

A manual on

How to cooperate with industry

on a problem within
Sustainable Waste Management



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Co-funded by the
Erasmus+ Programme
of the European Union



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We would like to thank *Anja Svenstrup Jørgensen* for helping us with the section on contacting the industry partner.

This manual has been developed as teaching material for Erasmus+ project EduEnvi - Enhancing Competences of Sustainable Waste Management in Russian and Kazakh HEIs / EduEnvi.

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Introduction and reading guide

This manual has been developed as teaching material for Erasmus+ project EduEnvi - Enhancing Competences of Sustainable Waste Management in Russian and Kazakh HEIs / EduEnvi. In this manual we begin by describing the preconditions for involving an industry partner in an industry/university collaboration as part of the curriculum. Following this we describe a series of steps to follow when collaborating with the industry partner in the curricular activity as an innovation project based on the pedagogical principle of “Problem based Learning” (Savery, 2015).

This guide will offer you two kinds of text:

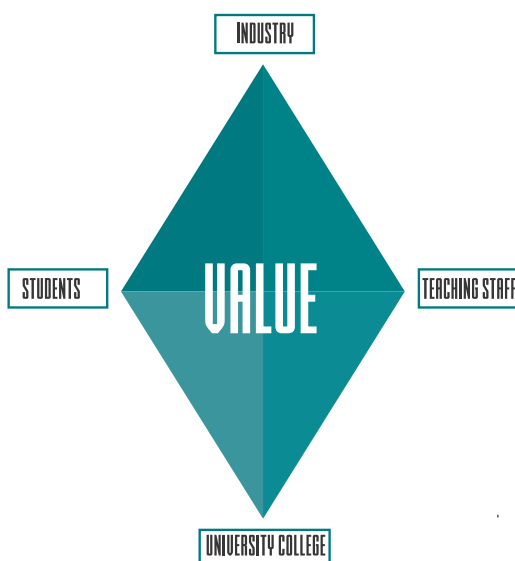
1. Guidance texts which explains preconditions and steps.
2. Example of introduction letter and other material, which you might choose to use for inspiration, when you start up a cooperation with an industry partner.

Guidance texts will have a white background. Example texts will be shown with a light blue background, for you to know the difference.

Setup and preconditions

When setting up a course based on the curriculum for Sustainable Waste Management (hereafter called SWM), it is crucial to establish an obligating learning environment between the cooperating industry partner and the university. In other words – establish a partnership where challenges and benefits for both parties are described.

The first prerequisite for a good progress is that the participants from the industry partner see themselves as a part of a committed partnership / learning environment.



The industry partner must see the Problem– or “the challenge” within SWM as a problem the industry partner needs to solve – in order to establish a sense of urgency. This also means that the participating industry partner must have a strategy for, how they want to deal with SWM.

The problem - or challenge - presented by the industry should be an innovation challenge¹ - this means a problem, for which the industry does not have a set solution.

This allows for all participants in the project to learn something, the industry partner, the teachers and the students. At UCL we call this the “value diamond”.

¹ An innovation project is in this context understood in light of Lotte Darsø’s description as “new knowledge”. (Darsø 2009: 28)

How to create contact with a industry partner from local industry?

First of all - the industry partner must acknowledge and realize that they have a Problem or a “challenge” concerning sustainable waste management.

The cooperation industry partner must accept and understand the actual course learning and development premise. This is a question about openness and knowledge sharing between the two organizations.

Below is a list of topics that must be considered before starting.

The industry partner should never participate with a simulated project. The cooperating industry partner must have (or has to develop) a plan with real-life - or authentic - problems they are facing within SWM that needs solving. The “Problem” should be one the industry partner actually faces, and that they do not has an established solution for already.

We recommend, that the University appoint a professor who would be responsible and act as “key account manager” in relation to the contact with the industry partner.

