flexible forms of education.[86] The university has a great regional importance since approximately half of the university's students stay in the region after their graduation.[87]

As shown in Figure 13, Miun is divided into two faculties, Faculty of Human Sciences and Faculty of Science, Technology and Media, which in turn are divided into several departments. Attached to the faculties are also eight research centres, four at each faculty.

Figure 13 Miun faculty and department chart.



Source: Miun's homepage.

[85] Miun's homepage.

[86] Annual report 2017, p.24.

[87] Miun's homepage.

The research at Miun is conducted both within the different disciplines at the university, as well as within research centres. The objective of the research centres is to gather several disciplines within certain profile areas to tackle complex problems through interdisciplinary cooperation.[88]

Research accounts for 36 percent of the university's operations, 43 percent of which is financed by external funds. The largest single contributors being the Knowledge Foundation, EU's structural funds, Swedish Energy Agency, Swedish Environmental Protection Agency, Vinnova, the research councils and the municipalities of the region.[89]

H.1.1 Recruitment and career routines and policies in place

Research careers is one of the priority areas within the university's Research Strategy 2012–2016,[90] focusing on the recruitment, skills development, career paths and equal opportunities of researchers at the university. The goal is "to be an attractive workplace on equal terms with good conditions for recruiting and retaining staff, where career paths are clear, and all research staff are offered skills development".[91]

The Research Strategy states that, regarding the recruitment of researchers, the university is to develop faster recruitment processes and strive for diversity regarding e.g. gender and ethnicity, in order to improve quality and attractiveness. With regard to skills development, the university is to facilitate the researchers who hold a PhD to regularly spend time abroad and to strengthen the career paths between academia and industry, in order to ensure the skills development of the researchers and to prevent loss of qualified employees. When it comes to career paths, the university is to increase (national and international) mobility, develop routines for more flexible use of funds for different types of positions (e.g. career-development positions) and support the PhD students in their career planning. Finally, the Research Strategy states that it shall not depend on gender, origin or age if a researcher at Miun receives a certain position, amount of funding or is invited for cooperation. Therefore, the university shall ensure equal opportunities for researchers by mapping the current status of equal opportunities within all research environments and develop a vision for equal opportunities for these environments, as well as stimulating merit-based competition and openness.[92]

H.2 Presentation of empirical findings

For this case study we have interviewed five researchers in the beginning of their career, two recruiting managers and three managers on strategic level.

H.2.1 Career paths

Previously there were two entrances into a research career at Miun: (1) as a doctoral candidate and (2) as a lecturer (without a PhD) who could participate in research programmes, but now only the former option is available. Many doctoral candidates within technology and the natural sciences graduate with a licentiate degree[93] before completing their PhD. After completion of their PhD and a postdoc period, they can get a research appointment or an associate senior lecturer position (with possibilities for permanent position as senior lecturer), but the former is getting more uncommon, since Miun no longer wants to have researchers who focus only on research, but also teaching. Last, they can become docent (a title essentially equivalent to Associate Professor) and professor. In Sweden you have the right to have your academic merits evaluated for professorship, although it does not automatically mean that you have the right to get promoted even if you pass. There must be available positions. Only a small part of the research staff become professors, since there are simply not enough professor positions available. Apart from this typical career path, the researchers can also choose a teaching career or a management

[88] Research Strategy 2012-2016, pp.5-6.

[89] Annual report 2017, p.39.

[90] A new Research Strategy is currently in the works, but did not get published in time for this case study.

[91] Research Strategy 2012-2016, pp.17-18.

[92] Ibid., p.19.

[93] A degree that exists in Sweden and which essentially is half a PhD; it contains research training and a thesis. It is particularly common in the technological disciplines. It is possible to continue to a PhD afterwards.

career (i.e. become head of department, dean etc.), but these are not as common. Many researchers also choose to move on to the industry after their doctoral graduation.

H.2.2 Views on the research career

The researchers we interviewed were all in the beginning of their research careers. Most of them stated that the fact that they had ended up at Miun was more or less a coincidence. As reasons for applying, the researchers noted factors such as contacts at Miun, previous familiarity with the university, and the location of the university. All of the researchers were required to carry out other duties in addition to doing research (mainly administration, writing applications and teaching), which took up approx. 50 per cent of their time. Regarding the impact these other activities have on their research careers, most of the researchers felt that it is a double-edged sword. On the one hand it takes away time from their research and publication-writing, on the other hand the administration is part of the job and teaching experience is required to become senior lecturer and professor. One of the researchers felt that in an international perspective, these activities could have a negative impact, since on an international level you only get recognition based on your publications.

Most of the researchers said that their current position had fulfilled their expectations. Most of them also felt that it was hard for them to have a clear work-life balance, but they still felt content since the job is so flexible and they get to work with something they are passionate about. Miun was seen as a family-friendly workplace, although most of the researchers noted that generally speaking parental leave can have a negative impact on the research career, since they will lag behind peers in terms of research and publications. The answers among the researchers were dispersed when being asked whether they ever had considered leaving their research career for another job. Those who said that they had considered changing career mentioned as reasons that they wanted to see more practical outcomes of their research and the fact that it is tough to be a researcher, especially regarding job security. One was very clear; his next career step would be to move into industry, either as entrepreneur or as researcher at a company.

The middle management staff regarded a research career an attractive alternative for their employees. They noted that many researchers choose to stay within academia because of the climate and the fact that they want to focus on “free” research rather than the more product-oriented research conducted within the industry.

H.2.3 Views on the recruitment process

Research positions at the university are advertised through public job advertisements. To a large extent, Miun recruits internationally, in which case the job advertisements are spread through the researchers’ own networks or on certain webpages for postdocs. The middle management staff thought that the organisation had become more dependent on external funding regarding recruitment to research positions than before. Since it is hard to secure financing for more than a couple of years at a time, it has led to more short-termed positions, e.g. they more often recruit for licentiate positions (2 years + possible extension) than for PhD training positions (which typically is four or five years). The strategic management staff, on the other hand, said that internal or external funding had no real impact on the recruitment of permanent staff, but recruitment of postdocs requires projects with external funding.

The middle management staff felt that the university must struggle to some degree to attract research staff, since (naturally) the bigger and more well-known universities attract the most promising researchers. The strategic management staff, on the other hand, saw no real difficulties with attracting researchers to Miun, although they also agreed that the bigger universities get some of the best applicants. Miun has in general a very low turnover of personnel, and the researchers who choose to leave Miun often do so because of the form of employment (temporary); they move to the industry or they move to another geographical location.

