



Interreg
Deutschland - Danmark



CROSSWIND

Work package 5

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Project details

Project: CROSSWIND / CRoss-border Open-Source Small-WIND

Funding: INTERREG 5a

Project duration: 01.01.2021 – 31.12.2021

Contact details

Leadpartner: Wind Energy Technology Institute der Hochschule Flensburg

Name: Prof. Dr.-Ing. Torsten Faber / Kai Mommsen M.Sc.

E-Mail: torsten.faber@hs-flensburg.de / kai.mommsen@hs-flensburg.de

Project partner: Fakultät für Mechanik und Elektronik der Syddansk Universitet

Name: Prof. Morten Hartvig Hansen / Assist. Prof. Hamid Arionfard

E-Mail: mortenhansen@mci.sdu.dk / arionfard@mci.sdu.dk

INTERREG 5a Region

Germany	Danmark
Nordfriesland	Region Syddanmark
Flensburg	Region Sjælland
Schleswig-Flensburg	
Rendsburg-Eckernförde	
Kiel	
Plön	
Ostholstein	
Lübeck	
Neumünster	

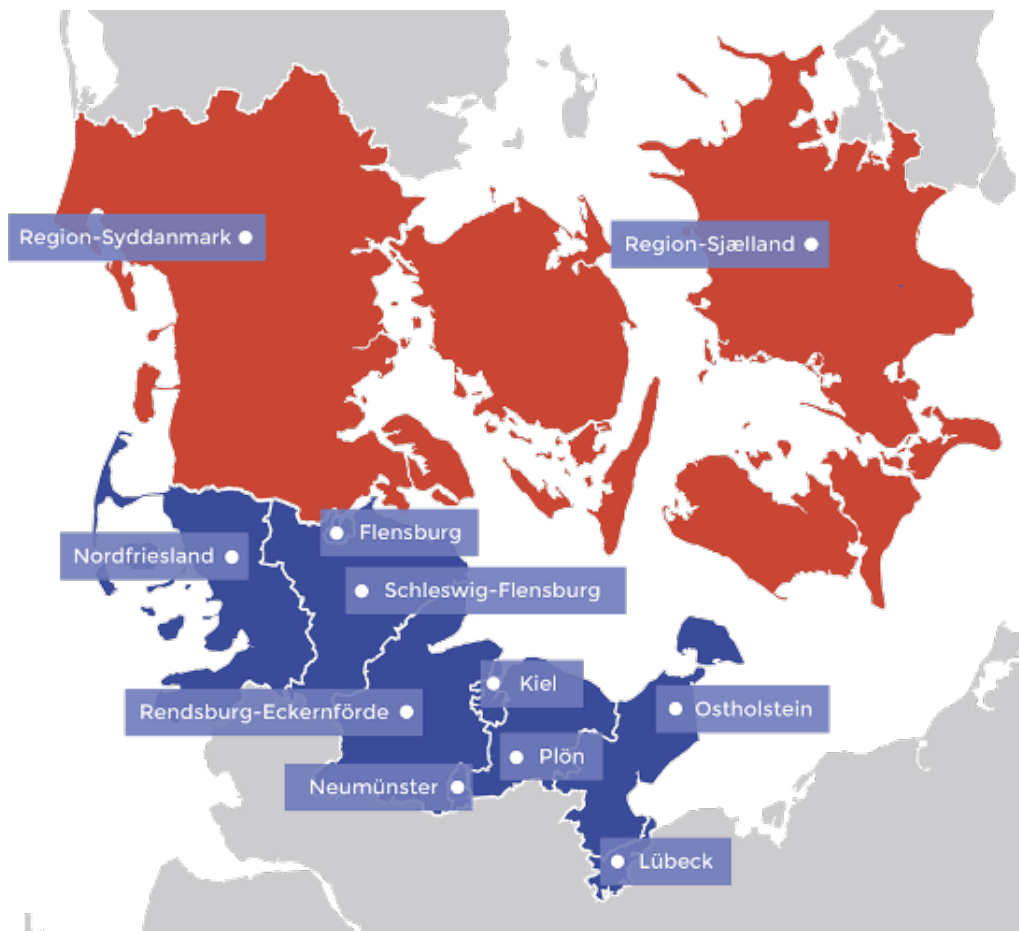


Abbildung 1 - Map INTERREG Region 5a

Source: <https://www.interreg5a.eu/en/>

Work package 5.1 CROSS Linking

The goal of this work package 5.1 is to create long-term effects after the network project duration of CROSSWIND is finished, the end of 2021. To strengthen the international collaboration in education and research between the Southern Denmark University and the University of Applied Sciences in Flensburg especially with the Center of Industrial Machines and the Wind Energy Technology Institute is under investigation by detecting synergy effects in this chapter. The first step is to have a deeper look into the single lectures, courses and modules of each university. The goal is, to offer the students a higher range in education by detecting synergies in the future. At the same time, synergy effects in research projects is under investigation, in respect of currently running research and finished projects. International resources can merge in the case of possible future research projects.

Furthermore, the interest of the network project CROSSWIND relies in promoting enterprises to be part of the research application in the INTERREG 6 funding program. It is that enterprises are highly affected by prejudices when it comes to work as a team in cross-border manners. With the knowledge, that each country has different aspects in administration, organization, working processes, responsibilities, culture etc. we as the Team of the CROSSWIND network project think, it is easier to find project or network partners, working in a cross-border project, by sharing this knowledge of similarities and differences. The investigation relies on the view to describe the atmosphere between companies and between universities to achieve a first impression. There are already enterprises, such as C3 Consulting, sharing basics if enterprises work on crossing borders to Denmark and Germany [1]. A summarize on the following pages in this chapter is documented. Additionally, the INTERREG 4A project SMiK (Stereotype und Marketingstrategien in der deutsch-dänischen interkulturellen Kommunikation) investigated the cultures in more detail in every single aspect of a daily life. Nevertheless, that does not include the working cultures of public Institutions such as the Southern Denmark University and the University of Applied Sciences in Flensburg. For that, a questionnaire is set up to collect feedback of currently employed persons in current or finished INTERREG projects.

Synergies in Education

In the appendix a complete list of courses from the mechanical engineer bachelor program at CIM (Center for Industrial Mechanics) and all the courses of Wind Energy Technology Institute at HSFL can be found.

A common ground consisting of basic courses within mathematics and mechanics exist. But more interesting synergies could for example be established around these courses at CIM:

MC-MLE Machine Learning: Modelling of dynamic systems and identification, tools for machine learning, machine learning for dynamic tuning

ME-FAT Fatigue: Basic fracture mechanics, theory & practice of fatigue characterisation and prediction, fatigue analysis of stochastic systems, rainflow counting, linear damage theory, effect of mean stress state, and experimental fatigue testing

SPRO4B Power Conversion Systems: The project for the semester is based on the development of a mechanical product that involves different power conversion systems

And promising courses of Wind Energy Technology Institute at HSFL for establishing interesting synergies could for example be:

Electrical Engineering for Mechanical Engineers

Controller Design for Wind Turbines and Wind Farms

Modelling & Simulation of Wind Turbines

FE & Fatigue Analysis

Computational Fluid Dynamics

Control and automation of wind power plants

Green Entrepreneurship

How to register as a student at the cross-border university?

Status quo at the University of applied Science in Flensburg

Until now, it is not possible to register students from the SDU at the HSFL **just for one or two lectures in one semester**. It is only possible to register students from SDU over the Erasmus exchange program for **an entire semester**, which is not the focus of our investigation. Another possibility is that students of the SDU can register as guest students, but that means they **cannot participate in the examinations**.

A possible solution to offer the students a higher range in education, an agreement to the Southern Denmark University could be an option to realize the possibility of international collaboration for students of the SDU. They register as exchange students at HSFL for one semester. That means the students of SDU get the right to participate in examinations, so that those students get the same status like an exchange student from the Erasmus program. Due to the reason that the Erasmus program is not in charge, the students of SDU will need to pay the semester fee for the administration of 76 Euros or they can choose to pay the full amount of the semester fee, that includes the administration. At the end of the semester the SDU student will be issued with a full record of transcript, regards their participated courses and written examinations at the HSFL, to take it into account at the SDU.

As option, for the case to use free public transportation in Schleswig Holstein, then the total semester fee is 182 Euro, which includes the administration.

Status quo at the Southern Denmark University in Sønderborg

Students from HSFL can only register as guest students, because HSFL is not an Erasmus partner with SDU. A guest student from HSFL can attend a whole semester of courses including exam, or single courses including exam. Each course has to be paid for. The tuition fee is 850 kr. for each course. Exchange students can only sign up for a whole semester. If a student follows a whole semester and thus wants to live in Denmark, some rules about longer stay will apply: "Studies over three months require a residence permit. Citizens of an EU country, an EEA country or Switzerland who intend to stay in Denmark for more than 3 months must apply for a certificate of registration at the Danish Agency for International Recruitment and Integration (SIRI). You will be informed about the registration process once you have been enrolled."

Foreign students at SDU attending a full bachelor program in Sønderborg are covered by a student job guaranty. This means that one of the major or smaller companies in Sønderborg kommune (municipality) will employ the student in a study relevant job 10-12 hours a week. Thus, a student from HSFL might also have a chance to get a student job, because many companies have such positions in their position structures. Summer student jobs are also a possibility.

Competences in research projects

Up until recently (1st of December 2021) a full professor within wind energy were employed at CIM. He has now absence of leave for a year or two. But he still supervises a Ph.D. student at CIM in Sønderborg. The Ph.D. students research topic is within wind energy. But apart from this Ph.D. research a lot of common ground in research at both CIM(Center for Industrial Mechanics) and Wind Energy Technology Institute at HSFL exist. This common ground are research areas within control theory, mathematical modelling, multi-physical modelling, flow-dynamics, machine learning etc. Synergies in all these areas can be exploited in future closer collaborations.

Working culture in Denmark and Germany

In the manner of enterprises

The Danish enterprise C3 Consulting shared some basic details on their website regards the different cultures in Denmark and Germany [1]. Here they do point out the perspective of a Danish company compared to a German company. A short summarize will be as follow.

The Germans are more formal than the Danish. The same counts for the spoken business language, which is highly direct with less chitchat in between. More or less, that means that the Germans are highly correct, punctual and polite in every case. Even the dress code is formal, if you work in a German office, but that depends in which industry you're working in. The mind of a German employee needs a plan with detailed goals, for the future. Otherwise, your seriousness to your boss or colleagues has no guarantee. In Germany the hierarchy and the status of a single employed person is highly important. In respect to the hierarchy, the structure of organization is clearer, than in Denmark. That means at the same time, the responsibility allocates to the designated person. The Danish employees work more independently on their tasks, they work more under the term "freedom with responsibility", while the German employees work out their task immediately as soon the persons is asked to do it. Regards the investigations of C3 Consulting, Monday mornings are in Germany for chitchat, which means what has happened on the weekend and very often the talk about the latest football match. During the week, the Germans spend only little time at the coffee machine. As recommendation, it is the best to talk and listen to your international colleagues how they do their jobs. Be always curious with an open mind. Do your own observations and you are welcome to ask your own questions, because each country and each person has an individual cultural background, personality and differences. As citation of C3Consulting,

all cultural understanding begins with self-understanding. So, begin by digging into your own cultural background so you have an informed basis for finding differences and similarities with other cultures. [2]

Additional a finished project of the INTERREG 4A program investigated the cultures of Denmark and Germany in profession. [3] On the project website, a document called "DEUTSCH-DÄNISCHE KULTURBRILLE or DANSK-TYSK KULTURBRILLE" is available. A highly detailed report about similarities and differences is available. The content, of this document shows or describes a guide how to interact privately or in terms of business in respect of the cultures. Due to the reason that the business side is summarized above and the private side is not part of the investigation in this project we most likely refer only to the website www.stereotypenprojekt.eu where the full documentation is available.

In the manner of public institutes

All references refer only to the international collaboration in businesses or private sector, but nothing is investigated regards the public institutes. In Germany the environment in an enterprise differs a lot to the working environment in a public institute and the same counts for Denmark! For the authors, we do not have any academic degrees to do a detailed and accurate survey for it, but a questionnaire was established for employees at our universities, to achieve a very first impression of how the working culture or environment in each country of each university is. The online-questionnaire was conducted using the software tool SurveyXact licensed by SDU (SydDansk Universitet– Southern University of Denmark) , which CIM (Center for Industrial Mechanics) is a part of.

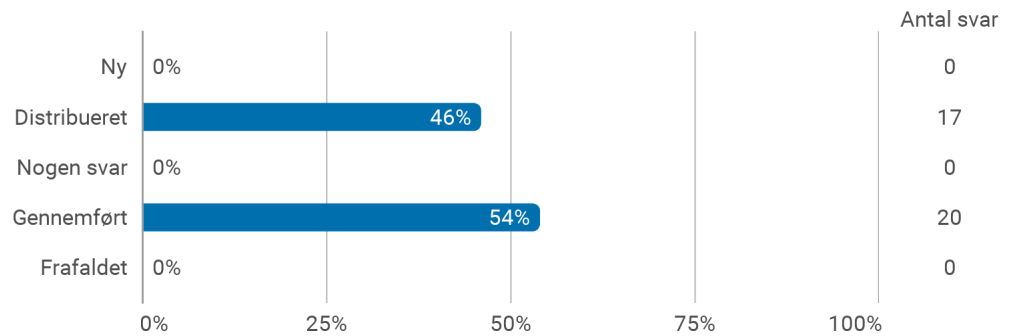
The working culture survey results

Firstly, due to the co-author Søren Tops inexperience with the software tool SurveyXact some language setting errors appeared in the survey – some danish words creeped in: "Samlet status" means overall status, "Antal svar" means number of responses, "distribueret" means distributed, "Gennemført", means done the survey. SurveyXact does not contain a spell-checker, so some linguistic errors sadly appear in the survey.

Due to the low number of participants no proper statistical methods were employed such as setting up confidence intervals etc. The fact that the respondents come from different INTERREG projects of varying degrees of successes and failures also introduces variations in responses. Instead of proper statistical analysis, the actual numbers of the different responses of the questions in the survey are commented and interpreted by the co-author Søren Top – in many cases the shown diagrams also speak for themselves, especially when work culture difference tendencies seem to repeat from question to question.