Often he or she will be the one, who establish the initial contact to the industry partner. He/she is the liaison between the University and the industry partner, so it is his or hers responsibility to establish and ensure communication between colleagues and management at the University and the management of the industry partner about the project and the terms for cooperation.

Short guide to recruitment of companies for interdisciplinary-projects

This short description is a “walk-through” of the customer journey – seen from the university’s point-of-view when it comes to recruiting a potential industry partner.

Contact to the relevant local industry and assessment.

First of all, start out with your own personal network to get in contact with Industry. This could be through formal networking groups, professional corporation, social networks i.e. LinkedIn.

Once you have made a list of potential companies you want to get in contact to, make sure you keep track of relevant information.

- Name of the company and their webpage
- Info on the person you want to get in touch with – name, occupation, email and phone number
- Dates for contacts: phone, email ect.

- Business-networks – here you create a specific document, where you list all the initiatives you have been taken – i.e. invited the CEO to your network (LinkedIn), invited relevant persons from the company to conferences ect.

It takes time - and a lot of phone calls and emails to establish the first contact – and to set up the first meeting.

When you talk to a representative from the industry, you could start by telling about the study-program SWM and the value of the program – ethical and environmentally. Here we recommend, that you have a created a little brochure or another kind of hand-out material, that gives a short description of the project and the background for it.

The overall aim of this conversation is for you to get permission to present how you - as a representative from the university - can see the mutual benefit from this interdisciplinary corporation – and why you have chosen this specific industry for this program.

During this meeting where you present and describe how a “real-life-challenge” or Problem from the local industry” can be solved through this interdisciplinary project by students and professors from the university.

Important issues at the face-to-face meeting

Now it is very important, that you emphasize the mutual relevance – the industry gets a number of well-researched and documented academic solutions from the students after a limited period that is able to solve the local industry’s professional challenge.

It is important, during this phase, that the Problem or challenge is suitable and fits within the framework and curriculum of the study-programme.

The Problem could cover just one module or it could cover the whole programme. We will recommend, that you start out with challenges, that covers the content of the curriculum from just one module/semester.

The university benefits from this interdisciplinary project because the teaching and lecturing of the students is getting closer to “real life problems” and the students learn how to be able to use academic theory to solve real-life problems.

And it helps the University to constantly update the curriculum to the meet the challenges from local industry as a kind of ongoing assessment.

On the next page you will find an example of a letter for the industry partner.

Example of letter for industry

Target group: The industry partner

Dear mr/mrs xxxxx

I am professor xxxxxx from xxxxx University.

We are currently part of an Eu-project called EduEniv.

The main aim of the project is to modernize, improve the accessibility and to internationalize the higher education in Physical sciences and Environmental protection in Kazakhstan and Russia. This aim will be achieved by building the capacity of the local academic staff in participating partner country universities in sustainable waste management in the latest European pedagogical approaches.

As part of this programme, we would like to invite you to participate in this new and innovative way of teaching through an interdisciplinary project, where you present a “real-life-problem” within Sustainable Waste Management as a case for our students - an authentic problem that you are facing right now in your industry.

Our students from our new Master-program in Sustainable Waste Management from xx and xx department will, in teams of 3-4 students create suggestions or solutions to your problem in cooperation with employees from your organisation.

If this short presentation has got your attention I would like to present or method further at a meeting or on the phone.

I am looking forward to hearing from you again.

Sincerely

Project description

Roles and responsibilities when using the industry project in SWM as an innovation project for the students

The industry partner must be ready to get involved in student project work and help ensure that the project work entails the ambitions of the industry partner within Sustainable Waste Management.

The students are to be involved as professional resources in the project.

The professors acts as facilitators for the industry partner in terms of creating the right description for the current interdisciplinary project.

The “Project Description” is a description of the project which is ultimately meant for the students and is obligating for the cooperating industry partner.

On the next pages you will find is a project description from our BA-programme in Digital Concept Development at University College Lillebaelt in Odense, Denmark.