The middle management staff said that the quality of the applicants had improved during the last years, and that they have gotten a greater spread of nationalities as well. However, the number of applicants on doctoral level within the natural sciences has decreased, due to an overall reduction of the number of

students in the field. The strategic management staff meant that the quality of the applicants varies depending on the subject area and position. One strategic management interviewee said that it becomes harder to get enough good qualified applicants the higher the available position is. The middle management staff explained that the biggest challenge when recruiting researchers from other countries is to assess their credentials, while the benefits are e.g. more applicants and a more multicultural environment. The strategic management staff saw several benefits with recruiting foreign researchers, such as new perspectives, new networks and new ways of thinking. The challenges they saw included possible language issues, difficulty in knowing the quality of the research and education background, and administrative difficulties in getting a Swedish social security number.

The researchers' experiences of the university's recruitment process varied greatly. Some had gone through a formal process, while others had been recruited through contacts. Some felt the process was smooth, while others found it messy. Several researchers felt that the formal recruitment process was very lengthy, especially compared to the industry.

> *The process became very messy for me. It took very long time from when Miun saw the need for a position and until it was completed. They advertised it first, but then changed their mind and said it was no longer to be a new position. But still the process was not really cancelled, it was more put on hold. And then it was restarted again. Then it went really fast. It took over a year from I applied until I got it.*

Most of the researchers felt that in many cases there is already a specific candidate in mind, in which case the position is tailored to fit this candidate and the formal recruitment process becomes more of a facade. Even those who had been employed through such a process was critical towards it.

> *Bad that it is already decided who they will to hire. You never get the best, it is no real competition.*

However, the researchers recognised that this not only applies to Miun, but to other academic institutions as well. The researchers found several differences between the recruitment processes within academia compared to the industry. Apart from the processes within academia being longer and slower, one of the researchers also said that the competition for research positions works better within the industry. Another researcher said that recruitment within the industry works smoother than within academia, not only regarding the process itself, but also when it comes to the introduction of new employees in the workplace.

H.2.4 Views on career development

According to the middle management staff, the university has no formulated career policy. They were divided on whether researchers usually have a career plan, but noted that during the annual performance review the researchers discussed their career path with their manager. According the strategic management staff, the way the university monitors and assesses the progress of the research employees varies depending on which career level they are at. Doctoral candidates have both main supervisors and acting supervisors (to ensure that personal chemistry will not be a hindrance) that follow up on the doctoral candidates through regular meetings. At later career stages the follow-up is not as structured; they mostly follow up on publications.

All researchers we interviewed had a clear vision of their next career step and the requirements to reach it. Among the things needed to boost their career were building a stronger network, increase their publications/track record, and get more time for research. All of the researchers thought that the requirements within academia to reach the next career step were reasonable, but one of the researchers said that it has become *eduflation* within some sectors of the industry and noted that in order for big well-known companies to even consider you as an applicant you must have done 2-3 postdoc periods at prestigious universities. A female researcher was a bit weary but made an interesting note in passing:

> *Am going to be associate professor next* [docent]*, but it is not certain that I want to be a* [full] *professor. The organisation works towards making me professor, like,*

> *they want more women as professors. I get support if I wish. But I can imagine industry as well.*

Based on our interviews, it seems as if the younger researchers have less knowledge of their career path and whether there are any formal career development processes in place at Miun. The researchers who are a bit higher up on the career ladder (senior lecturers), on the other hand, had a good idea of their career paths and had participated in formal career development processes at the university, such as pedagogical training, supervisor training and research manager training. Several of the strategic management staff expressed that the fact that there are formal and clear criteria for the different career steps helps create a structured career path for the researchers.

The strategic management staff stated that there is no formal strategy for career management, although they try to make sure that all research staff are aware of the criteria for the different career steps so that they can plan their career paths. They also try to ensure that everybody have the resources they need in order to acquire further qualifications, e.g. everybody has a teaching obligation. The middle management staff we interviewed said that there is no direct support for researchers in their career development, but mainly small pushes here and there for them to take their next career step. For example, the middle management staff try to encourage their research staff and the doctoral candidates to take up temporary positions abroad to enhance their careers. There are, however, some initiatives on central level, such as research management training, and the organisation has development funds available. The strategic management staff also said that they, to an increasing degree, encourage their research staff to get international experience. One strategic management interviewee noted that the university had a programme a couple of years ago through which younger researchers got funding from the university to go abroad for a few months, and another interviewee noted that some of the bigger research groups also have money set aside for this. Many of the younger researchers' international stays are funded by external means.

Most of the researchers were provided with sufficient resources at Miun to develop as researchers, although one of the researchers wished for closer mentorship. Among the most important resources needed to develop as a researcher the researchers mentioned time to concentrate on research and infrastructure. A couple of researchers mentioned that Miun has implemented many new initiatives during the recent years targeted at supporting researchers' career development, such as pedagogical courses and the possibility to apply for funds for writing applications. Most of the strategic management staff thought that their organisation provides sufficient support to the researchers' career development, although there could be a more formal career planning process. There also seems to be somewhat room for improvement regarding the amount of support provided by the organisation to researchers' career development. One middle management interviewee noted that there are few possibilities to support individual researchers' career development by internal research funds, and it is thus largely dependent on the research managers to secure external funds. As obstacles for their work with recruitment and supporting the career of young researchers, the middle management staff mentioned lack of time to get more involved and fewer possibilities to offer senior lecturer positions, which would provide clearer career paths than the temporary positions they often have to offer pending more external funding. One strategic management interviewee stated individual factors as possible obstacles, such as the attitude and objective of the research group leader.

The answers among the strategic management staff were dispersed regarding who is responsible for supporting the researchers in their career progress, and one of the interviewees noted that the division of responsibility in this regard is not entirely clear. The two faculty boards are highest up in the chain of responsibility, and under them are the heads of departments. The head of department is the one conducting the annual performance review with the researcher, where career development is one of the discussion points. Individual support is in reality given by the research group leader, although this takes the form of a practical mentorship than a formal responsibility. The researchers themselves felt that they are primarily supported in their career development by the leader of their research group, although on the lower levels (doctoral candidates/postdocs) it is more up to the individual.

H.2.5 Coherence between competence/skills requirements, actual valued competences/skills in the recruitment process, and transparency

With respect to what matters when recruiting researchers, a PhD degree, the field of study, research quantity and quality and teaching credentials were mentioned. Things that matter on the professor's level include the applicant's network, leadership experience, experience of operating large research projects and experience of applying for funds. Non-degree-based skills that are emphasised in the recruitment of researchers at Miun are mainly teaching credentials, but also other qualifications, such as ability to get funding and previous cooperation with the industry. Among the credentials that the researchers felt were valued in the recruitment process were their academic degree, number of publications, teaching experience, which university they had been to and which professors they had. All of them said that their credentials had been correctly assessed, although one researcher wished that experience from the industry would be more valued in the recruitment process.