Now on to the survey results:

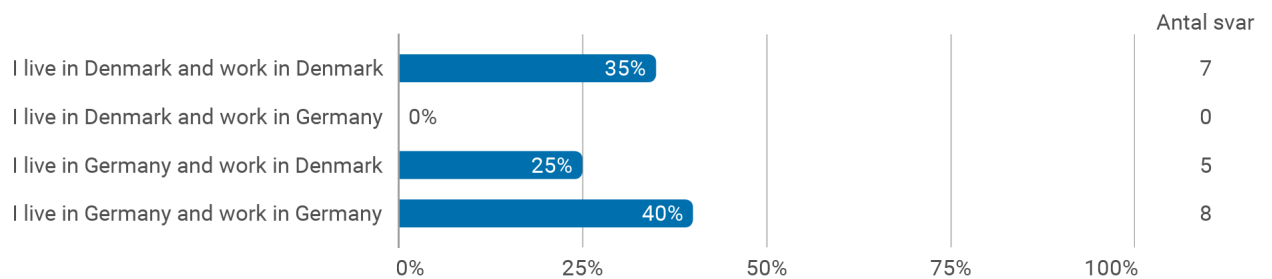
Overall status



The survey was sent to 37 persons. Most of them are from Hochschule Flensburg and from CIM(Center for Industrial Mechanics and MCI (Mads Clausen Institute) in SDU Sønderborg. Few were from the University of Kiel. 3 did not take part due to reasons not to be given here, so 59% of the possible persons responded.

First question:

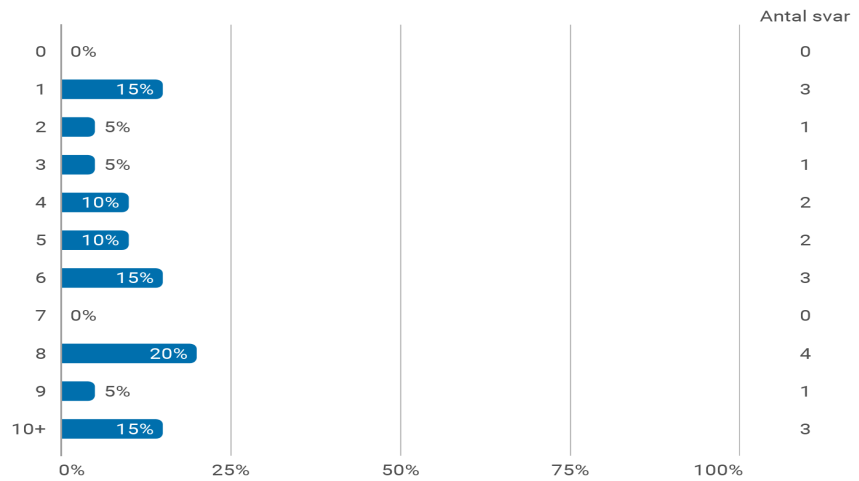
Where do you live and work?



As the distance between Sønderborg and Flensburg is ca. 50 km, 5 of the persons live in Germany and work in Sønderborg. Thus, we have 4 subgroups of persons of interest: Persons working in Denmark, Persons working in Germany, persons living and working in Denmark, persons working in Denmark and living in Germany. For the researcher taking part in the survey there are no native danish speakers coming from Germany and to my knowledge there are no native German speakers among those who live and work in Germany, so we can assume that the persons in the survey do not belong to the danish minority in Germany or to the German minority in Denmark. But a question dealing with this issue would have been nice to have in the survey. Thus, the dataset has been filtered according to these groups and a result report has been generated for each of group. The non-filtered result report and these reports for the filtered groups are listed in their entirety in appendix, so the interested reader can compare the question answers outcome for each group in detail. For the rest of the survey questions to be treated in this section interesting answering (cultural)differences between these 4 groups will be presented and discussed.

Next question:

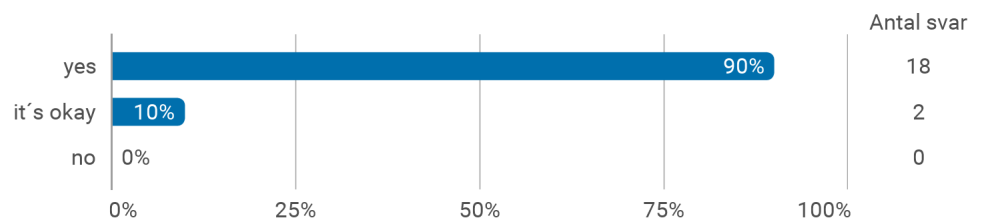
For how many years have you worked in cross-border projects? ("vælg" means choose)



As can be seen in the figure some people have participated in cross-border projects for many years. In the subgroup work_in_DK_live_in_GE no one has more than 8 years of experience, but that can easily be explained by the fact that their employment in Sønderborg are not that long of age.

Next question:

Do you like the cross-border working culture?



Here it is noteworthy to remark that in the group work_in_DK_live_in_GE we have 100% yes. In the group work_in_DK_live_in_DK 14% answers Its'OK. Similarly, we have 13% answering It's OK in the work_in_GE group (they all also live in GE). Thus, people commuting across the border seems to be most enthusiastic about the cross-border working culture.

Next question:

What is/were your role in such a cross-border project?
researcher, project manager
research assistant
research assistant
project partner
project management
participant, WP leader
managing project partnership
interconnecting culture, business and education
administrative VIP
Project manager, public relation and WP3 lead
Project management and scientific staff member
Project leader (Professor)
Project leader
Project lead
Project Management in the Lead Partner Institution
Project Administration
PI
Financial project partner in Interreg and previously business partner in international development and construction projects
Communications
Administrator, project manager

This question answers tell us that the participating persons in the survey fulfil a variety of roles. It is important to note that a cross-border project do contain other tasks than pure research. We should also keep in mind that the 3 following subgroups to be used a lot in the interpretation to come differ a bit regarding the composition of roles

Split out in 3 subgroups:

Work_in_DK_live_in_DK:What is/were your role in such a cross-border project?
project partner
participant, WP leader
administrative VIP
Project leader
Project Administration
Communications
Administrator, project manager

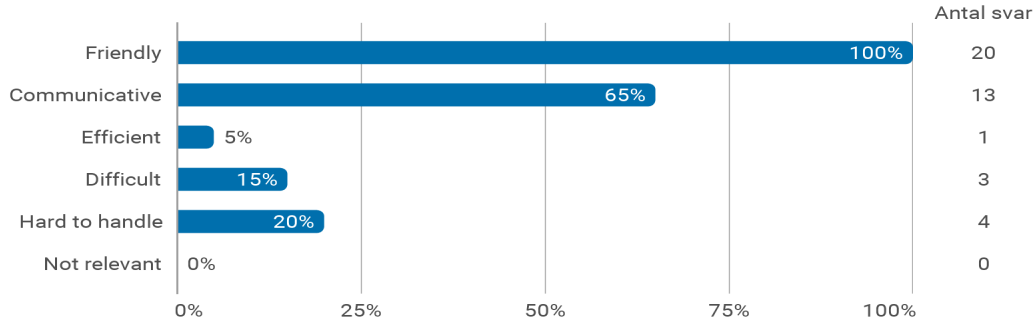
Work_in_GE(lives in GE):

What is/were your role in such a cross-border project?
research assistant
research assistant
project management
Project management and scientific staff member
Project leader (Professor)
Project lead
Project Management in the Lead Partner Institution
Financial project partner in Interreg and previously business partner in international development and construction projects

Work_in_DK_live_in_GE:

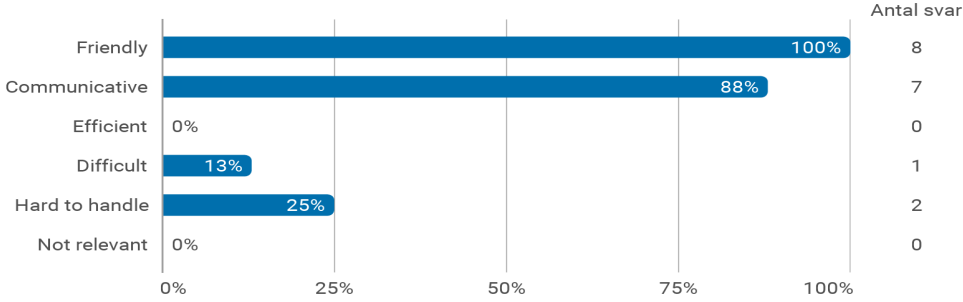
What is/were your role in such a cross-border project?
researcher, project manager
managing project partnership
interconnecting culture, business and education
Project manager, public relation and WP3 lead
PI

Next question: How was your specific working environment in cross-border work? (several answers are accepted)

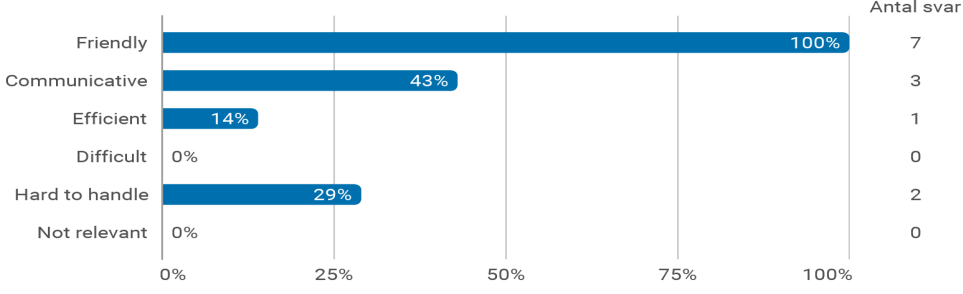


Here it is interesting to dig a bit deeper by looking at the subgroup answers:

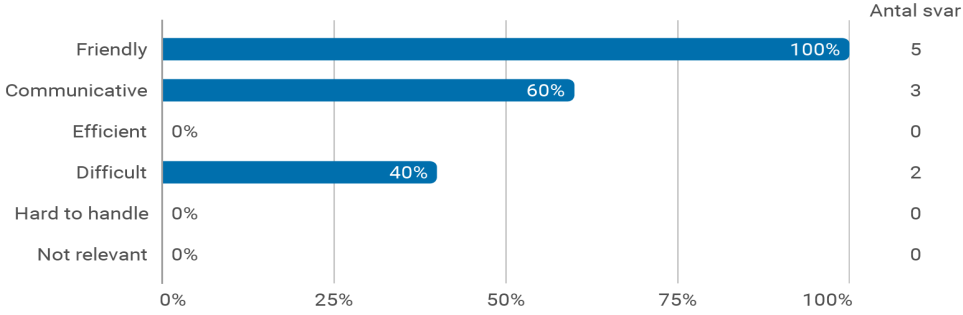
Work_in_Ge(lives in GE):



Work_in_DK_lives_in_DK



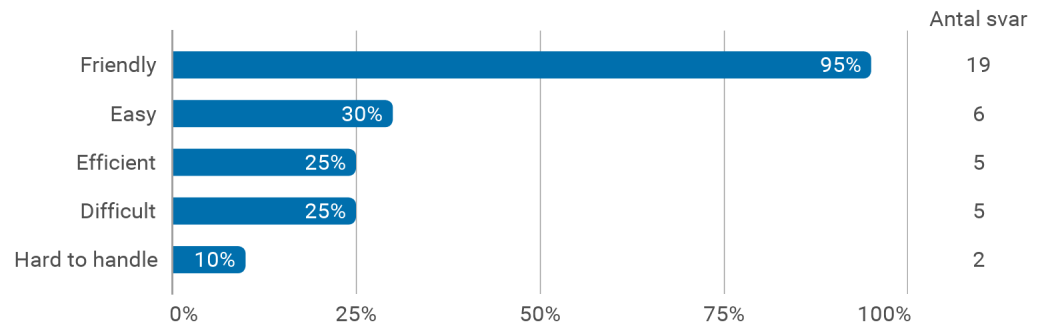
Work_in_DK_live_in_GE:



The most positive ones are again the commuters across the border and the answers in the work_in_DK_live_in_DK group are not so positive. But all groups answer 100% yes about friendliness and all groups also finds difficulties in the working environment, so this seems to be the conclusion here. The Germans rate "communicative" high and the next question in the survey will deal with this in detail.