In this description the industry Problem is described first. Then you find the learning goals and curricular conditions, for the students to understand. Lastly the description contains project deadlines and format of the students’ hand-ins.

The project description must be approved by all those involved - University-colleagues - such as professors and researchers - industry partner and key account professor on the project. This is time consuming, so start preparing the project the semester before, it is supposed to be executed.

Project Description

Odense Citizen's House



BA in Digital Concept Development – 6. semester fall year 2018

In this project the industry partner is Municipality of Odense, who is looking to create a “Citizen’s House” where they offer a number of services as e.g. library

- The project’s purpose is to create a visual identity combined with a system of wayfinding for the building (including a new name).
- The services in the house should have a unified communication, but at the same time remain independent.
- Name? Logo? Identity? Wayfinding?
- Design & layout? Digital appearance? Service? ...?

Platform for assignment:

Project 1 is one of three assignments to deliver for the portfolio examination at the end of the semester. Evaluation of the Project 1 report will be part of the evaluation that will be submitted to censor before portfolio examination.

Requirements:

You deliver 1 report for modules Digital Design, Marketing and Communication and Project Management B in 6th semester: – deadline.

You should show your prototype of your solution for the project via a link or a photo/video documentation.

Content in general

- Problem definition describing what problem you are solving generally for your client
- Use relevant methods and theories, that you have been introduced to during the classes in this semester in both Digital Design, Communication & marketing and Project Management B – or describe relevant other methods and theories to argue for your choice of solution.
- Describe the result of your research.
- Describe your design process. What steps did you take
- Describe how you have implemented this – what deliverables would be necessary for finishing this product, and making it ready for implementation.
- Describe what insights your user test of your concept gave you. Describe the tests.
- Describe your project management method
- Give a budget for/an overview of the costs
- Finish off with a shared conclusion for all three modules. Remember that the suggestion described above should not be looked upon as a Table of Contents. So you can put the sections in whatever order you find relevant.
- Remember a shared list of literature.
- Remember footnotes with references to literature.

The report should be MAX 6 pages per first group member and 2 for each additional team member. This does not include images or appendixes.

Counseling

Counseling will take place during at designated hours for each teacher listed on our LMS.

Preparing the interdisciplinary collaboration in regards to industry problem

Definitions

Firstly, we would like to try to define the terms with which we will be describing the university's preparation for collaborating with industry.

We use the term "subject" for the different parts of an education. Thus, in the *B.Sch in Chemistry, Urban Ecology* might be a subject. We discussed using the term discipline, but this term often refers to different sections of a university department (e.g. chemistry or physics) and in this sense, different educations.

Within a subject we refer to the different parts of a semester's teaching of a subject as a "topic". Thus, a subject like *Urban Ecology* within the B.Sch. of Chemistry have a number of topics as e.g. "*Composition, properties and volume of solid waste*", "*Household and industrial waste*", "*Ecology of Urban Soil*" etc.

Teaching in a semester in Denmark typically has the extension of 4 month. We have two - September to December and February to May. Exams are held in June and January. A semester is equivalent to the student's workload of 30 ECTS (European Credit Transfer and Accumulation System). Different subjects have varying ECTS "value", but they together have to equal 30 ECTS in a semester. For example, 6th semester on the BA in Digital Concept Development has three subjects of 15, 10 and 5 ECTS, equalling 30 ECTS.

When we talk of a "semester flow" we are thinking of the totality of the different subjects a student is taught during e.g. their 6th semester.

Meeting learning goals

An important challenge when preparing for collaboration with industry is how to make sure the curriculum goals on knowledge, skills and competences are met, as described in the course curriculum and stipulated in governmental acts, while the students work with the industry project?

The goal of an industry/university collaboration is not to have the industry projects be just an "add-on" to the normal teaching. When you are using "Problem based Learning" you may want it to frame the totality of learning goals within knowledge, skills and competences, which students are supposed to fulfil in a specific semester.