According to the management staff, gender is a focal point in Miun's strategy for recruitment – and this is possibly confirmed by the female researcher's quoted experience above. Even though credentials outweigh gender in the recruitment process, Miun has increasingly been focusing on gender issues on different levels, especially through acquisition of qualifications of younger female researchers. A couple of years ago Miun conducted a screening of all research environments at the university to assess diversity and equality aspects in these environments. This led to implementation of a diversity recruitment strategy, which aimed to balance uneven gender and multicultural spread in certain research environments at the university. The strategic management staff noted that although they try to recruit more female professors, it is hard to correct the gender imbalance on this level because there are few female candidates and hard competition. However, the gender balance on lower levels is much better.

Regarding the transparency of the recruitment process, the researchers felt that the requirements for positions were clear when they applied, although a couple of them noted that the requirements get clearer the higher you get on the career ladder. Some of them pointed out that Miun has formal documents which clearly state the requirements for the different research positions. Most of the researchers thought that the instances when there is already a specific candidate in mind and the position and advertisement are tailored to fit this candidate, made the recruitment process at Miun less transparent and fair.

> *-Is the recruitment process reasonable, transparent and fair?*
>
> *-I would like to say no. If they already have a candidate in mind, then that person has an advantage. […] It is more transparent now than before. It seems to get better with time.*

Nevertheless, most of the researchers felt that there was no need for changes regarding the transparency, and one researcher noted that the transparency has continuously improved over time.

According to the management staff we interviewed, the criteria for hiring research staff is stated in the job advertisement, including a reference to the university's appointment procedure, which lists all criteria. They also said that the recruitment process follows the university's appointment procedure. According to the management staff, there are many aspects of the recruitment process which helps ensure that the recruitment of research staff is transparent and fair. Apart from the fact that all recruitment goes through the HR department, the applicants for higher research positions (senior lecturers and above) are reviewed by an employment council and through external peer-review, while candidates for temporary positions are reviewed by research colleagues. Finally, the whole recruitment process is documented and reviewed before the hiring decision is made. The management staff thus considered the recruitment process transparent and fair and saw no need for changes. However, several of the interviewees noted that the transparency efforts of the current process have caused the process to become slower and lengthier.

H.3 Summary and final conclusions; lessons learnt

Most of the researchers we interviewed seemed to have ended up at Miun more or less by coincidence and most of them meant that their current position had fulfilled their expectations. The researchers felt that it was hard for them to have a clear work-life balance, but the flexibility of the job combined with their interest in the field still left them content with their situation. Some of the researchers had considered leaving their research career for another job, e.g. because they wanted to see more practical sue of their research and get greater job security.

Regarding the recruitment of researchers, open positions are advertised externally. The criteria for research staff are stated in the job advertisement, including a reference to the university's appointments procedure, which lists all criteria. The criteria seem to correspond to the researchers' experiences of which credentials they felt were valued in the recruitment process, and all of the researchers said that their credentials had been correctly assessed. Gender is also a focal point in Miun's strategies for recruitment, although credentials outweigh gender in the recruitment process. Miun has increasingly been focusing on gender issues on different levels, especially through support of younger female researchers.

The researchers' experiences of the university's recruitment process varied greatly, as some had gone through a formal process, while others had been recruited through contacts. Several researchers meant that the formal recruitment process was very lengthy, which was echoed by most of the management staff. In many cases there was already a specific candidate in mind, in which case the position was tailored to fit this candidate. In some part, this makes the recruitment process at Miun less transparent and fair. Nevertheless, the researchers were in general content about the transparency of the recruitment process and most of them saw no need for changes. This contentment was echoed by the management staff. The management staff stated that the recruitment process follows the university's appointment procedure and there are aspects which helps to ensure the transparency and fairness of the recruitment process, such as involvement of the HR department, assessment of applicants by the employment council, external peer-review, and the fact that the whole recruitment process has to be documented and reviewed before the hiring decision is made. Miun thus seems to have succeeded in creating a transparent and fair recruitment process.

The middle management staff felt that the quality of the applicants has improved during the last years, and that they have gotten a greater spread of nationalities as well. The middle management staff felt that the university must struggle to some degree to attract research staff, while the strategic management did not see any such issue. Miun has a very low turnover of personnel, and the researchers who choose to leave the university often do it because of the form of employment, they move over to the industry or they move to another geographical location.

The university has no formulated career policy and no formal strategy for career management, although they try to make sure that all research staff are aware of the criteria for the different career steps so that they can plan their career paths, as well as ensure that the researchers have the resources they need in order to acquire further qualifications. The middle management staff thought that there was no direct support for researchers in their career development, but mainly small pushes here and there for them to take their next career step, such as encouragement to take up temporary positions abroad. These efforts seem to have succeeded, since the researchers we interviewed had a clear vision of their next career step and the requirements to reach it.

The researchers are provided with sufficient resources at Miun to develop as researchers. Most of the management staff also said that their organisation provides sufficient support to the researchers' career development, although some improvements could be made in terms of formal career planning. As obstacles for their work with recruitment and supporting the career of young researchers, lack of time to get more involved, few possibilities to offer senior lecturer positions and human factors such as the attitude of the research group leader, were pointed at. The division of responsibility regarding support of the researchers' career progress is not entirely clear at Miun. The head of department conducts annual performance reviews with the researchers, where career development is one of the discussion points, but more individual support is given within the research group by the research leader. Overall, the career

development support for researchers at Miun seems to be working fairly well, although both the organisation and the researchers would benefit from a clearer and more formalised division of responsibility on the matter.

Appendix I ASML

I.1 Background of ASML[94]

ASML is a company in the Netherlands, specialised in the provision of hardware, software and services for chipmakers. The technology from ASML is used by the world's top chipmakers like Intel, Samsung and TSMC. In 2017, the net sales of ASML was €9.1 billion, of which €6.7 billion in the Asian market and €1.5 billion in the United States. The worldwide market share is around 85%. In the same year, about €1.2 billion was spent on R&D.

The company ASML was formed in 1984, when the companies Philips and Advanced Semiconductor Materials International (ASMI) created a new company to develop lithography systems. The company was first located in the city of Eindhoven in the South of the Netherlands and moved to the nearby city of Veldhoven when it grew to 100 employees in 1985. By 1988, the company had already set its first steps on the Asian market. The biggest growth of the company was after 1991, when the company launched its breakthrough platform that dramatically reduced manufacturing times of its customers. In 1995, the company became fully independent from Philips. In the following years, the company continued to introduce new technologies that made it possible for their customers to produce smaller and smaller chip features that also made the chips faster and more powerful.