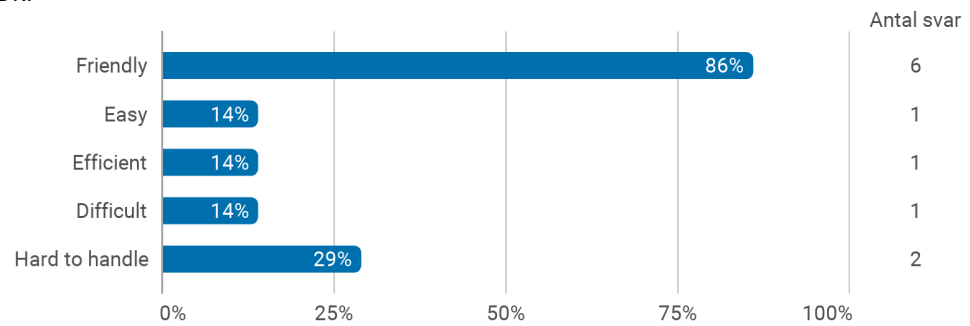
Next question:

How was your specific working communication in cross-border work? (several answers are accepted)

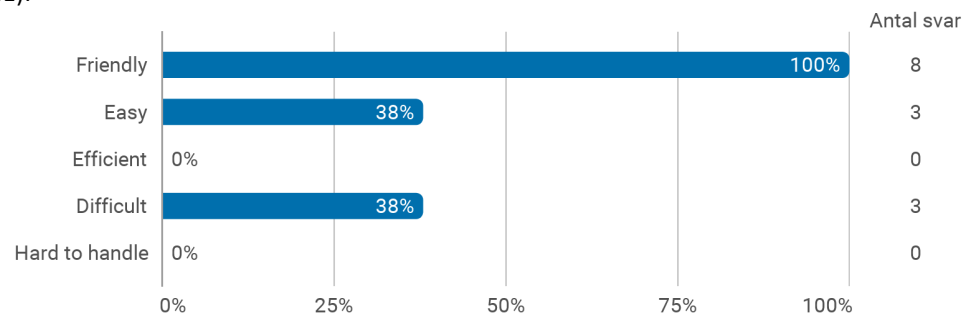


What is noteworthy is that only 10% (2 persons) answers “hard to handle”. Again, it is relevant to dive a bit deeper into the subgroups:

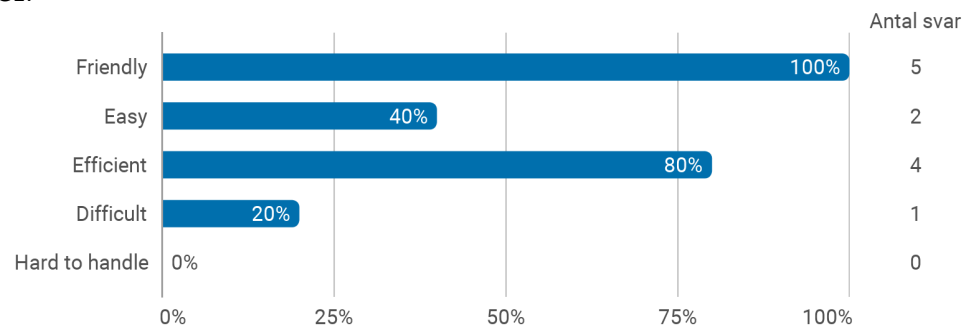
Work_in_DK_live_in_DK:



Work_in_GE(lives in GE):



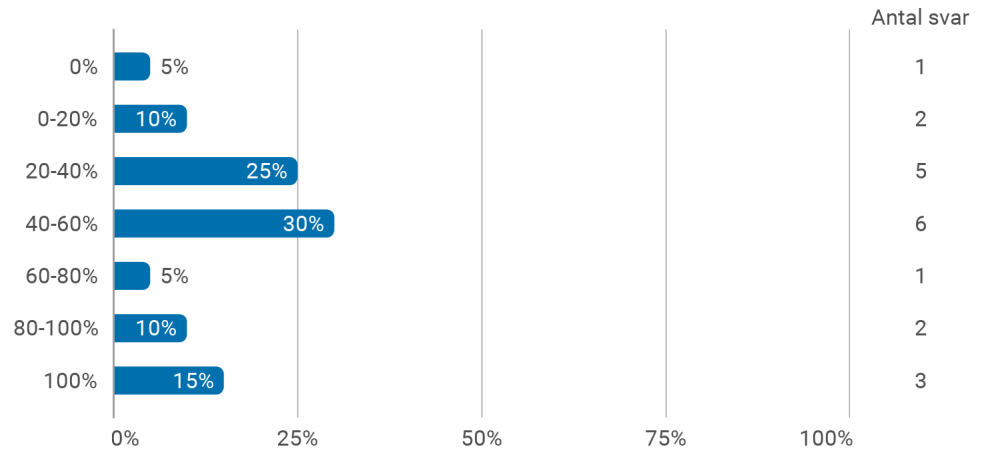
Work_in_DK_live_in_GE:



Again, on a scale of positiveness the cross-border commuters are most positive work_in_GE group are a bit less positive and least positive are the work_in_DK_live_in_DK group, which also contains the 2 “hard to handle” answers. But despite that the numbers are small the tendencies from the previous question remains also here.

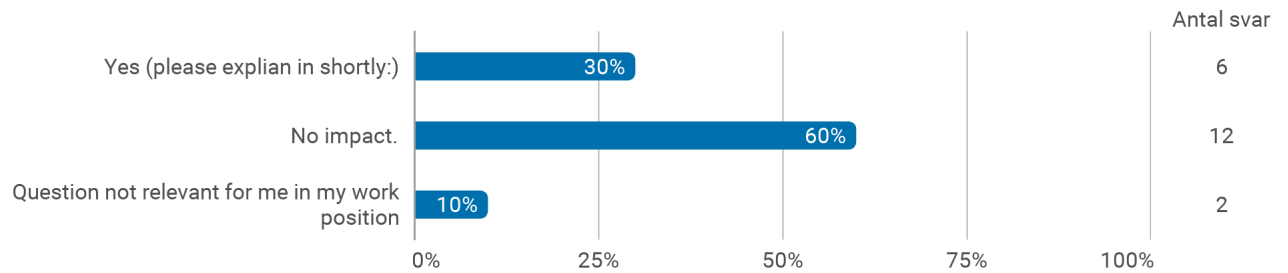
Next question:

How was organization of meetings of the project? - choose the online-meetings share - 0% means all meetings were physical



The unknown factor here is the Corona-situation for the 2 last years. But what is noteworthy here are the extremes. Some projects had only physical meetings and some had only on-line meetings. Working culture differences affecting meetings is treated in the next question.

Next question: In respect to meetings, is the cross-border working culture affecting majorly the structure of such project meetings?



A third answers yes and again let's dive into the subgroup's explanations:

Work_in_DK_live_in_DK:

No one answered yes

Work_in_GE(lives in GE):

50% answered yes

The comments:

Work_in_DK_live_in_DK: No comments

Work_in_GE(lives in GE):

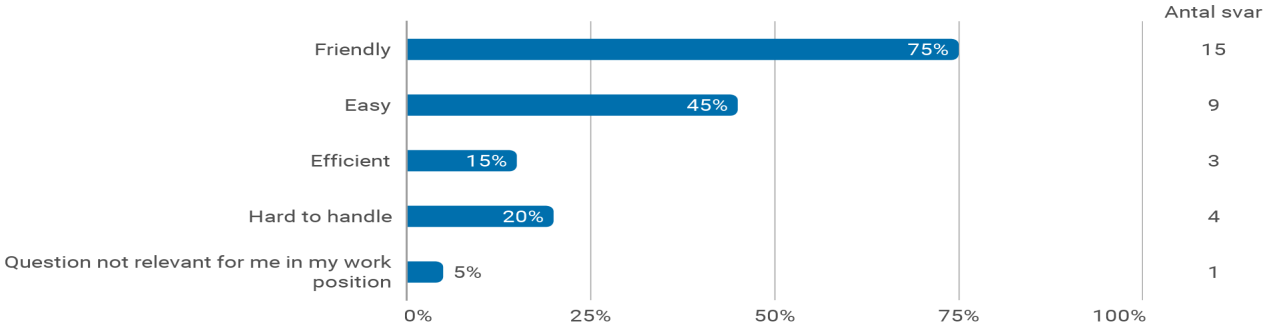
In respect to meetings, is the cross-border working culture affecting majorly the structure of such project meetings? - Yes (please explain in shortly:)
in dk they do not follow the task in a row or with a structure, just talking randomly about the topics
It's nice
For instance concerning the time scheduling of the meeting itself as well as the time slots during the meeting to discuss on the different perspectives.
Different languages, behaviours which needs to be handled.

Work_in_DK_live_in_GE:

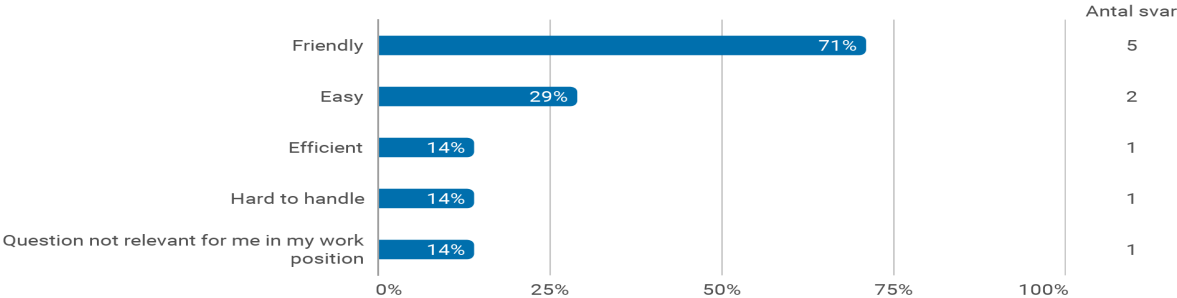
In respect to meetings, is the cross-border working culture affecting majorly the structure of such project meetings? - Yes (please explain in shortly:)
there sometimes really is a border in terms of language, working culture, etc.
physical meetings are much better

Here is a striking cultural difference: No one in the Work_in_DK_live_in_DK group saw any problems, whereas Germans enlist a lot of problems with the Work_in_DK_live_in_DK group: at meetings they are in general chaotic both when regarding topics and structure of meetings. One sense that the German "ordnung muss sein" clashes with the Danish "det går nok" :o)# (co-author note: internal cross-border talk – could not resist the temptation). A poor english translation: One senses that the German "there has to be order" clashes with the Danish "it will eventually work out" :o)#

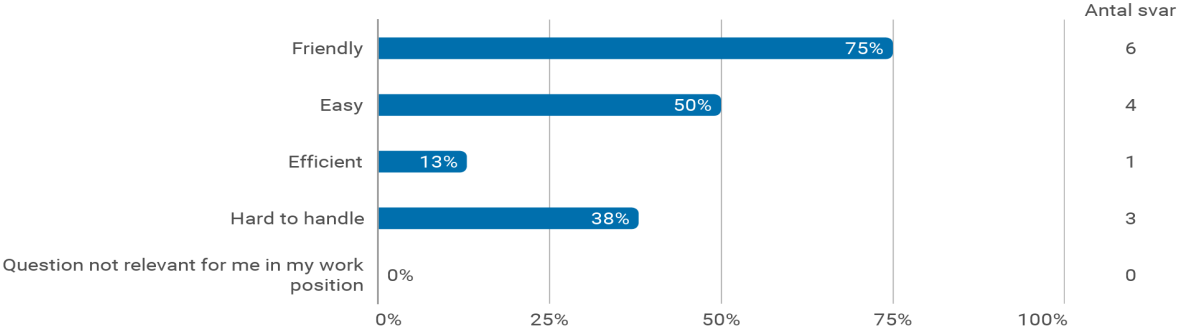
Next question: How was the communication about new ideas, which were not part of the project description in the beginning? (several answers are accepted)



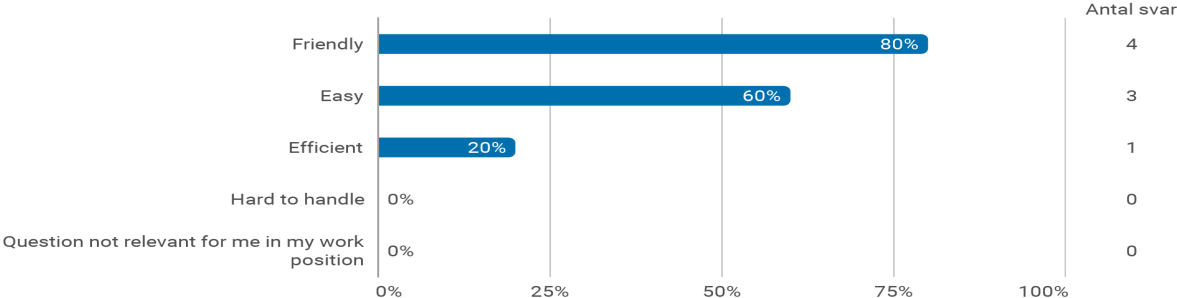
Work_in_DK_live_in_DK:



Work_in_GE(lives in GE):



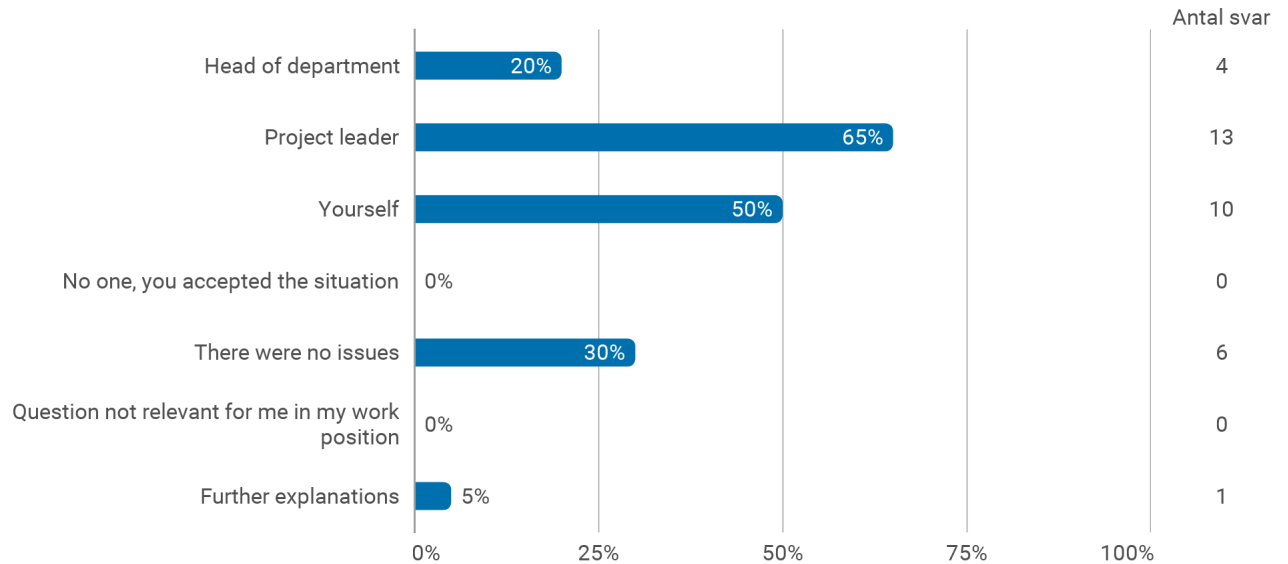
Work_in_DK_live_in_GE:



Again it turns out that the cross-border commuters comes up with the most positive answers, whereas both the groups Work_in_DK_live_in_DK and Work_in_GE(lives in GE) have lesser positive scores. And regarding difficulties - the "hard to handle" category : Work_in_DK_live_in_DK group has one hit and Work_in_GE(lives in GE) group has three hits. An interpretation of this outcome seems be that the commuters having roots in both work cultures at each side of the border manages extra new ideas better.