It is our belief that an Industry/university collaboration project only becomes seriously relevant in relation to curricular learning goals if they "penetrate" all subjects and all classes in an education in total.

A pedagogical Framework

One solution, developed at University College Lillebaelt by Lise Agerbæk and Ellen Houmøller, is structuring the semester according to a structure we have named “A Pedagogical Framework”.

This entails that:

- Each teacher must understand and implement the industry challenge in relation to the topics of the subject (through e.g. lesson plans)
- A framework must exist, which provides interdisciplinary understanding of the points in which topics of each subjects may influence each other
- This specific framework supports interdisciplinary coordination, taking into account coherence and order of each subject, as well as professional progression.

There are several ways of adding an industry project to a semester-flow.

Either you can

1. have different projects for each subject.
2. work with the project as “breaks” between otherwise not directly related teaching
3. use the project as a frame around the subjects taught in a specific semester, so each taught subject relates all topics to the project.

We have developed the *pedagogical framework* to use for the third option. In this option all the different subjects taught in the same semester are integrating the industry project in each of classes taught.

Semester
3 months

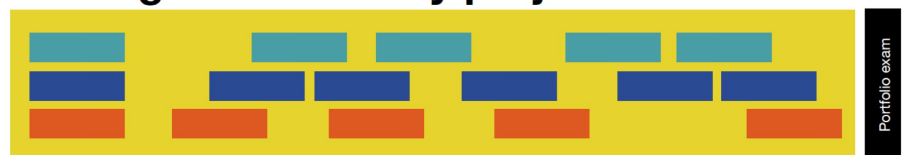
1. No interdisciplinary projects



2. Project “breaks”



3. Integrated industry projects at UCL



Option 3 - Assumptions of the Pedagogical Framework at UCL

The development of the framework is done based on some pedagogical assumptions:

Authentic² challenges

The students feel the project is meaningful and show ownership towards it, if the solution to the challenge, provided by industry, is not something that already exists. To put this in other words our assumption simply is that students learn better through problem based learning, if there is no set solution, no "answer book". This actually happens when we are treading the unknown ground in *innovation* challenges, where the industry partner is as unsure of the best result as the students in beforehand.

Interdisciplinary understanding

The students understand the interdisciplinary interplay of the subjects, if the industry project is involved in all academic subjects, where every topic is explained and trained in light of the project. Thus the understanding of different subjects will supplement each other through the work with the industry project.

Urgency (transfer³)

The students experience urgency of learning a skill or competence, the shorter the distance is between the learning period and the time they need to apply this to a real life situation. Even more crucial - there will be no transfer if there is too long time, between the learning and the point of application.

Practical conditions

There are also a number of preconditions in regards to working conditions, which we have experienced will further the project. The teachers in a particular semester should be organised as *a team*. This means that all teachers, a particular student or class meets during a particular semester should be collaborating as a team. This team should be self-governing, within boundaries described by management.

There should be time enough for planning the semester and for contacting the industry partner (1/2 year). It is helpful if the teacher-team share a room/digital space for collaboration.

In Denmark there is not a set national sequence of topics stipulated by re-

2 "In this context: the term "authentic" means that all transactions and implementations of learning situations are simultaneously connected to real development cases within the world of work and have a definite value in the value network", (Pirinen 2009)

3 "Transfer training in teaching is more effective than transfer training after teaching." (Frydendahl Holm 2009)

gional og national governmental institutionens. We are in other words “free” to teach subject in any order we find relevant, as long as all learning goals from Governmental Acts are met.

The opportunity for a face-to-face meeting of 2 days at the beginning of each semester is important for using the pedagogical framework. A certain maturity of the students is also a benefit, at least to start off with. So start with 4.-7. semester students.