Nowadays, ASML is one of the leading technology companies in the Netherlands with 21,000 employees and 60 offices in 16 countries worldwide. The largest site of the company is that in Veldhoven, with about 10,000 employees. Currently 6,500 people work in research and development. The company has R&D and manufacturing locations in the Netherlands, the USA, China, Taiwan and South Korea. Its main customer groups are the producers of memory and logic chips.

The company is organised in three main business lines: Deep Ultraviolet systems (DUV), Extreme Ultraviolet systems (EUV) and Applications. Several business functions such as Research, Sales, Operations and Sourcing support these business lines. People with all kinds of backgrounds work at the company: from business and administration to lithography and mechanical engineering.

To remain at the forefront of technology development, the company works with an open innovation model, uses parallel engineering to accelerate product development and is always looking for new people, including people with research background. In 2017, the company hired 2,500 employees globally and it expects to hire 3,500 employees in 2018.

I.2 Recruitment and career routines and policies in place

As a global company, the recruitment policy of ASML is also fully global. The company language is English and vacancies are advertised worldwide. The company has assembled an international network of universities and uses this network to reach out to (possible) new employees. There is a specific team at the human resources department for university relations that tries to get in touch with universities that are of strategic importance (e.g. have technical faculties).

I.2.1 Recruitment routines

There are several ways through which a person can apply for a job at ASML.

The regular process is by applying via the website, where a person can apply for a specific vacancy or submit an open application. ASML recruiters perform a first screening based on the resumes and motivational letters they receive. Suitable applications are reviewed by a line manager and a check is done whether the application matches (better) with vacancies. The applicant is notified of the outcome of the screening within three weeks.[94]

When an applicant is successful in the screening process, several personal interviews will be held with a line manager and/or a recruiter. Most times, candidates also have to make an online assessment in

[94] ASML website: www.ASML.com

between interviews (exceptions are sometimes made for people that have for example already done an internship at the company). As an international company, it is possible for applicants to do their first interview via Skype. The second interview is almost always in the Netherlands. Sometimes, the company also organises interview days in other countries.

Once the above steps have been completed and both the company and the applicant feel that there is a match, a proposal of employment at ASML will be made with a terms and conditions agreement. When the applicant accepts the offer, he or she will receive the contract and will start working.

For people with a PhD background, there are special recruiting events. The company annually organises a PhD masterclass, where people with a PhD background are invited to come to the Netherlands and get to know the company. ASML also visits different universities to recruit locally. Furthermore, ASML facilitates learn-work trajectories for students at different levels (from vocational schools to bachelor).

There is no specific focus on gender in ASML's recruitment strategy except for the creation of communication material that also inspires women. The company would like to have more female employees but does not apply any form of positive discrimination. The main selection criterion is quality: finding the right person for the job.

I.2.2 Career routines

People starting at ASML begin with a new hire training day. During this day, new employees are welcomed to the company and get a tour through the ASML 'experience centre' where they learn about the history of ASML and the technology. Furthermore, there are activities in smaller groups where people meet the technology and other people in an interactive way. The day is meant as a way to get people to know the company in a friendly way and form their first network of colleagues and friends. Furthermore, ASML also appoints a 'buddy' for the first weeks: someone on the same floor that coaches the newcomer on the ins- and outs of the workplace.

Within ASML, there are three possible career paths: technical specialist, project manager and line manager. Next to this there are specific functions, such as communication, sales and HR. A person can stay and grow within one path for his/her entire career but it is also possible to change paths. In order to become line manager or project manager, there are certain requirements that the company has put on paper.

- Working at ASML as a technical specialist means working on research and development to come up with technical solutions. A technical specialist can grow to the function of architect or fellow; the latter having similar salary level as a top managers.
- As a project manager, you start with managing small projects and as you grow you will manage bigger projects with more stakeholders, people and risks and eventually you will become a product programme manager.
- A line manager at ASML can develop from a team lead to group lead, department manager, cluster manager and possibly even vice president.

A person with a PhD background can choose any of these roles. For certain functions a PhD is required because research skills or in-depth knowledge on a certain topic is necessary for the job. The scientific level is regarded to be very high. A manager in recruiting positions said:

> *Our individual technical goals and specifications are the same as the specifications of top-research, at minimum.*

For each person an individual Development Action Plan (DAP) is set-up, in which a person defines what his/her goals are and how he/she wants to grow. Together with the line manager, specific steps are set out to reach these goals (e.g. walk with a colleague for a day, get a coach or a mentor, follow specific trainings).

I.3 Presentation of empirical findings

For this case study we have spoken to four young researchers, two hiring managers and one strategic manager from ASML. We present their views below, structured along three different categories: the views on the research career, the recruitment process and the further development of employed researchers.

I.3.1 Views on the research career

The fact that someone can stay a technical specialist within ASML until his or her retirement is considered unusual. Managers consider a research career at ASML to be attractive, since the technical goals and specifications require top-research. One manager indicates that new people at ASML sometimes find the job titles confusing, as they diverge from the 'traditional' image where employees eventually become managers or directors.

All young researchers that were interviewed stated that they discovered ASML when looking for a new job outside of academia. The reason for them to leave academia was the difficulty of getting an indefinite contract at universities and the high competition for research funding. One of the young researchers has still published several papers while being at ASML. One researcher phrased it like this:

> *One of the things that pushed me out of physics is the competition and the funding agencies. Now I have an indefinite contract at ASML. Getting an indefinite contract for a researcher is not easy.*

The only difference from academia is that he needs to provide the company with a business case for this research before they will support him.

When someone decides to leave the company an exit-interview is held. The reasons for people to leave ASML are very different.

I.3.2 Views on the recruitment process

Managers at ASML are satisfied with the recruitment process and consider the process to be transparent and fair. Managers receive training on how to assess qualifications and skills. The online tests provided by HR can also be used to give a sense of an applicant's soft skills levels. Many times, the decision is however also (partly) based on intuition of the hiring team. One manager stated that it remains difficult to assess the quality of open applications and application letters from people all over the world.

The quality of applicants for vacant research positions is considered good, but the number of applicants is insufficient. There are more vacancies at ASML than can be filled. One of the reasons for this is that other companies have entered the market and recruit employees with similar backgrounds. Hiring managers state that ASML is not a brand name that is known very well outside the Netherlands. This makes it hard to lure talent away from other technical regions in for example Germany, where companies such as BMW are more well known. The search for employees at other hubs in the world like Silicon Valley, Shenzhen and Toronto requires the company to come with good offers. In this case, it is not enough to come with an attractive job offer, but it is also important that the living area around the company is well-developed and attractive.

To increase the supply of skilled workers, the company also tries to stimulate STEM-education and works to limit fixed student quotas for technical education programmes in the Netherlands. ASML also tries to make universities aware that while universities mostly focus on educating students for an academic career, more than half of the students will end up in industry. One of the ways they do this is by working closer with universities.