Next question:

In the case of issues regarding the project or issues between the project team members. Who was responsible to bring up a solution? (several answers are possible)

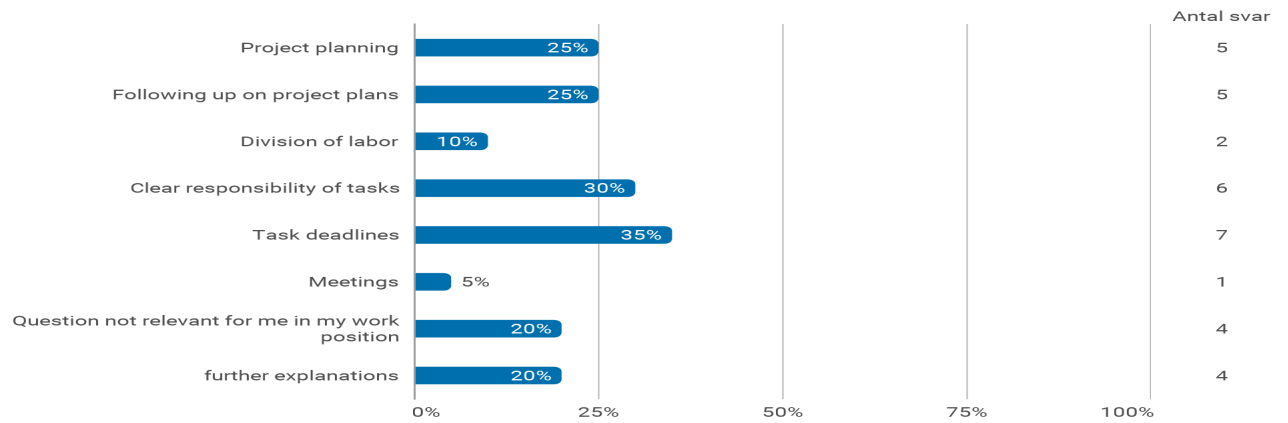


In the case of issues regarding the project or issues between the project team members. Who was responsible to bring up a solution? (several answers are possible) - Further explanations

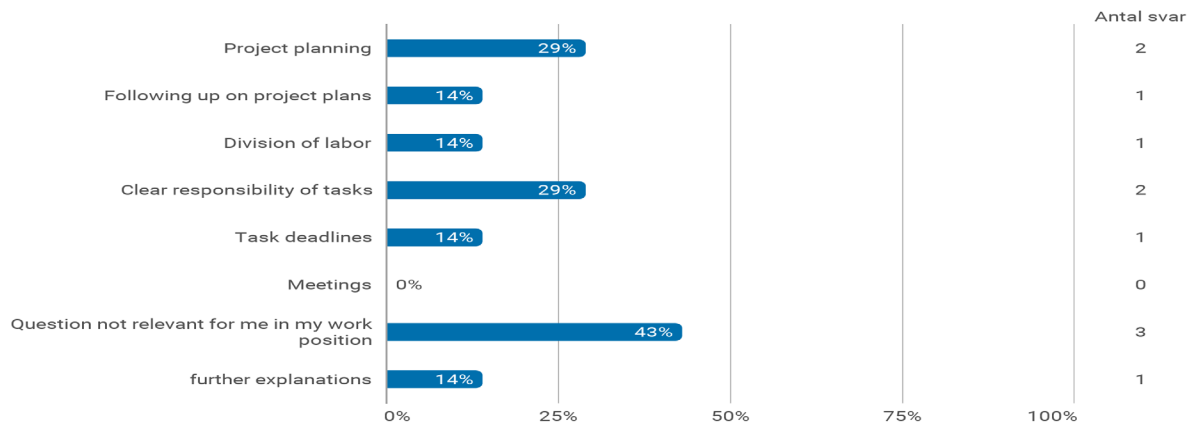
Each partner by himself.

The answer to this question relates more to the actual projects the person has joined. In this survey in the order of a handful INTEREG projects are represented, and the different answers from the different subgroups do not expose any patterns. So, the outcome simply tells that no simple general way is followed in order to deal with problematic issues.

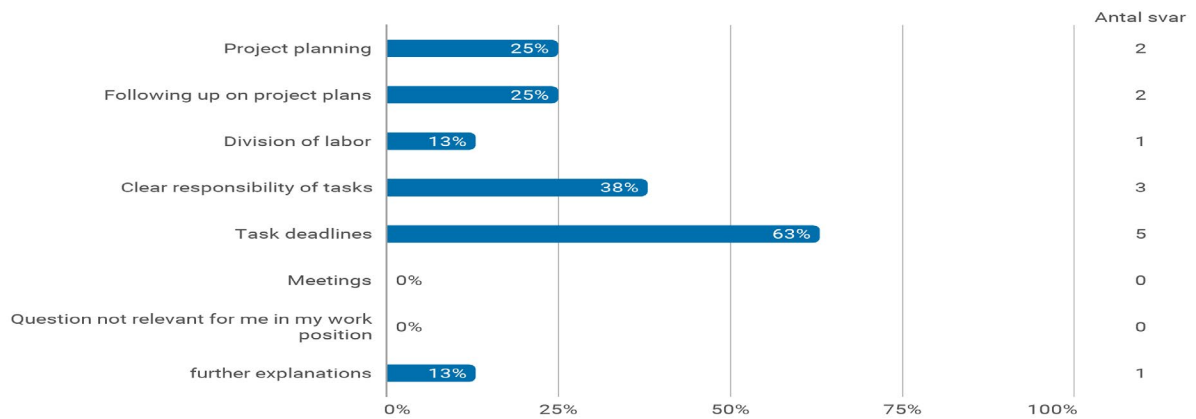
Next question: Were there differences in working cultures impacting negatively on: (several answers are possible)



Work_in_DK_live_in_DK:



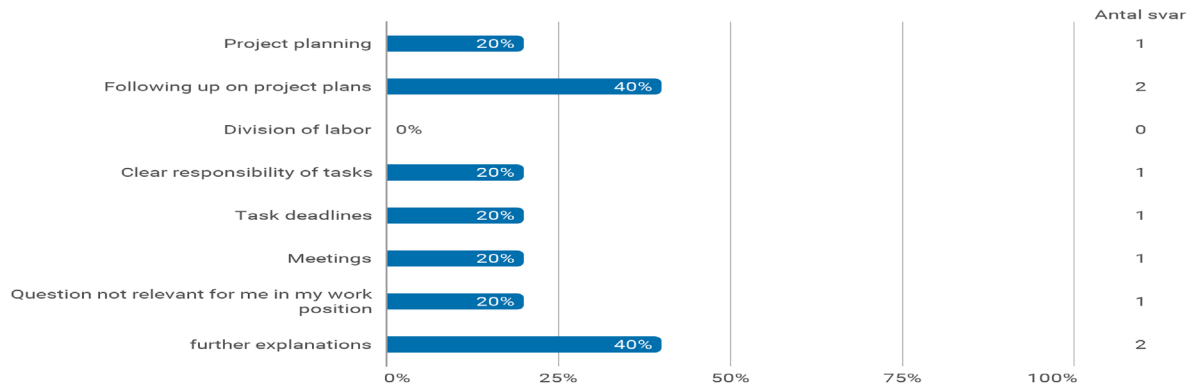
Work_in_GE(lives in GE):



Were there differences in working cultures impacting negatively on: (several answers are possible) - further explanations

No

Work_in_DK_live_in_GE:



Were there differences in working cultures impacting negatively on: (several answers are possible) - further explanations

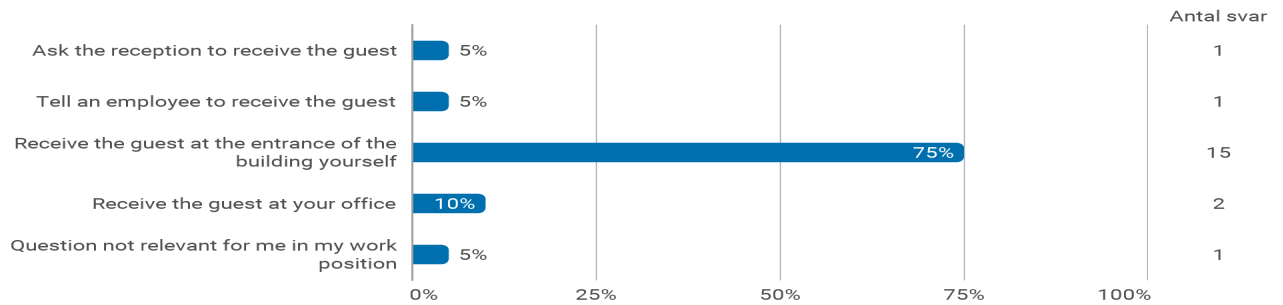
there were no problems

In Flensburg they start to employ people first when they get the grant, which might be a bit late concerning the fact that it takes often a long time to find the right person.

First category differences to be noticed is the category “not relevant for me...” , It has 3 in Work_in_DK_live_in_DK group, 2 in the Work_in_GE(lives in GE) group and 1 in the Work_in_DK_live_in_GE group. This observation underlines the diversity of the groups and emphasizes that comparisons must be done in a cautious way. The most striking category differences are “clear responsibility of tasks” and “task deadlines” between the 3 groups with the highest score (3 and 5) in the Work_in_GE(lives in GE) group, lower scores (1 and 1) in the Work_in_DK_live_in_GE group and lower score (2,1) in Work_in_DK_live_in_GE group. The conclusion regarding these 2 categories looks like that Germans in Germany worry more about this than the two other groups. But we must remember that the persons in the survey take part in different INTEREG projects, so the deviations could be caused by different projects having different levels of difficulties.

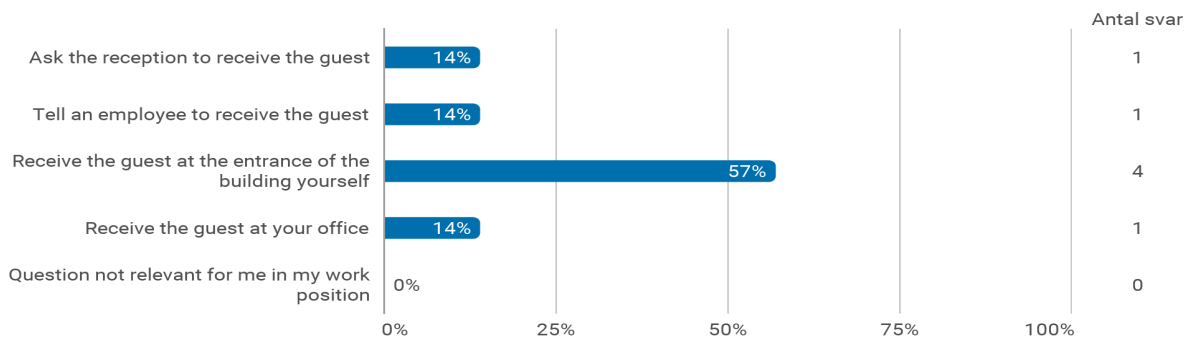
Next questions are some reactions to some what if scenarios:

A guest that you have invited but never met before arrives at campus – what do you do?

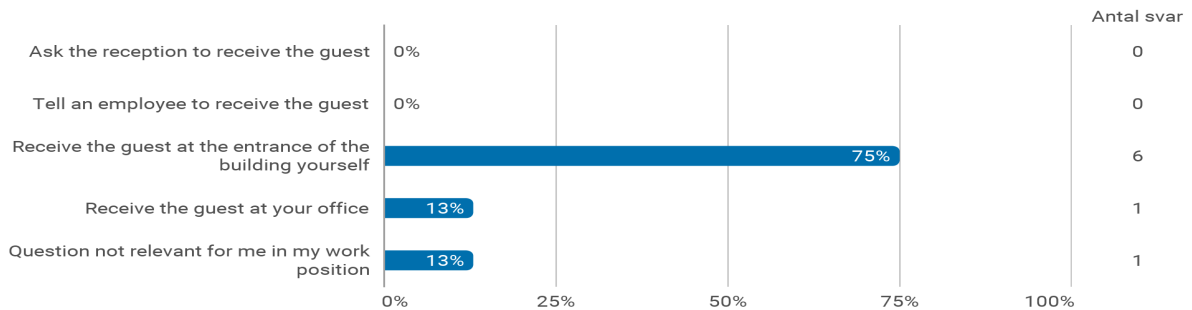


And the response from the different groups:

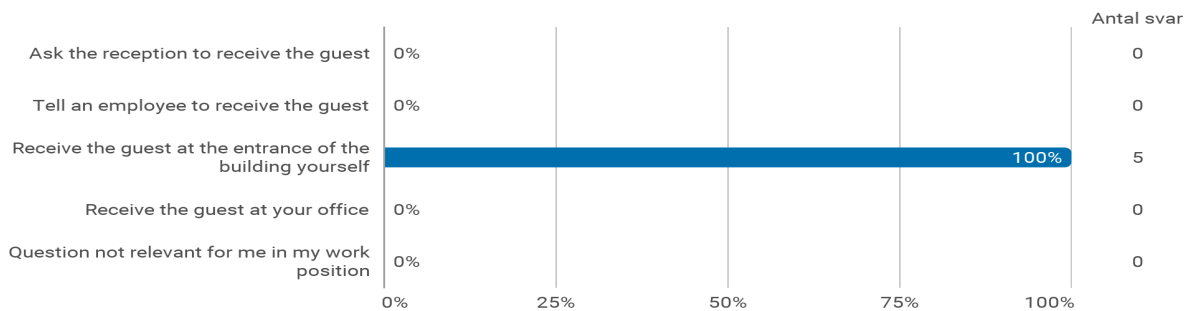
Work_in_DK_live_in_DK:



Work_in_GE(lives in GE):