The first iteration of the pedagogical framework

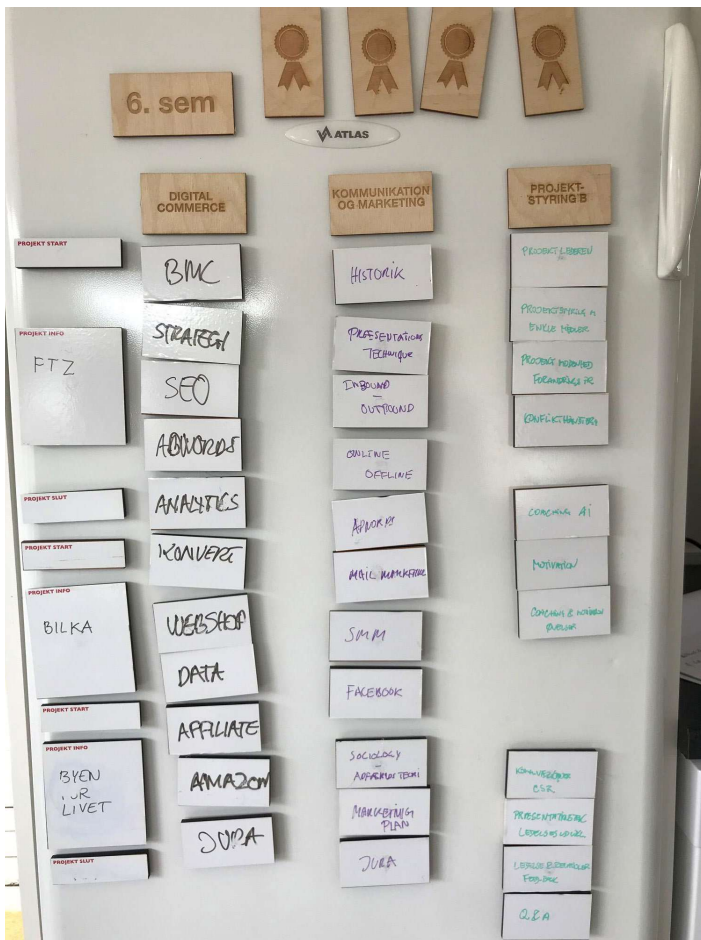
The team teaching the BA in Digital Concept Development at UCL have experimented with an analogue tool - a matrix based on post-its to achieve this.

As a start we created a weekbased Storyline on a large piece of paper – paperbased to get an overview of both the learning objectives for the students - and the projects the industry partner is involved in.

Secondly we have created tweet-sized summary of each topic related to the learning objective from the curriculum in order to create the overview and to make sure that they are met in all cases. The topics were written on post-its, so they could be moved around in relation to industry projects. Based on this short analysis and overview we create a Storyboard that structure week by week sequence of the learning objectives in all subjects taught.

The second iteration of the pedagogical framework

There are a lot of practical problem using posters and post-it. It is difficult getting an overview and the post-its fall off. So the second iteration was a



another analogue one - a number of blank refrigerator magnets, where the tweet sized topics of each subject can be written by hand.

On the recent teacher's workshop we actually used a refrigerator as a board to move the topics around in regards to the industry project.

On the left side in the list of "Refrigerator magnets" on the refrigerator you will find the names of the industry projects. The wooden magnets above the top columns have the name of each subject taught lasercut on it. Under these each topic (taught for 4 lectures at a time) is written down on each refrigerator magnet.

The sequence of topics in each subject can be moved around according to whether they seem more or less relevant in relation to the industry project. By the end of this workshop each teacher has a sequence of topics that may translate directly into a lesson plan.

We are currently working on a digitisation of the tool - maybe using Augmented Reality.

Semester
3 months

1. No interdisciplinary projects

Subject A - own projects

Exam

Subject B - own projects

Exam

Subject C - own projects

Exam

Option 1 - Industry projects in only one subject

However, it is not always possible to work in an interdisciplinary team. This does not mean, that you cannot work with an industry innovation challenge within just one subject.