All interviewees indicated that they were happy with their recruitment process. Compared to recruitment processes in academia, which young researchers consider as tough and very demanding, ASML comes across as a company that is mostly looking for a two-way-match between the employee and the company and the recruitment process is perceived to take place in a very friendly way. There are some hints that the recruitment process does not go smoothly in 100% of the cases. One interviewee was

in the recruitment process for two months – mainly because of Christmas holidays and a hiring manager falling ill – and one interviewee did not have a bad experience himself, but his spouse had had a lot of difficulty reaching HR and did not receive any notification that she was hired. A third interviewee was called by two different departments and HR managers, pointing at a lack of communication within HR.

It is clear from the interviews that ASML is constantly thinking of how to reach possible employees through new means. It is trying to establish networks, it starts collaborations with universities and employees are rewarded when someone they suggested as a possible new employee is hired. In the past three years ASML has also intensified its interaction with higher education institutions. Furthermore, ASML uses recruitment and employment agencies to find new employees. One young researcher that was interviewed joined ASML via such an employment agency and found the recruitment process to be very fast. The only hiccup for him was the contract, which was badly translated from Dutch to English. After eight months, it was possible for him to convert to a contract with ASML. This is happening more often, as the company is turning more of its flex-force into fixed staff. A manager explained that for ASML the employment agencies are very helpful, since it allows them to have a flexible workforce to work on urgent projects. His experience with employment agencies in the Netherlands is good, since they are very agile and respond fast.

I.3.3 Views on the development of employed researchers

All interviewees consider the available support for employees to be sufficient. There are standard procedures that require managers to have a formal meeting with each employee on his/her development action plan three times a year. Informal discussions take place on an irregular basis. Furthermore, there are several informal networks that an employee can join, such as the young ASML club, and all kinds of supportive structures, such as coaches for people with autism. Furthermore, because ASML is an international company it is also possible for employees to take up a temporary position abroad, but this is not an obligation.

The development opportunities, the development action plan and the career paths within ASML are also presented at recruitment events. Once a person is employed at ASML, information on the development opportunities can be approached via the intranet. Young researchers do however state that while they understand the different development paths within ASML, the exact way to progress along this path is unclear to them.

The amount of time employees can spend on development activities depends on what is considered to be necessary for them at that moment. This can for example be coaching on the job, but can also be a training of multiple days. There are no standard rules on the amount of time someone is allowed to spend on development activities. Young researchers rely on their managers to help them with their development action plan and getting the right support to reach their goals. The support staff receive in this regard appear to differ from manager to manager. Managers emphasise that the support someone receives is dependent on the initiative of that person him-/herself. When someone asks for support, a lot can be arranged. The current HR-department does however not have the capacity to actively help people that are less assertive and do not actively ask for support themselves.

While managers are asked to report on the help they are giving people in their personal development, some interviewees are afraid this results in ‘excel management’ and feel that personal coaching and mentoring by managers can be improved. The fact that many people, including managers, have a technical background (with less focus on social competences) also means that social skills is a continuous area of improvement within the company.

I.3.4 Employee benefits

Young researchers state that the work-life balance at ASML is much better compared to work in academia, and they consider the company a family friendly work place. This is considered one of the reasons why it is attractive to work at ASML. In the Netherlands it is not unusual for men to take a “daddy-day” off (a day off to take care of kids) and people are allowed to work from home when their child is sick. There are also ‘vitality trainings’ and health checks offered, and awareness is created around

burn-out issues. One young researcher adds that while ASML provides the opportunity to balance private life and work, it is of course up to the person him- or herself how well this is done.

Another reason why it is considered attractive to work at ASML are the employee benefits. The employee benefits ASML provides differ per country (Netherlands, USA and Asia) and are highly competitive. ASML also makes a tailor-made compensation and benefit package based on the individual situation of the employee. Some of the interviewees that moved to the Netherlands value the fact that they received an upfront salary payment and compensation for the expenses related to their move.

Because innovation is so important for the company, employees get a lot of room to be creative and 'do their own thing'. This is considered attractive by young researchers. One of them said:

> *In the university they are trying to see if you fit with their needs for the next two years. Here they want to make sure that they can benefit from you and that you also feel that you benefit from them – to make sure you don't leave.*

Furthermore, interviewees recognise ASML as a company where you can continue learning. The complexity of the ASML products and the sheer size of the company ensure a steep learning curve for starters. It takes about a year before people feel they know their way around. The fact that people are being challenged is also considered one of the reasons why people stay at the company. If people feel they are no longer challenged, they can move around within the company. For this, every February an internal career day is organised and in the vacancy database employees can look for internal positions. Internal candidates are given priority over external people. When they apply to such a vacancy, it is also possible to have an informal chat with the hiring manager.

Finally, young researchers very much appreciate the multicultural environment that is offered by ASML and the region where ASML is located. All interviewees recognise that when many positive factors come together this helps the company to be innovative.

I.4 Coherence and transparency

Since ASML is a company that develops highly technical products, a large part of the people working at ASML work in research and development in technical areas. For this, the company looks for technical expertise. The company considers academic knowledge and skills indicated by an academic degree to be sufficient indication of someone's technical knowledge and expertise. The actual recruitment process therefore focuses on soft skills. Most valued competences are having a 'bright mind', learn fast, being able to communicate and work together in a team. The company also actively approaches universities to create awareness of the need for students to develop soft skills.

From the interviews, it appears that there is a mismatch between researchers' expectations when they take up a position at ASML and the reality. Interviewees state that most academics are not expecting deadlines and clients. One young researcher found that there was more bureaucracy in the company than he had expected. He feels that, because of the high risks for the company when something goes wrong, quality assurance processes are sometimes overdone. This is one of the reasons for the company to organise a PhD masterclass; to show people that working at a company means working with clients, deadlines and stakeholders. This way, the company tries to ensure people to make a well-informed choice on whether they want to work at ASML or not.

I.4.1 Transparency of the recruitment process

ASML has specific people within HR that are responsible for the transparency of the recruitment process within the company. For each applicant, it is obligatory to move through the different recruitment steps and for managers to administer what decisions are made. An interviewee stated that more internal transparency regarding the recruitment process is preferable. This can for example be on why certain applicants are being selected and others not, but also feedback for ASML recruitment-staff on their execution of the interview.

ASML offers trainings to prevent bias in interviews. While managers feel there is no ethnical bias, one interviewee stated that it sometimes happens that people prefer to hire someone from a certain university over someone from a different but equally suitable university.

I.5 Summary and conclusions

As a fast-growing company, ASML is constantly on the look-out for new employees. The company competes with other innovative regions such as Shenzhen and Silicon Valley for the best employees and tries to come with highly competitive offers and excellent working conditions.