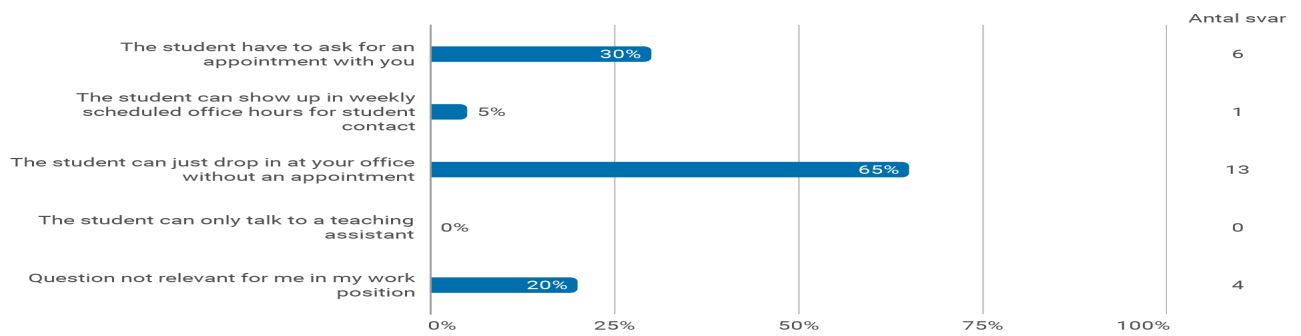


Work_in_DK_live_in_GE:

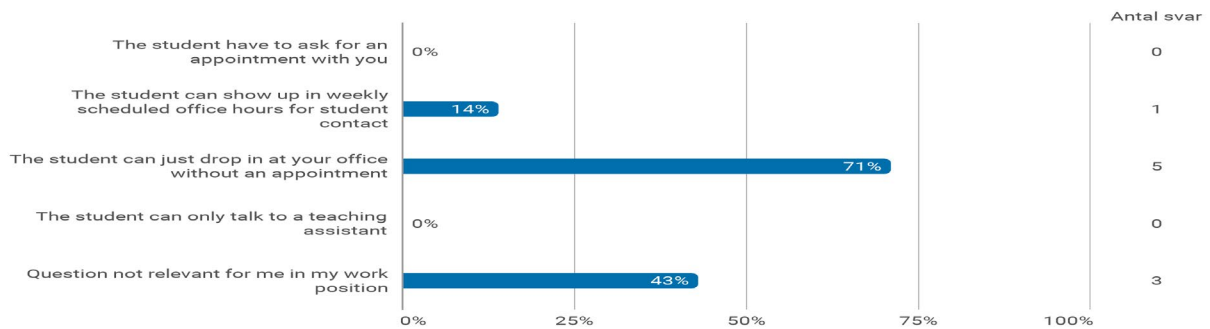


One might expect that Germans in Germany would let others receive the guest due to the prejudice about being more bureaucratic. But the opposite is in fact the case and can best be explained by the cultural difference shown in other surveys mentioned in section “in the manner of enterprises” above namely that Germans acts more polite than Danes.

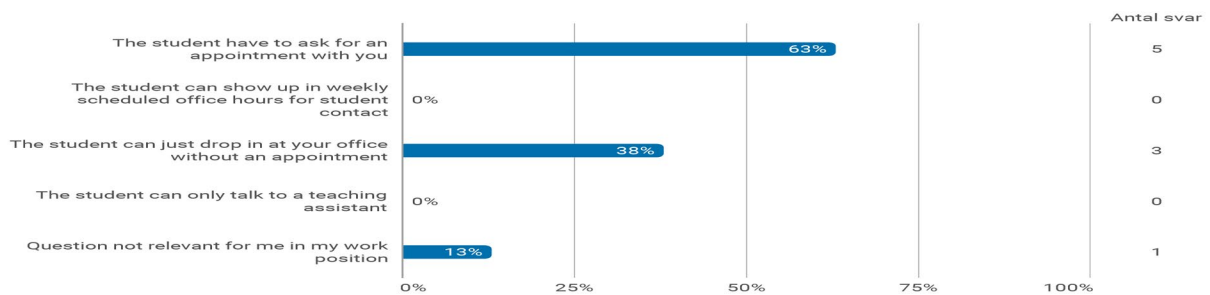
Next question: A student wants to talk with you – when and where can this take place?



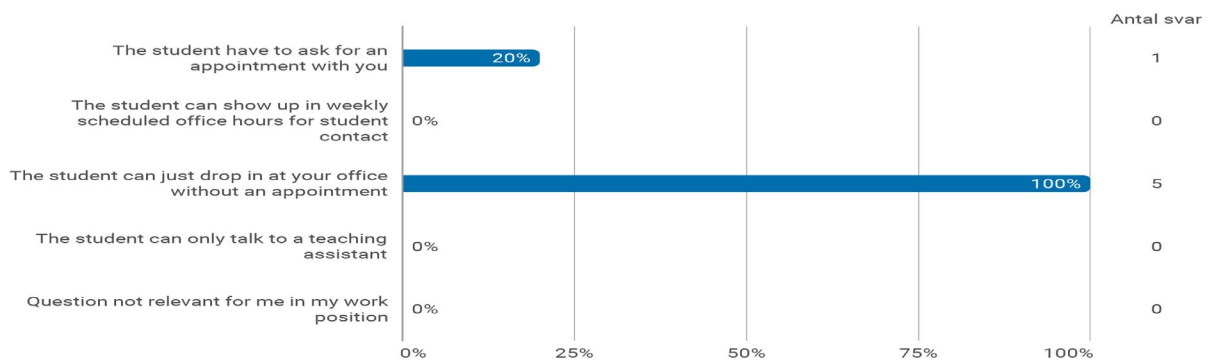
The answers split in the 3 groups: Work_in_DK_live_in_DK:



Work_in_GE(lives in GE):

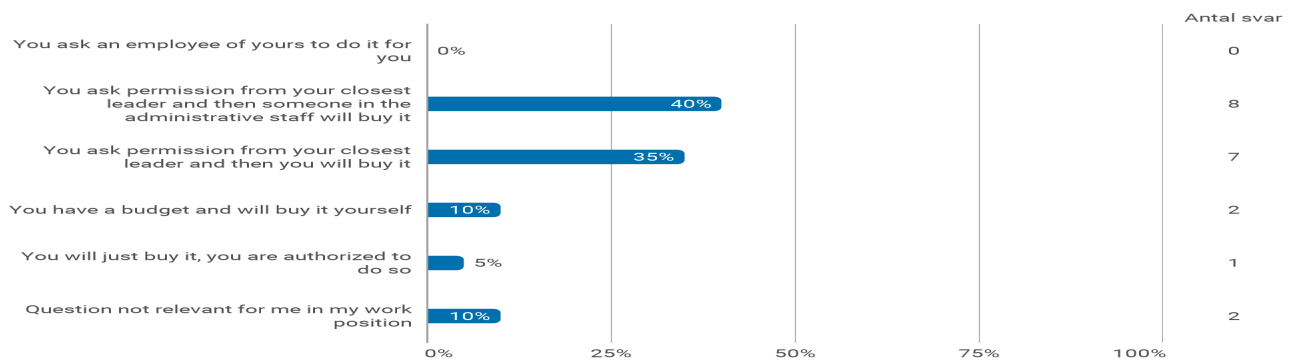


Work_in_DK_live_in_GE:

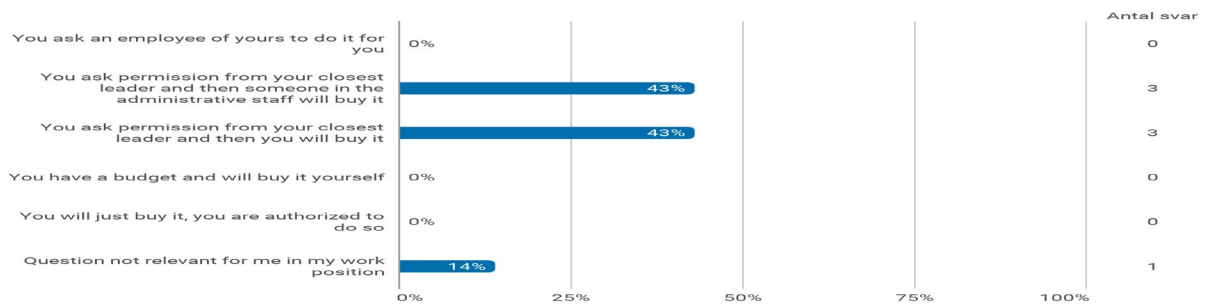


The most relaxed and informal way for the student to approach is in Work_in_DK_live_in_DK group. The most indirect and formal way of student approach is in the Work_in_GE(lives in GE) group and the student approach in the last Work_in_DK_live_in_GE group is a surprising kind of mixture between the two former groups, although being very relaxed.

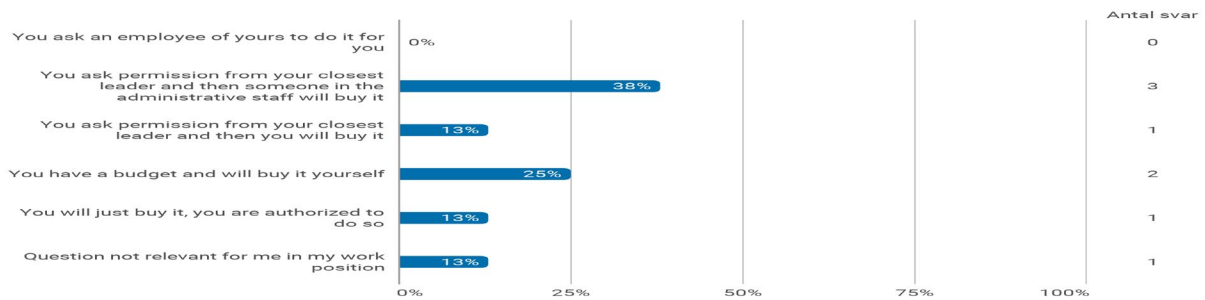
Next question: You want to buy a small piece of equipment – what do you do?



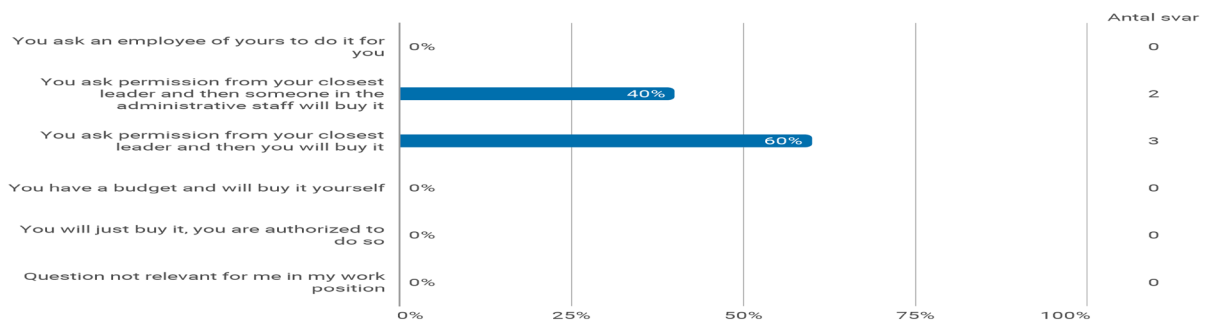
The answers split in the 3 groups: Work_in_DK_live_in_DK:



Work_in_GE (lives in GE):

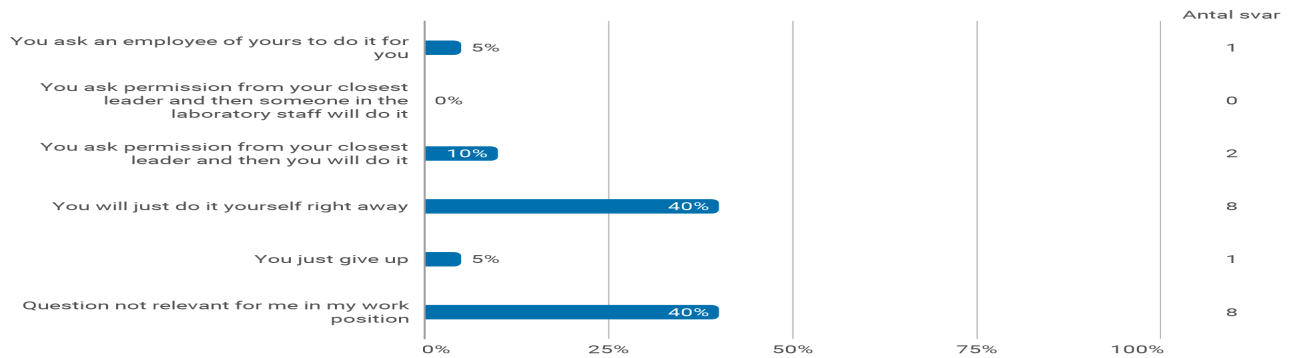


Work_in_DK_live_in_GE:

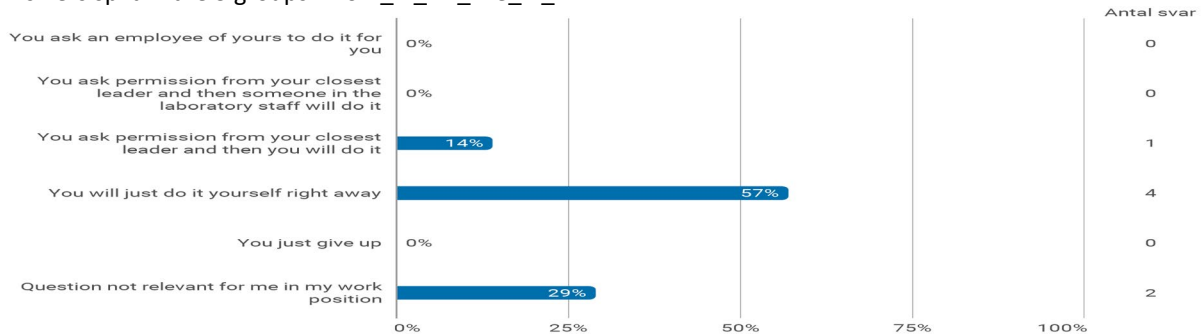


The only outcome of the split seems to be that purchasing can be done in more ways in Germany than in Denmark.