Collaborating with an industry partner in only one subject is a viable option, if there is no tradition for interdisciplinary collaboration at the university. It is sometimes easier also, because it would leave the responsibility with the teacher who is then both contact with the industry partner and executor of project. It means less people to get involved and thus less preparation.

We recommend that you still use the division of the subject into topics that can be moved around in accordance with the curriculum goals, so the sequence benefits the solving of the challenge. For this purpose, we still find the "refrigerator magnets" practical – as they enhance reflections on what topics fit best with the project.

The role of the teacher is still that of being a facilitator for the students' process, but of course on an interpretation of the project that only relates to the one subject this teacher teaches (e.g. chemistry, biotechnology etc.). The teacher also has to do the work of the key-account-manager teacher including contact with the industry partner. Preparation still needs to be done about three to four months in advance of the project.

Execution of the project

The role of each teacher during the semester

The role of each teacher is to be the students' facilitator in relation to the project. Each teacher does this in relation to his or her own subject, whereas one of the teachers act as "key account manager" and handles the contact with the industry partner.

Across all subjects the students are separated into teams. In our experience at UCL a optimal team size is 3-4 people working together. Larger teams leave teams with some individual team members without enough work to do. Smaller teams make the workload too heavy on the individual team member.

Each team makes an attempt at solving the industry challenge. This means the industry partner will see more solutions to the problem. This enhances the industry partners chance of finding the best solution.

The industry project can sometimes be done as a "competition", so that in the end the industry declares a winner.

Contact with industry partner from key-account-manager-teacher

The teacher with the contact to the industry partner arranges and time and date for several meetings between the students and the industry partner. There are a minimum of two meetings, but more can be arranged if deemed necessary.

The key account manager-teacher should arrange at least 1 Brief, where the industry partner explains the challenge to the students and have time for questions. This usually takes app. 90 minutes.

If deemed necessary the industry partner could also be invited for a Pre-pitch in the middle of the project period, where the students can present their preliminary idea and get feedback for further development from the industry partner.

At the end of the project period the key account manager arranges a Pitch session, where the students in groups can present their solution to the challenge for the industry partner. This usually - depending on the number of groups - lasts 2-3 hours (10 groups, each pitching 15 minutes).

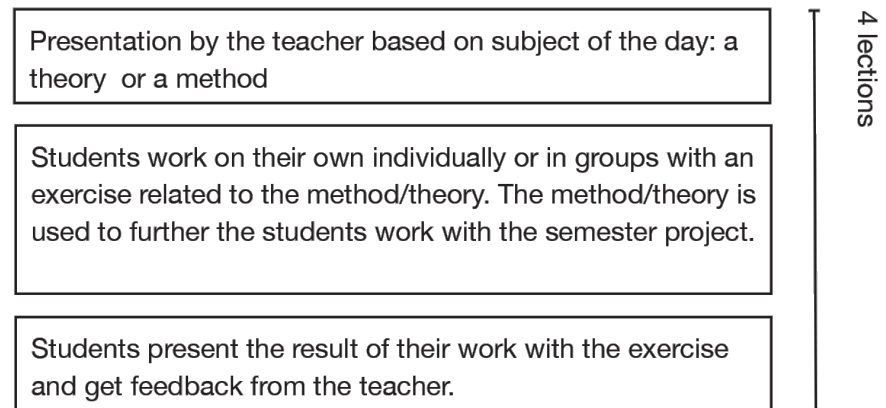
Teachers who are not key account managers

The teachers, who are not key account managers, facilitate the industry project in their regular classes by letting the students work with the project during class. This does not mean that you as a teacher have responsibility for

how the students use their time, but rather that you encourage them to work with the industry project by giving them relevant exercises.

Every subject is taught in classes of 4 lections of 45 min. Breaks can be held whenever the teacher see fit.