In general, young researchers, hiring managers and strategic managers at ASML are happy with the current recruitment process. There is a standardised process to select staff and overall, this works well. Only on a few occasions small flaws appear, with miscommunication or processes taking longer than necessary. Hiring managers feel that applicants with a research background often have a wrong image of working at a company and actions such as the organisation of a PhD masterclass are taken to improve this. The company uses its ties with universities to attract people and influence educational programmes.

Once they have started working at ASML, young researchers with a PhD background typically experience their work to be very interesting and challenging. ASML provides them with a friendly, international work environment. Hiring managers and strategic managers agree that ASML is an attractive company to work for, where people with a PhD background can work on technical problems that are equal to those in top-research.

There are several standard procedures in place to help ASML-staff with their development. An example is the Development Action Plan that is written by the individual employee together with management. Furthermore, there are many opportunities for coaching, training and informal networks an employee can join. The company can improve in its support to people within the company that do not actively ask for support themselves. Currently, the support an employee receives is also relatively dependent on the type of manager in charge. ASML is aware of this area of improvement and is continuously working on improving the people skills of its staff.

Because a major part of the organisation is working on research and development where the focus is on finding new, innovative solutions to problems, it is possible to have a full research career at ASML. Instead of growing into a management position after a certain amount of time, a researcher can continue as a technical specialist until he or she arrives at retirement age.

There is little mismatch on formal career and recruitment routines and actual practice at ASML. The company has clear guidelines for its staff members and the interviewees experience little difference with the predefined processes. Small flaws sometimes appear, but this is something that is not uncommon for companies of this size. Overall, the company can be considered a very attractive place for researchers to work.

In summary, the case of ASML shows that a large company in the high-tech sector can be a very attractive place for researchers to work at, where they are challenged and provided with many extra benefits that a person does not receive in academia. Because of the competition, the company is constantly working on providing their employees with the best offer. The one major difference with academia is having to work with deadlines and clients, something that people with a PhD background have to get used to.

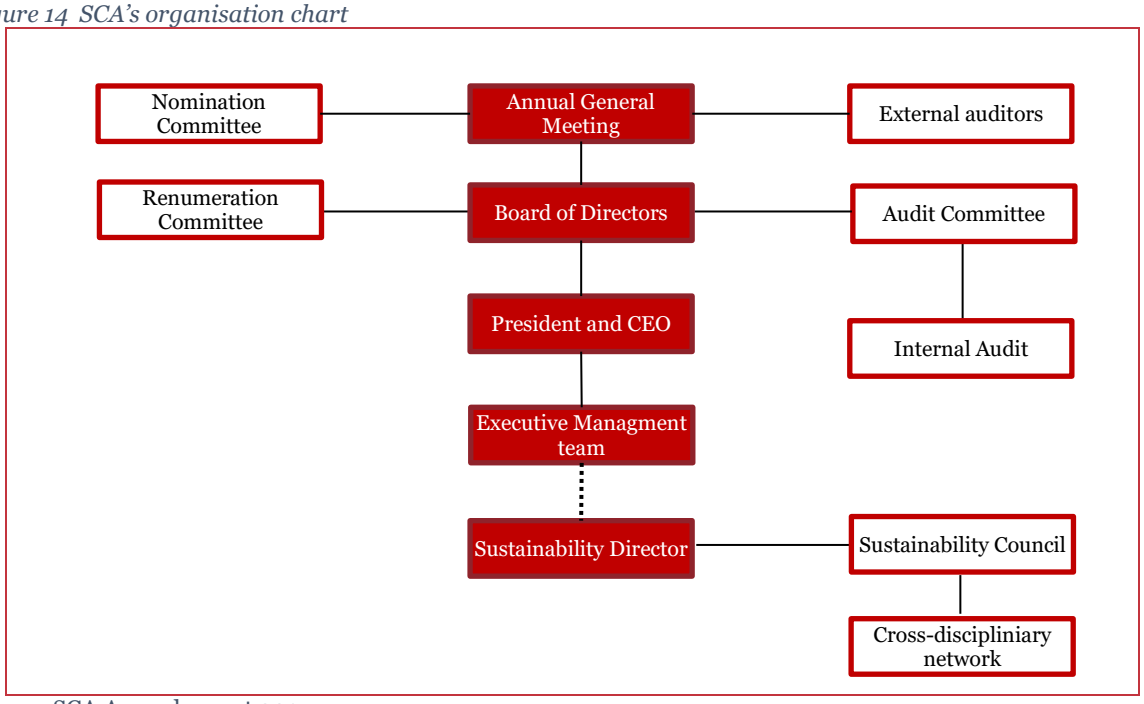
Appendix J SCA

J.1 The company and the selected unit at the company

SCA (Svenska Cellulosa AB) was founded in 1929 in Sweden and currently has its headquarter in Sundsvall. As the owner of 2,6 hectares of forest, SCA is the biggest geographical owner of private forest in Europe. Since 2017, the SCA Group is divided into two parts; one part focusing on the hygiene industry and the other focusing on the forest industry. Within the forest industry, the company focuses on five business areas: forest, sawmills and wood processing, paper mills, pulp mills and renewable energy as biofuel and wind power. The main clients are producers of furniture, doors, windows, floors etc. in Europe, North America, North Africa and Japan. SCA conducts research in cooperation with the Mid Sweden University through the company's R&D centre, which is focusing on developing new products and drive innovation to find new business prospects.[95]

In 2017 the company had a turnover of SEK 16,7 billion and had 4,127 employees in Sweden and Europe. The company's biggest shareholders in 2017 were the Swedish investment company Industrivärden, Norges Bank (the central bank of Norway) and Svenska Handelsbanken's Pension Foundation.[96] The sustainability agenda is managed by the Sustainability Director via the Sustainability Council and the cross-disciplinary work which are supported by units at local level.[97]

Figure 14 SCA's organisation chart



Source: SCA Annual report 2017, p. 55.

J.1.1 Career paths

The PhDs who join SCA often start at the R&D centre as R&D engineers. In order to reach the two following career levels at the R&D centre, R&D specialist and Senior R&D specialist, there has to be a need to fill these higher positions. In comparison with R&D engineer, the R&D specialist has greater monitoring responsibility to bring in new knowledge to the company. The Senior R&D specialist has even greater responsibility and advises in market related matters. Senior R&D specialists have often

[95] SCA's homepage.

[96] Ibid.

[97] Annual report 2017, p.55.

worked at the company for a long time and have good internal and external networks. The Senior R&D specialist is formally appointed by the CEO, and it is the highest research position within the company. Currently, out of 45 employees at the R&D centre, five are Senior R&D specialists. The Senior R&D specialists who want to develop their career further can choose to transition into more managerial roles. SCA does not differentiate their employees based on their academical background, and on all of these research levels there are employees without PhD degrees.