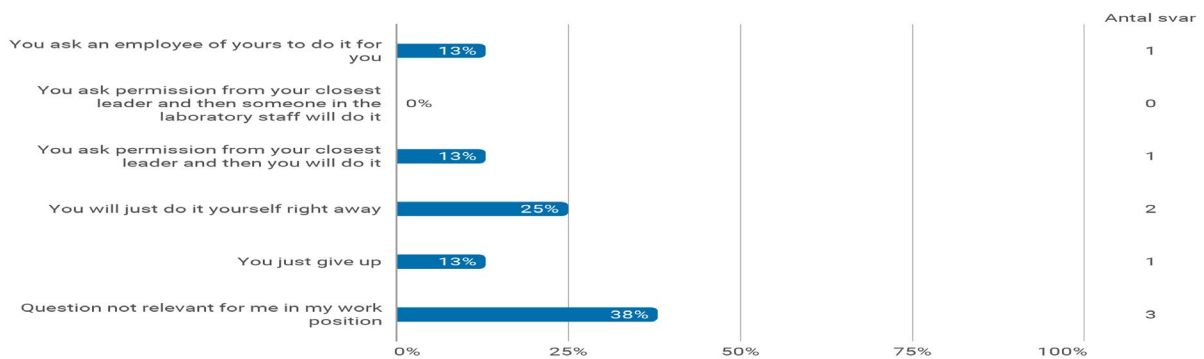
Next question: In the laboratory you want to have an exercise set-up – this is 3 hours of work – what do you do to make it happen?



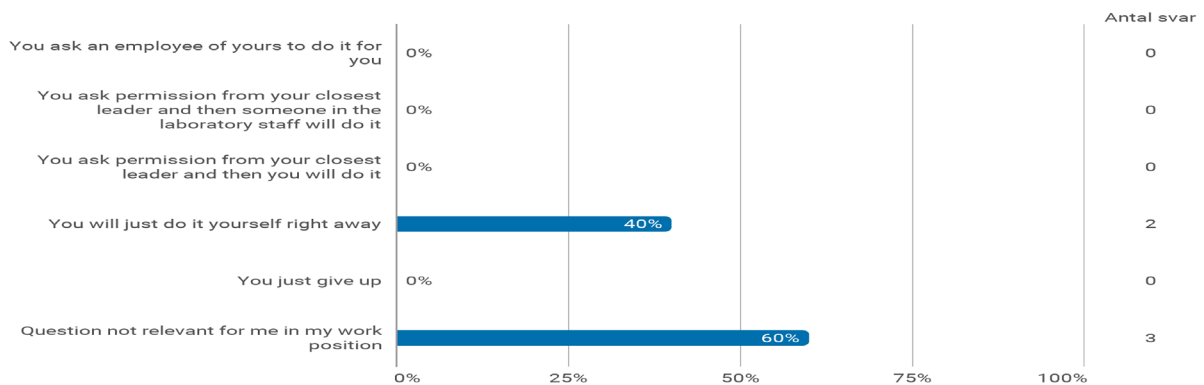
Answers split in the 3 groups: Work_in_DK_live_in_DK:



Work_in_GE(lives in GE):



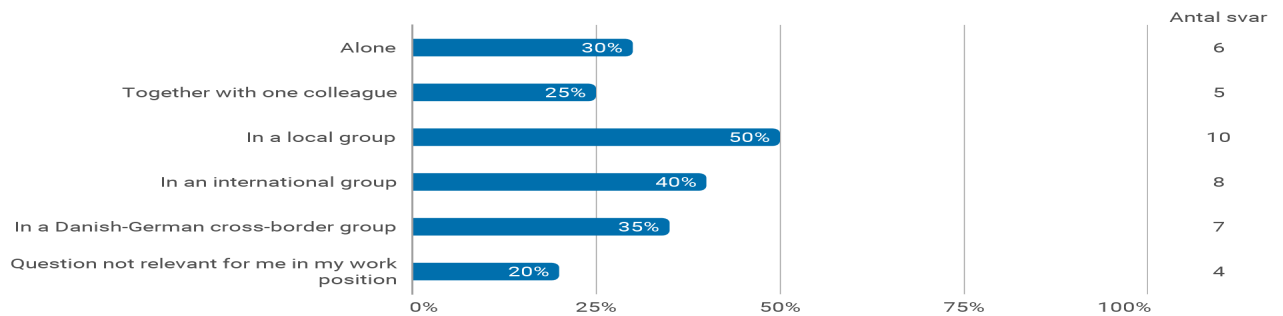
Work_in_DK_live_in_GE:



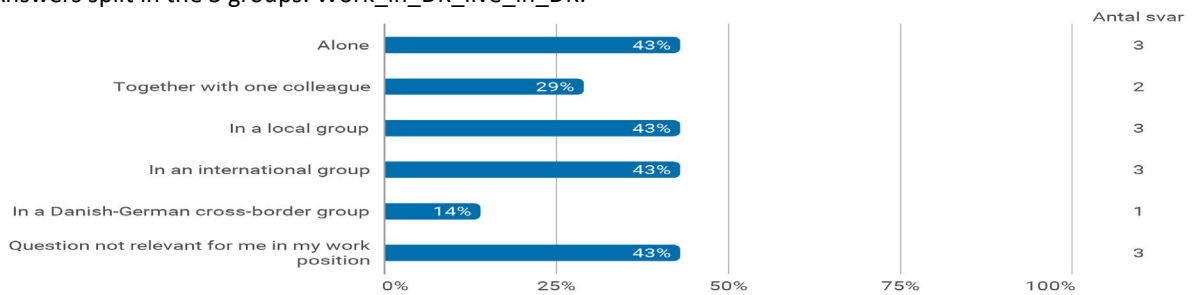
The numbers are small, but it seems that in Sønderborg you have to do the work yourself anyway – informal but no service. But in Germany it is done in more ways or given up – perhaps more formal and perhaps procedures are also an hindrance. Again numbers are just to low to conclude anything on the German side.

The last groups of questions deals with cooperation:

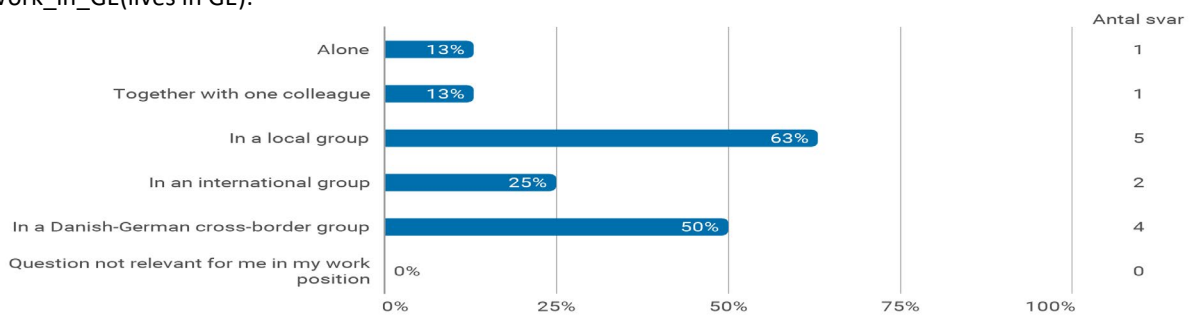
Are your research activities done (several answers are possible)



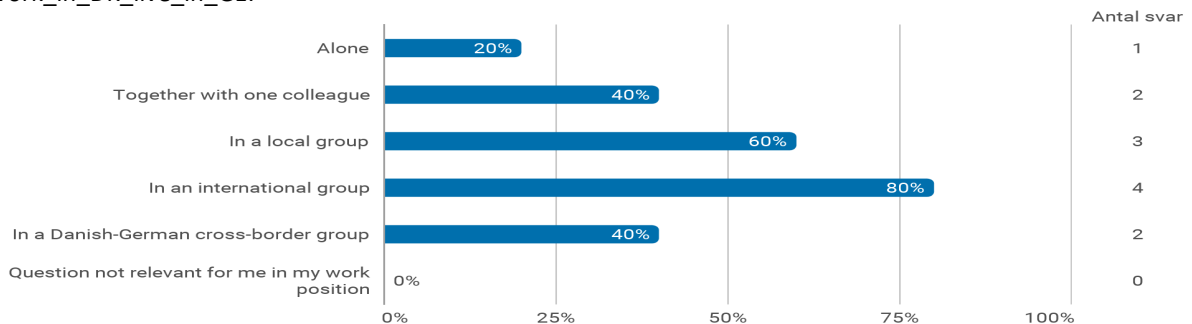
Answers split in the 3 groups: Work_in_DK_live_in_DK:



Work_in_GE(lives in GE):

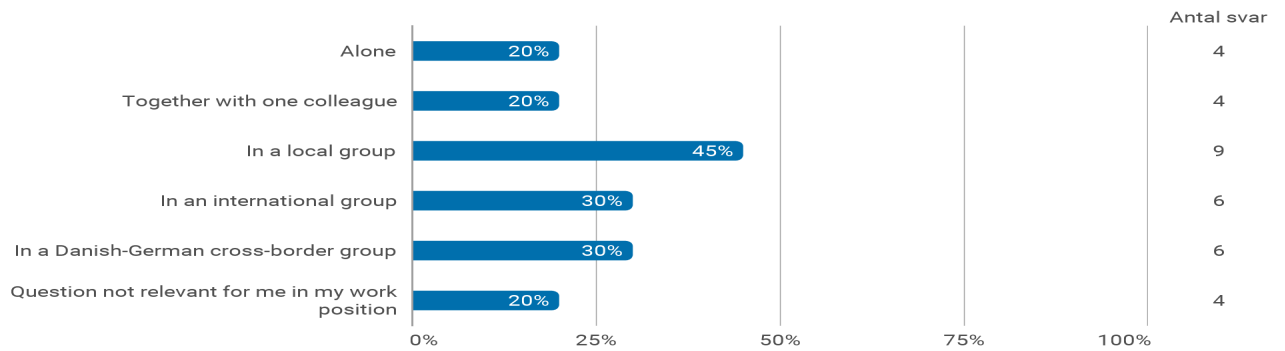


Work_in_DK_live_in_GE:

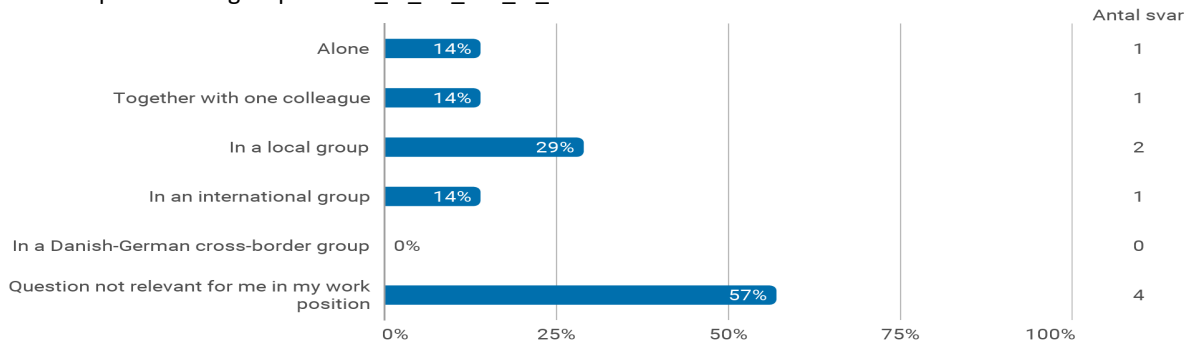


When it comes to “in a local group” category the Work_in_GE(lives in GE) group has the highest score. The Work_in_DK_live_in_DK group has the lowest score in the “in a Danish-German cross-border group”. Surprisingly Work_in_DK_live_in_GE group has the most international research collaboration. But again, the numbers are small – still the tendencies are clearly present – the commuters have more international research cooperation.

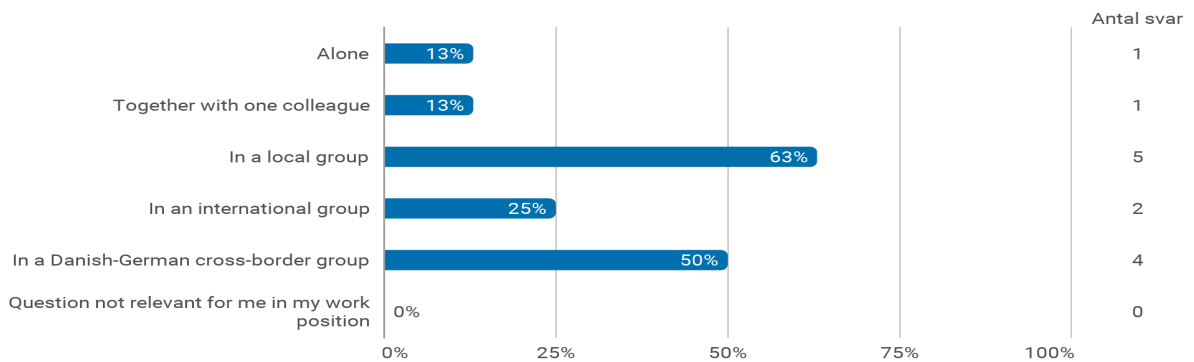
Next question: Are your industrial contact activities in research and development done (several answers are possible)



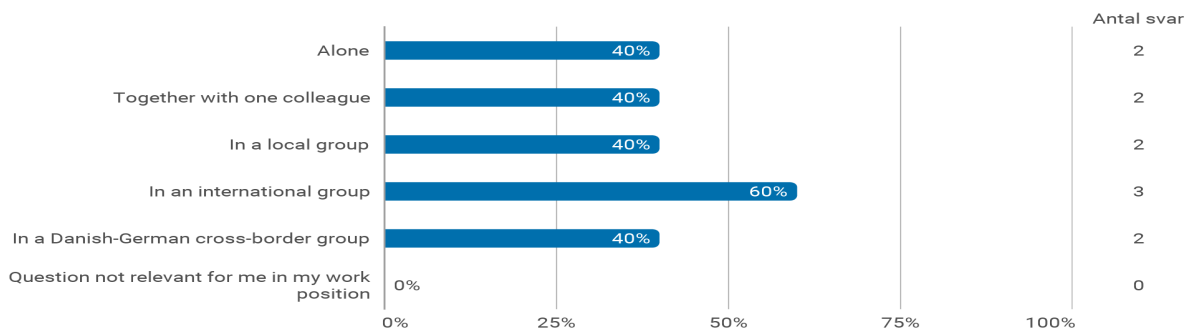
Answers split in the 3 groups: Work_in_DK_live_in_DK:



Work_in_GE(lives in GE):



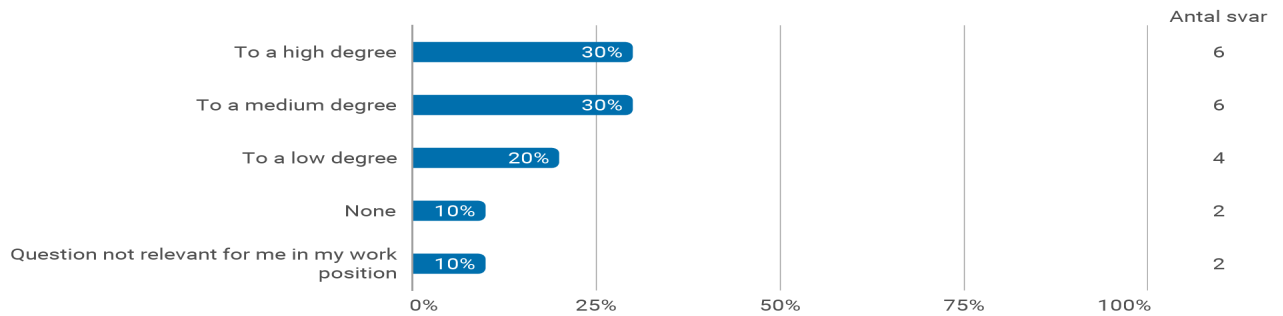
Work_in_DK_live_in_GE:



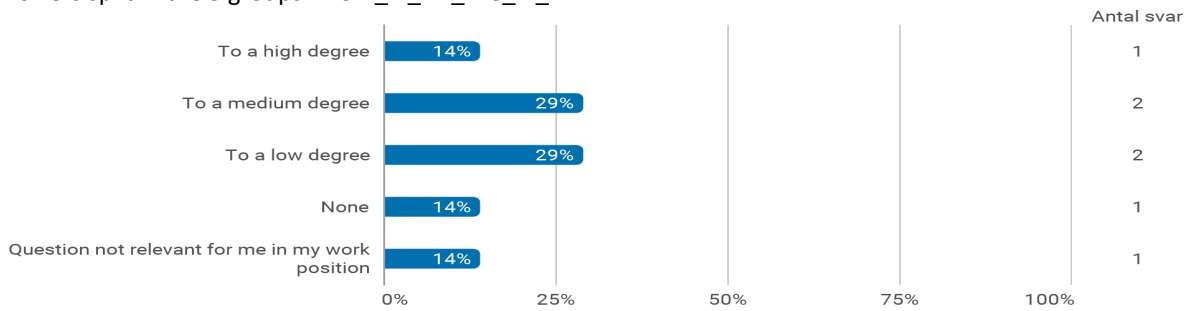
The same conclusions from the previous questions also applies even more here.

The last two questions deal with long lasting cross-border cooperation's:

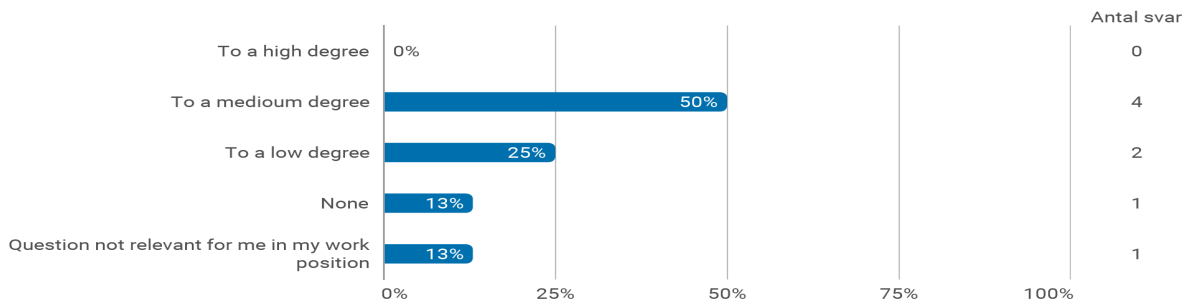
Do you have long lasting cross-border cooperation with other researchers?



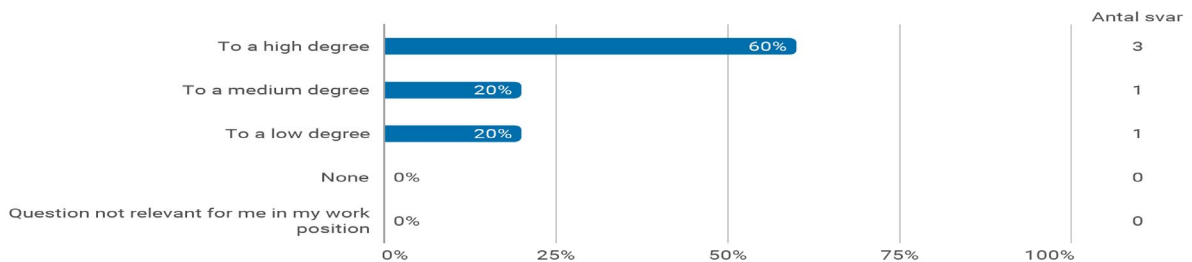
Answers split in the 3 groups: Work_in_DK_live_in_DK:



Work_in_GE(lives in GE):



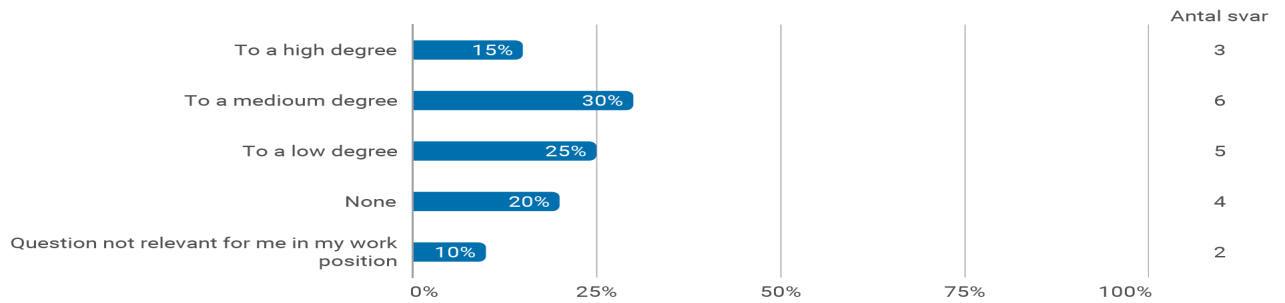
Work_in_DK_live_in_GE:



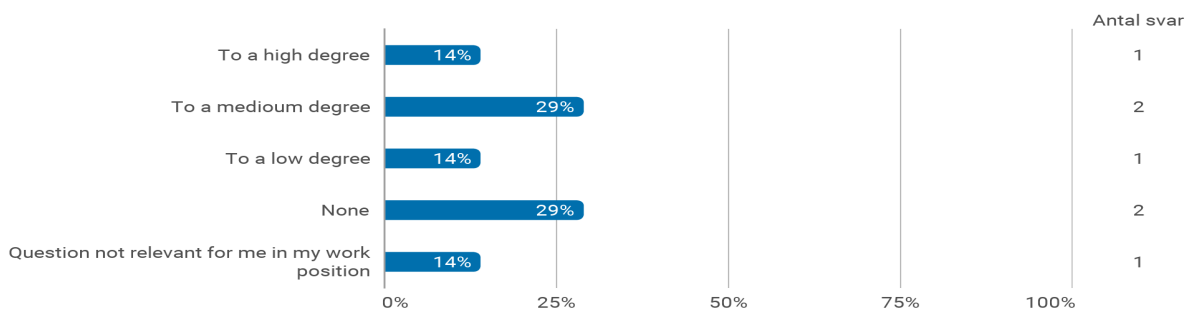
The lowest scores appears in the Work_in_GE(lives in GE) group, which could be explained by the fact that only a little research takes place in Sønderborg, but in the rest of Denmark there are indeed world-famous research institutes in wind-energy. The highest score appears in the Work_in_DK_live_in_GE group confirming the "more international" tendency from previous questions.

Next question:

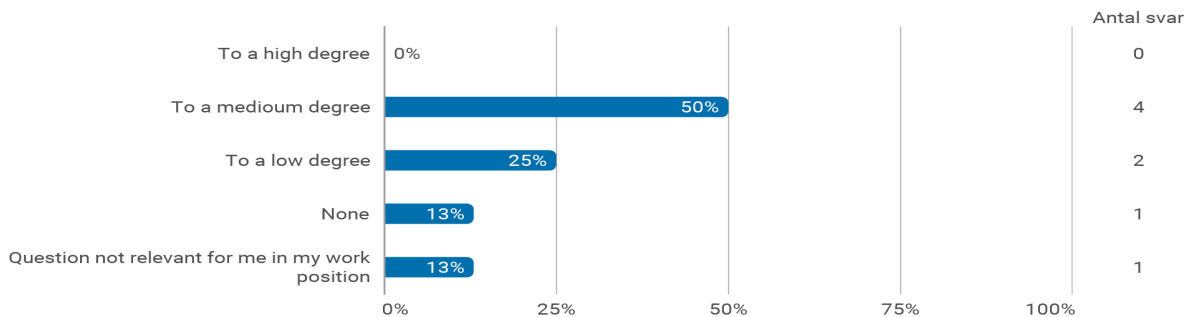
Do you have long lasting cross-border cooperation with companies



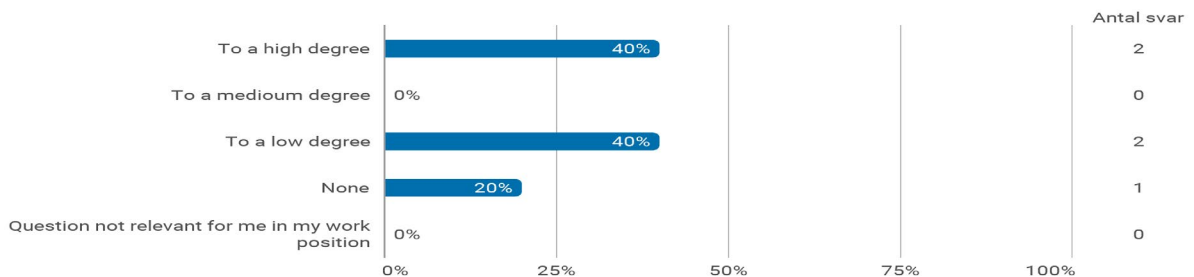
Answers split in the 3 groups: Work_in_DK_live_in_DK:



Work_in_GE(lives in GE):



Work_in_DK_live_in_GE:



The category "To a high degree" has no score for the Work_in_GE(lives in GE) group. The numbers are small, but scores are lower than in the previous question about long-lasting cross-border research collaborations. Perhaps long-lasting cross-border cooperation with companies are harder to establish.

Some general overall remarks to the survey results

Surprisingly, the Work_in_DK_live_in_GE group seems to have a work culture of their own combining the best from the work cultures on each side of the border.

Although differences have been in focus in commenting the survey questions one by one a lot of similarities in academia across the border has been revealed.

One must be cautious regarding conclusions, because the survey participants come from different INTERREG projects each having their own history of successes or failures in various degrees. And the numbers when splitting answers up in the subgroups are indeed very small. Furthermore, these groups are also quite diverse when it comes to roles in projects. Despite of all these survey shortcomings the diagrams all together has a story to tell about cross-border work cultures in academia.

Work package 5.2 Target declaration for CROSSWIND and INTERREG 6

The network project was set up to achieve a first impression about, what is required or which targets are required after the network project is finished. Over the year 2021, the network project duration, every single work package faced different aspects to consider the following research application at the INTERREG 6A funding program. Here the target declaration are set as work packages with their activities and outcomes, like a research proposal need to be documented for the INTERREG. This documentation is a first assumption of the requirements and needs to be discussed with the project partners, due to the reason that every single project partner will have a responsibility and they need to set the time tables and describe their specific tasks and outcomes.

The first point to mention is the category of the project for the INTERREG 6. For now the network project is in the category „2.1 Steigerung der nachhaltigen Nutzung von Ressourcen und Energiequellen in Unternehmen des Programmgebiets | Øge den bæredygtige udnyttelse af ressourcer og energikilder i programområdets virksomheder“ which gives no room for innovation in respect to the category and network project.

The team faced, with deeper investigation into the topics, the more the goals had to be adjusted and mostly the tasks are set as goals for the following research proposal. Therefore the category 1 should be considered from the INTERREG 5 Program “Spezifisches Ziel: Steigerung der Produkt-, Prozess- und Sozialinnovationen in den für das Programmgebiet identifizierten Stärkepositionen | Øgning af produkt-, proces- og socialinnovationen inden for de identificerede styrkepositioner i programområdet“. The INTERREG 6 funding program offers new categories, which are similar to the categories of INTERREG 5. Which suits the project the best? That requires a discussion when the time has come to submit the project.

The following work packages describe the new goals and tasks. The outcomes of each work package require more discussion with the project and network partner.