A model of 4 lections teaching often used by UCL is illustrated below:



So each theory/method introduced by each teacher is seen in the light of the industry project. And the students can use each class to reflect on and develop the project. This greatly enhances the possibility of transfer between learning and using according to Wahlgren (Wahlgren 2016).

Brief from the industry partner to the students



First industry project event: The Brief

As mentioned above the purpose of the Brief is to introduce the project for the students and allow for the students to meet the industry partner, and allow for a Q&A between the two. The brief can easily take place in a normal classroom. It shouldn't last too long, as the industry partner seldomly have the time to spare away from the business for a longer time. At UCL we normally use 1,5 hours.

At the brief the industry partner describes his/her company and what they work with, who their customers are and so forth. Then he og she repeats the challenge from the project description. Then the students have time to ask questions in regards to the project.

It is a good idea for the industry partner to bring handouts (brochures e.g.) about the company, if they have any.

It is important to obtain right for using the email of the contact of the industry partner, so the students can send questions if they have some after the brief or during the project. If possible some visits at the industry partner's could also be agreed during the brief.

Second (optional) event: Prepitch

It is optional if you want to have a prepitch session, but sometimes the benefit is that the industry partner is more prepared for what will happen at the final pitch. It also means that the students get to know if their ideas resemble what the industry partner is expecting. So the result is mutual knowledge of both parties' expectations.

The prepitch is an opportunity for each team of students to present their preliminary idea for a solution of the industry challenge and to hear the response from the industry. We normally give each team app. 10 minutes - 5 for presentation and 5 for feedback from the industry partner. This is normally a quite informal meeting.

Third event: The Final Pitch

The Final Pitch is where the students present their finished projects for the industry partner. At UCL this is typically done as a presentation using powerpoint or the like. Each team of students have 7-10 minutes, and then the industry partner has 5-7 minutes for questions and feedback.

We supply the industry partner with a small manual for giving feedback. See example of the following page.

Final pitch



Evaluation criteria for university/ industry projects

Bachelor in Digital Concept development at UCL - University of Applied Science

First and foremost, thank you, because you will help us and the students with a challenge that you want a solution to.

Guide to giving the students feedback

- Does the solution solve - or not - the described challenge? Explain and justify.
- What works well within the solution? What does not work well with the solution? Explain and justify.
- What makes/doesn't make the solution implementable in your company.
- What could the group do to make the solution even better from your perspective? Explain and justify.
- What is particularly significant with this solution? Explain and justify.

Grading scale

We ask you to judge student projects based on the following scale:

1. BASIC LEVEL
Does the solution meet the required task?
2. PROFESSIONAL LEVEL
Is the solution implementable in your company? Does the solution have a professional level?
3. INNOVATIVE LEVEL
Did the solution deliver something, you had not imagined yourself before.

Based on this scale, we may ask you to appoint a winner of the challenge.

At the end of the Pitch session the industry partner can be asked to appoint a winner, if the project is of a competitive kind. This is not mandatory, but sometimes enhances the motivation of the students.

Gathering the results of the project for the industry partner

In general we tell the industry partner that the students have the copyright of their own work. If the industry partner wants to continue working with the individual projects - or just some of them - an agreement should be made with the students individually.

The key-account-manager teacher usually gather the students reports and powerpoint and sends them to the company, so they might remember each project.

Evaluation of the project

Once the project is finished a meeting with the industry partner is arranged. In this meeting the client and the teachers can reflect on the project flow, process and results. Also you can use this meeting to set-up new projects for the coming semesters.

This is an opportunity for the teachers to create follow-up research, which in several cases is done via sending in papers to educational international conferences. Thus the participating teachers enhance the lists of publications and the University benefits from the proliferation of the experiences with this type of university/industry project (Houmøller & Marchetti 2015, Agerbaek 2014).



Elisabeth Agerbæk and Ellen Houmøller presenting at the OEB conference in Berlin, December 2017

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