Some of the employees with PhD background start out in product development at the company's production facilities. Some of the employees at the R&D centre also choose this path instead of continuing their research career at the R&D centre. Some employees choose to move even further away from research and into marketing or business development. SCA has many possible career paths for employees with research background, and the employees have substantial possibilities to transition into new areas and take on new challenges depending on their interest and ambition level.

J.2 Presentation of empirical findings – the interviews

For this case study we have interviewed three researchers in the beginning of their career, two recruiting managers and one manager on strategic level.

J.2.1 Views on the research career

According to our interviews with researchers at the R&D centre, the majority of the researchers' time at SCA goes into doing research, although one of the researchers is also involved in support work for the factories. Most of the researchers mentioned that they are required to be quite broad in their research and to go beyond their specific areas of expertise in many projects. The researchers did not feel that they need something special to boost their careers, they just need to work hard. One of the researchers wished for more staff resources, since there is much to do and too few hands.

Among the reasons for moving from academia to the industry, the researchers mentioned a desire to get a permanent position, making greater impact with their research, try something new and get a chance to focus on research rather than applying for funding. As a reason for applying to SCA the researchers felt that the company simply had interesting opportunities within the right field.

Most of the researchers felt that their work-life balance had improved since leaving academia for the industry. They felt that in academia it is more competitive, more result based and there is a constant pressure to publish. At SCA it is more of a normal job than a life calling, since they have a set number of working hours per week.

> *-How would you describe the balance between work and your private life?*
>
> *-Better after moving from academia to industry. In academia it was difficult to find a proper balance. It was very competitive, and there was a constant need and peer pressure to publish in prestigious journals. Long hours, time consuming. After starting at SCA it has gotten better. Private sector is better in this regard.*

SCA was seen as a family-friendly workplace, and one researcher mentioned that they have flexible working hours in the morning ("so you can leave your child at day-care") and free breakfast at work ("so that stressed-out parents have time to eat breakfast"). Parental-leave is considered natural at SCA, and although one researcher noted that you put your research career at hold during this time, there is an interest at the company to keep you informed on big decisions and such while you are gone. SCA also supports their employees by providing them with extra funds, on top of the parental allowance.

Most of the researchers felt that their current position had fulfilled their expectations and none of them had considered leaving their research career for another job.

J.2.2 Views on the recruitment process

SCA has no written recruitment policy. According to our interviews with middle management staff, open positions are generally advertised externally in all kinds of media and through employees' networks.

Certain positions are only advertised internally, and on occasion some positions are not even advertised at all, but filled by current employees. When recruiting personnel with an international background, SCA does not advertise internationally, but mostly use social media or employees' networks. A newly formed recruitment unit assesses the applicants together with the recruiting manager.

The management staff felt content about the quality of the applicants. One middle management interviewee noted that the applicants with PhD background have become more of specialists than generalists over the years, which could be seen as negative from the company's perspective, since they need researchers who quickly can learn about and enter new areas beyond their own areas of expertise. The middle management interviewees felt that the company must struggle to some degree to attract research staff. One interviewee noted that since SCA mainly has operations in northern Sweden it can be a challenge to attract people to move (and stay) there. Another interviewee noted that the company has a very small turnover of personnel. The strategic management interviewee, on the other hand, did not feel that the company must struggle to attract and retain research staff, but mentioned that the ones who do choose to leave the company often do so because they are moving to a different location or searching for new challenges.

The biggest challenges when recruiting researchers from other countries were administrative and logistical matters, e.g. to get visa and to get them to stay at the company in the northern part of Sweden. The strategic management interviewee felt that language can initially be a challenge, although it has not been a big problem thus far. The management staff felt that the greatest benefits of recruiting foreign researchers were new perspectives and greater cultural diversity.

The researchers who went through the formal recruitment process felt that is was professional and according to normal standard. One most positive voice said:

> *The interview was conducted very professionally, very positive attitude, I was relaxed, good interviewer. In the second interview I was interviewed by a group of people. Interesting and not stressful, recruiters did a great job. No negative experiences.*

Several of the researchers had previous experience of SCA through projects they participated in while they were still at the university, and for one of the researchers this was the way he transitioned from the university to SCA. One of the researchers noted that the work introduction at SCA was supportive and well-planned, which differed a lot from academia:

> *Impressed when started my work at SCA, they gave me a schedule for the first two weeks, great introduction! Very different from academia!*

J.2.3 Views on career development

All of the researchers had a clear vision of their next career step. One researcher expressed a desire to move on to more managerial roles, but felt unsure about the requirements and how to take the next career step. Another researcher felt that there should be some additional career steps between R&D specialist and Senior R&D specialist, so that one would have a shorter-term goal and not have to wait so long for promotion.

The individual career development is mainly up to the researchers themselves. SCA has a career tool, into which the researchers put their career plan and goals. This individual development plan is then discussed with their manager quarterly at the performance reviews, during which they also set up sub-goals for their career. One researcher noted that after he expressed interest in management responsibilities during these discussions, he was given more chances to develop in this area. The researchers can also choose whether their goals in the career tool are visible within the whole group, so that people from other units can contact them for assignments. One middle management interviewee noted that SCA is in general very supportive of the fact that the employees want to develop their career, and there is even a possibility to pursue PhD studies while being an employee.

SCA has some formal career development processes, although none of them is specifically aimed at researchers. One researcher mentioned that every year the managers can appoint certain persons to participate in a business development programme, which is a one-year project management course. The middle management staff stated that they encourage their employees to take up positions within other units of the company in order to enhance their careers. One middle management interviewee noted that it is more common for employees at the R&D centre to move to the production units than vice versa. The strategic management interviewee noted that there were greater opportunities before to transfer to one of their units abroad, since nowadays the company does not have as many foreign units left.

The researchers mainly felt that they were provided with sufficient resources to develop as researchers. One researcher noted that more research personnel was needed and that caused some limitations regarding how much time could be spent on development and training activities. Another one's view seemed to confirm this:

> *-Do you think that you get sufficient resources to develop as a researcher in your organisation?*
>
> *-In the daily work it is often a shortage of resources, you need to motivate quite clearly to be allowed to take an external course for example. Not impossible, but a slight scantiness. One has to have a long-term view, a clear plan and be able to motivate.*

Among the most important circumstances needed to develop as a researcher, the researchers mentioned time to monitor the trends and developments within their field, as well as an understanding from the management that although not everything you do will make more money to the company in the short-term, it can still be of value for the company in the long-term. The management staff felt that the company provides sufficient support to their employees to develop as researchers. The strategic management interviewee noted that, apart from the discussions at the performance reviews, the company has different training programmes and offer good opportunities to attend international conferences and other events. According to the most recent employee survey, the employees of the R&D centre think that the organisation has improved considerably over the past three years regarding career development, although there is still room for further improvement.