Work package 1 – Project Management (mandatory by INTERREG)

Work package 2 – Public Relations (mandatory by INTERREG)

Work package 3 – Economics of Small Wind Turbines

- Regulations of installation in Germany and Denmark in more detail,
 - o Which actions are required to install small wind turbines for higher economics
 - o Increasing Feed in tariff
 - o Lower manufacturing cost
 - o Guideline for building authorities for easier and faster permissions
- battery solutions or energy storage system (electrical cars, warm water, heating etc.) need to be taken into account
- for installation permissions animations and graphical views are required
- interactive map for INTERREG region, to create coloured layers for example by choosing a single small wind turbine out of the benchmarking list, output could be → cost of energy, payback period, Investment time etc.
- persons with skills:
 - o in economics

- in media design or landscaping architecture is required etc.
- in Python coding

Work package 4 – Design requirements

- Based on benchmarking list in WP 3.1
- Design specifications to a cost optimized small wind turbine concept
 - low cost of components, low noise and safeness required
 - more requirements are possible
- persons with skills in
 - designing
 - engineering
 - product design

Work package 5 – Prototyping & Manufacturing & Testing

Simulation

- Structure with
 - Licence:
 - Ansys or Solid Works
 - OpenSource:
 - FreeCad or OpenFoam

Manufacturing

- TestUp Laboratory University Of Applied Sciences in Flensburg
- Laboratory of Center of Industrial Machines
- Workshop of different project partner, if available
- Using:
 - Different methods of rotor blade manufacturing
 - Different structures in manufacturing
 - Different materials, sustainable materials
- Persons with skills in Designing, handcrafting and/or CNC-Engineering

Testing

- Wind tunnel tests (for example at FH Kiel)
- Proper test bench is required, includes certified equipment for measurement
 - Realistic conditions
 - Power curve measurement
 - Noise level measurement
- Folkecenter of Denmark has testing field (Note: not in interreg5 region)
- Hardware in the loop

References

- [1] 11.10.2021, "Danish and German Work Culture: Here Are the Most Important Differences," <https://c3consulting.dk/en/news-and-resources/blog/blog-issue/art-470>, accessed October 11, 2021
- [2] 29.10.2021, "Danish and German Work Culture: Here Are the Most Important Differences," <https://c3consulting.dk/en/news-and-resources/blog/blog-issue/art-470>, accessed October 29, 2021
- [3] Deutsch-dänische nationale Stereotype. 26.10.2021, "SMiK: Unterrichts- und Ratgebermaterialien | | SMiK: Undervisnings- og rådgivningsmaterialer," <https://www.stereotypenprojekt.eu/download/>, accessed October 26, 2021

Appendices

Mechanical bachelor engineering courses in SDU Sønderborg at CiM

From this link:

<https://odin.sdu.dk/sitecore/index.php?a=sto&id=39854&lang=en>

The competencies of the mechanical engineer are built around students working on topics from five subject columns:

- Theoretical foundation in mathematics and physics.
- Static and dynamic conditions in mechanical products – practical and theoretical.
- Technologies, design, and development.
- Methods and personal learning.
- Specialization via electives.

The academic topics are interlinked during the individual semesters by semester themes. Throughout the study, students continually acquire the necessary academic knowledge, while at the same time gaining personal competencies. The columns include the following subjects and disciplines:

Theoretical foundation in mathematics and physics

Consists principally of the following courses:

MC-MATH1: Complex numbers; Differentiation techniques; Taylor and Maclaurin series; Functions of several variables; Differential equations; matrices.

MC-MATH2: Integration techniques; Laplace transformation; Fourier series; Data handling.

MC-MATH3: Linear Algebra; Vector Calculus; Numerical analysis.

MC-THER Thermodynamics (part of ME-COHE) : Principal theories of thermodynamics, Equation of energy; Equation of state; Momentum theorem; Equation of continuity; Open and closed systems; Circulatory processes; Flows in compressible and incompressible media; Momentum and forces caused by flows; Heat transmission.

MC-MLE Machine Learning: Modelling of dynamic systems and identification, tools for machine learning, machine learning for dynamic tuning.

Progression through this column enhances the student's ability to understand the underlying physical circumstances and to use the relevant mathematical methods in an engineering context.

Static and dynamic conditions in mechanical products – practical and theoretical

Consists principally of the following courses:

MC-MECH1 Statics & Materials: Forces and couples; Isolation of mechanical systems made up of one or more solids; Dry friction; Torsion of circular members; Internal effects; Design of beams for bending; Mechanical material parameters for metals and polymers; Electromagnetic material parameters; Thermal Properties.

MC-MECH2 Dynamics: Absolute speed and acceleration; Coordinate systems; General equations of motion; Translation; Fixed-axis rotation; Work and energy; Linear Momentum.

MC-MAC Machine Components: Calculation, selection and use of standard machine components such as gear and chains, bearings, springs, mechanical clutches, and transition elements.

ME-SME Solid Mechanics: Mechanical strain and stress in three dimensions, elasticity, plasticity, stress criteria, plane strain and stress conditions, beam and plate theories and their application to solve engineering problems, torsion of non-circular members.

MC-CAE Computer Aided Engineering: Analysis of linear, static and heat transfer problems in axial, plane and three-dimensional models, finite element analysis using the ANSYS simulation tool.

MC-HYD Hydraulics (part of ME-POW): Pascal's principle and the hydraulic pressure, hydraulic systems, Bernoulli's Principle and Poiseuille flow, hydraulic components, and hydraulic simulation tools.

ME-TST Mechanical Testing (part of ME-DISC): Test methods for characterization of mechanical material properties according to ISO standards, hardness tests, tensile tests, toughness tests.

Progression through this column enhances the student's ability to use advanced theoretical methods in the process of analysing, modelling, developing, and testing static and dynamic mechanical systems.

Technologies, design and development

Consists principally of the following courses:

DES Design (part of ME-DISC): Modelling with primitive solid elements; Modelling with parametric solid elements; Modelling with curves and sketches; 3D assembly modelling with solid components; Design of technical drawings with section views and dimensions including tolerances; Making technical drawings on the basis of a 3D assembly model; Making an exploded view on the basis of a 3D assembly model; Making a parts list on the basis of a 3D assembly model.

ME-MBD Multibody dynamics: Mechanism design theory, introduction to mathematical modelling of multibody systems, application of software for analysing and simulating mechanisms and multibody systems.

ME-MAT Materials: Structures, defects, and properties of metals, ceramics, and polymers, deformation and strengthening mechanisms, phase diagrams and transformations, material failure and corrosion, material applications and processing, and other considerations (environment, health, availability, design).

ME-FAT Fatigue: Basic fracture mechanics, theory & practice of fatigue characterisation and prediction, fatigue analysis of stochastic systems, rainflow counting, linear damage theory, effect of mean stress state, and experimental fatigue testing.

SPRO1ME Discover the Mechanical Development Process: An introduction to the mechanical disciplines: concept, interdisciplinarity and focus on the development process and how to consider sustainable development during product design. A mechanical product or system is designed by applying the other skills acquired during the semester. If a certification standard applies to the product or system, the design must comply with it.

SPRO2ME Design and Build Mechanical Products: A mechanical product is built that can perform a task involving moving machine parts. The other subjects of the semester are the academic basis for the project. If a certification standard applies to the product or system, the design must comply with it.

SPRO3ME Manufacture and Operate Mechanical Systems: The semester project focus on the manufacturing of a mechanical system with the right materials and the right processes to ensure the operational lifetime and lifecycle of the systems with respect to sustainability and recyclability. If a certification standard applies to the product or system, the design must comply with it.

SPRO4A Cooling-Heating Systems: The project for the semester is based on the development of a mechanical product that involves cooling and heating systems.

SPRO4B Power Conversion Systems: The project for the semester is based on the development of a mechanical product that involves different power conversion systems.

Progression through this column enhances the student's ability to develop components, products, and systems, based on mechanical engineering methodologies and technologies.

Methods and personal learning

Consists principally of the following courses:

MC-EXS: Experts in Teams. The students will be challenged by a complex product development situation. They will work together in large teams in a project with many stakeholders where the ability to cooperate with different people (engineers and non-engineers) and the ability to organize the project as well as the ability to use one's own expertise is a "must" to achieve a satisfying result.

MC-PMTS: Project Management and Theory of Sciences. The students will learn to understand the managerial tasks related to project deliveries in organizations and about the nature of science, the scientific method, and the various forms of logical reasoning.

MC-IET – the Internship: The student gains practical and theoretical experience as an employee in a company – working as an engineer.

Progression through the projects enhance and develop personal and learning competencies, while at the same time the academic competencies are learned in depth and brought to maturity in "real" projects, thus giving personal competencies in the areas of: Commitment, Initiative, Responsibility, Ethics, Establishment, Ability to put personal learning into perspective and learning competencies in the area of: Analysis and assessment of data material; Communication of working results using approaches that require reflection, cooperation and independence. The progression finalizes with the one semester internship – where the student will be challenged on all competencies and experience how it is to be an engineer in the industry.

Specialization and electives – Mechanical Engineering

Focusing of competencies is done by choosing elective courses in the fifth semester (15 ECTS points in total). The courses will be within the domain of the DME research.

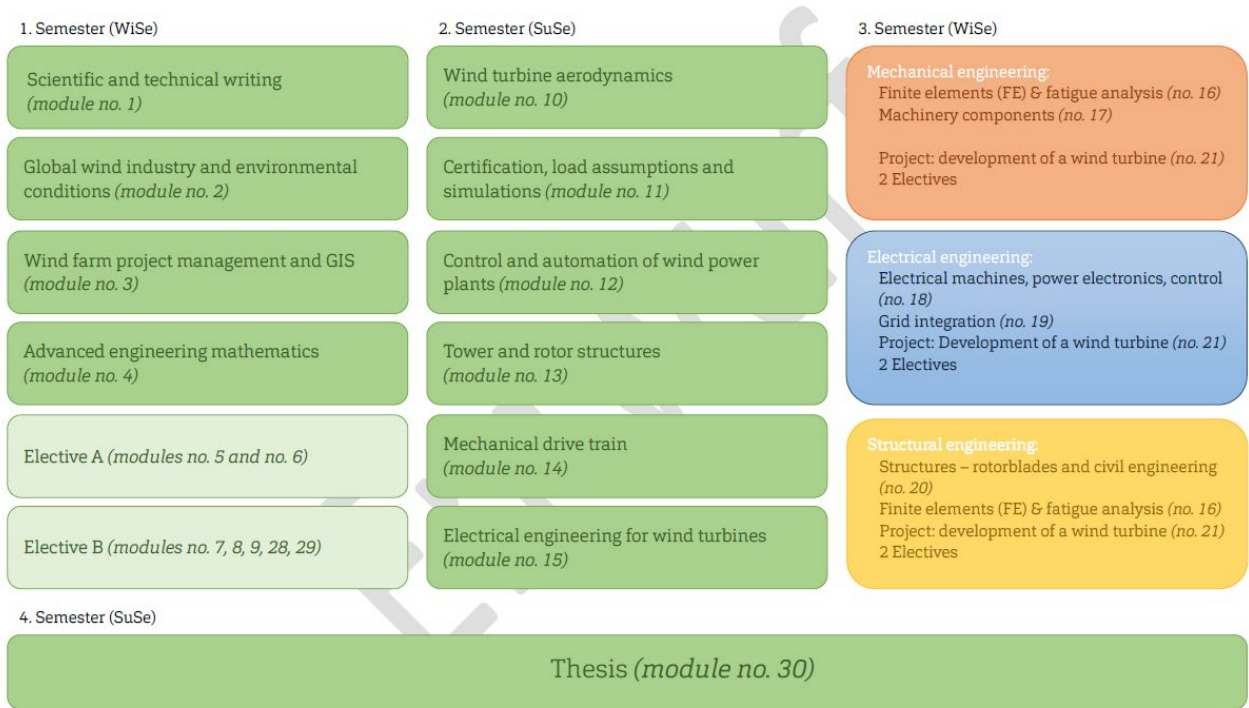
Courses offered at the Wind Energy Technology Institute at Hochschule Flensburg - University of applied science

From the link:

https://hs-flensburg.de/sites/default/files/studiengang/2021/draft_module_handbook_wind_energy_engineering_may_2021.pdf

The education structure:

Module overview



Last updated_May_2021

Compulsory elective modules

1. Semester (WiSe)

- Mechanical engineering for electrical engineers (Marten) (module no. 5)
- Electrical engineering for mechanical engineers (Saiju) (module no. 6)
- German for foreign students (Kähler) (module no. 7)
- English for engineers (Reimer) (module no. 8)
- Energy economics (Oei) (module no. 9)
- Wind energy challenge project (Faber, Mommsen) (module no. 28)
- Green entrepreneurship (Neumann) (module no. 29)

3. Semester (WiSe)

- Advanced wind farm planning (van Radecke) (module no. 22)
- Offshore wind energy: operation and maintenance (Birk) (module no. 23)
- Computational fluid dynamics (Schaffarczyk) (module no. 24)
- Modelling & simulation of wind turbines (Jauch) (module no. 25)
- Turbine measurements (Faber, Steck) (module no. 26)
- Controller design for wind turbines and wind farms (Schlipf) (module no. 27)
- Wind energy challenge project (Faber, Mommsen) (module no. 28)
- Green entrepreneurship (Neumann) (module no. 29)

Last updated_April 2021

Courses of the Wind Energy Technology Institute

Scientific and Technical Writing

Global Wind industry and environmental conditions

Global Wind industry and environmental conditions

Wind farm project management and GIS

Advanced Engineering Mathematics

Mechanical Engineering for Electrical Engineers

Electrical Engineering for Mechanical Engineers

German for foreign students

English for engineers

Energy Economics

Introduction to Wind Turbine Aerodynamics

Introduction to Wind Turbine Aerodynamics

Certification, load assumptions and simulations

Certification, load assumptions and simulations

Control and automation of wind power plants

Tower and rotor structures

Tower and rotor structures

Mechanical drive train

Electrical engineering for wind turbines

FE & Fatigue Analysis

FE & Fatigue Analysis

Machinery components

Machinery components

Machinery components

Machinery components

Electrical machines, power electronics and control

Grid Integration

Structure – Rotor blades and Civil Engineering

Structure – Rotor blades and Civil Engineering

Project: Development of a wind turbine

Project: Development of a wind turbine
Project: Development of a wind turbine
Project: Development of a wind turbine
Project: Development of a wind turbine
Project: Development of a wind turbine
Project: Development of a wind turbine
Advanced Wind Farm Planning
Offshore wind energy: Operation and Maintenance
Computational Fluid Dynamics
Modelling & Simulation of Wind Turbines
Turbine Measurements
Controller Design for Wind Turbines and Wind Farms
Wind Engineering Challenge Project
Wind Engineering Challenge Project
Green Entrepreneurship