As obstacles for the work with recruitment and supporting the career of young researchers, one of the middle management interviewees stated geographical obstacles, i.e. to recruit people to northern Sweden. Another middle management interviewee noted that the agreement with the trade union to advertise all open positions can be a hindrance in cases where you already have someone in mind who is already an employee, in which case it can be an obstacle for that particular employee's career development. The strategic management interviewee felt that a hindrance in the researchers' career development is that there is not an endless amount of managerial positions.

J.2.4 Coherence between competence/skills requirements, actual valued competences/skills in the recruitment process, and transparency

The middle management staff explained that when recruiting, there are job descriptions that clearly state the requirements for the different positions. These requirements are presented in the job advertisement and during the interviews. For example, an R&D engineer needs to have a Master of Science in Engineering and preferably a PhD, but job experience can substitute the PhD requirement. R&D specialists need to have a PhD. Both the middle and strategic management interviewees noted that a lot of emphasis is also put on the applicant's personal traits, such as communication and teamwork skills, as well as experience of (or interest in learning more about) the industry. The researchers we interviewed were divided on whether the requirements were clear or not when they applied for their current position. One researcher felt that the requirements were very clear, while another felt they were not clear at all. A third researcher felt that the basic requirements were clear, but noted that there were also some additional, more subjective requirements that were not clear. One researcher noted that unlike a university, a private company is not obliged to disclose all requirements for positions within the company. Among the credentials that the researchers felt were valued in the recruitment process were

their academic degree, their publications and their thesis. All of them felt that their credentials had been correctly assessed, and one of the researchers was especially content with the fact that they had valued theoretical competence and practical project experience.

According to the management staff, gender is a focus point in SCA's strategies for recruitment and career management, although competence outweighs gender in the recruitment process. For example, at the R&D centre there is an even gender balance. Among R&D engineers the gender balance is 50/50, among R&D specialists there is a predominance of women, while among Senior R&D specialists there is a predominance of men. The managerial positions within research are predominantly held by women. At SCA in general there is also an even gender balance, which according to one middle management interviewee is because there is a lot of women within the chemistry field.

The researchers appeared to be content with the transparency and fairness of the recruitment process. One researcher stated that he was informed about the number of applicants to the position, how many got selected to interviews, and he also got continuous update on the progress of the recruitment throughout the process. Another researcher noted that as a private company SCA has no obligation for external transparency, but internally they talk about the recruitments and as a colleague you can follow the process. The researchers felt that there was no need for changes regarding the transparency of the recruitment process, although one researcher noted that external advertising of short-term temporary positions, which usually are only advertised internally, would establish contact with other researchers and possible future colleagues, and could even lead to future research cooperation. The recruitment process was also seen as transparent and fair by the middle management staff, and they did not see any need for improvements.

J.3 Summary and final conclusions; lessons learnt

All of the researchers we interviewed had transitioned from academia to the industry, and they all seemed content with that choice. Among the reasons for transitioning to the industry, they mentioned a desire to get a permanent position, making greater impact with their research and get a chance to spend their time on research rather than applying for funding. Most of the researchers felt that their work-life balance had improved since leaving academia for the industry and working at SCA was seen more as a normal job than a life calling. All of the researchers felt that SCA provided interesting opportunities within their field, most of the researchers felt that their current position had fulfilled their expectations and none of them had considered leaving their research career for another job.

Regarding the recruitment of researchers, open positions are generally advertised externally, although certain positions are only advertised internally and on occasion not advertised at all. Although SCA has no written recruitment policy, they have clear requirements for the different positions, which are presented in the job advertisement and during the interviews, and a lot of emphasis is also put on the applicant's personal traits. Not all of the researchers felt that the requirements were sufficiently clear when they applied for their current position. SCA could thus benefit from further clarifying the requirements for the position when recruiting new researchers. The assessment of the applicants is done by a newly formed recruitment unit together with the recruiting manager, and all of the researchers we interviewed seemed content with the assessment of their credentials.

In general, the management staff felt content about the quality of the applicants to research positions. The middle management felt that the company must struggle to some degree to attract research staff, among other reasons because of its geographical location, while the strategic management did not see any such issue. The company has a very low turnover of personnel, but the ones who leave often do so because they are moving to a different location or searching for new challenges. According to the management staff, gender is a focus point in SCA's strategies for recruitment and career management, and it seems to have been a success, since the gender balance is even e.g. at the R&D centre, where 50 percent of the R&D engineers are women and the managerial positions within research are predominantly held by women. The fact that there is a lot of women within the chemistry field has been a contributing factor.

The researchers who went through the formal recruitment process felt that is was professional and fairly standard. They also appeared to be content with the transparency and fairness of the recruitment process, and especially appreciated the continuous updates on the progress of the recruitment to applicants and the chance for colleagues to follow the process internally. There does not seem to be a need for improvements regarding the transparency of the recruitment process.

The individual career development at SCA is mainly up to the researchers themselves. The individual development plans are discussed with the manager quarterly at the performance reviews, during which they also set up sub-goals for their career. These instances seem to be considered an important and functioning forum for career development discussions both by the researchers and the management. The middle management stated that they encourage their employees to take up positions within other units of the company in order to enhance their careers, although the strategic management noted that there are fewer opportunities nowadays to transfer to their units abroad. The fact that the researchers can choose whether their goals in the company career tool are visible within the whole group, so that people from other units can contact them for assignments, surely plays a role in facilitating the researchers' transition into new roles at the company.

SCA has many possible career paths for employees with research background, and the researchers seem to have great possibilities to transition into new areas and take on new challenges depending on their interest and ambition level. Although all of the researchers we interviewed had a clear vision of their next career step, one of them felt unsure about how to move into a more managerial role. Another researcher felt that there should be some additional career steps between R&D specialist and Senior R&D specialist, in order for the researchers at this level to create shorter-term goal and not have to wait so long for promotion. Although in some ways it might be unwise to complicate the hierarchy even more, some additional "milestones" could indeed help researchers create short-term goals and keep them motivated to stay within the research path at the company.

SCA has some formal career development processes, although none of them is specifically aimed at researchers. The management staff felt that the company provides sufficient support to their employees to develop as researchers, a view that was to a large degree echoed by the researchers themselves. Thus, there does not seem to be any general need for more support for the researchers' career development at the company. According to the most recent employee survey at the R&D centre, the company has indeed improved considerably over the past three years regarding career development.

Faugert & Co Utvärdering AB
Skeppargatan 27, 1 tr.
114 52 Stockholm Sweden
T +46 8 55 11 81 00
E info@faugert.se
www.faugert.se
www.technopolis-group.com