

Summary report of the development meeting of the Master Smart Systems Engineering

November 2020

During the visitation in February 2019, the term high-level engineer was developed to characterize the graduates of the Master Smart Systems Engineering. During the development meeting, the profile of the high-level engineer was explored.

The second subject of the development meeting was the exploration of the question how the research cycle and the engineering cycle should meet in the thesis phase of the master, especially in relation to the high-level engineer.

During the meeting both questions were explored leading to preliminary definitions and some actions for the lecturers' team.

Exploration on the high-level engineer

During the thesis phase students show that they are ready for their future role: the high-level engineer in Smart Systems Engineering.

A high-level engineer is always innovative. Innovation can be something new or it can be something old in a new context. S/he needs to find out what others have done before, to make sure the innovation is really new. 'High-level' is about knowledge and thinking, 'engineer' is about tools. The innovative aspect is in the systems approach. It is also about reducing complexity, for instance dealing with a tight time schedule.

Critical thinking is part of the profile. It is about validation and more about asking the questions rather than giving the information: teaching healthy skepticism.

The high-level engineer has to deliver a proper analysis of an engineering problem within the context of a given system. In the problem definition phase, the student has to choose which potential innovative approach S/he needs for the innovative design.

The high-level engineer has to reflect and motivate the choices made. Also, self-direction is important to show the master level.

Exploration on the interrelation of the research cycle and the engineering cycle

A research question has to derive from a proper analysis of a certain context. In answering the research question, students have to go through the engineering cycle. There always has to be a bandwidth between research assignments and engineering assignments, it must be a mix of high-level thinking and high-level engineering.

Each assignment knows its limitations (duration, maximum amount of complexity, comprehensiveness of the assignment) and not all aspects of the master programme can be present in the final assignment. There is always focus on some parts.

The assignment has to be representative for the total programme and thus some aspects of the engineering cycle should be present.

When the students get a broad problem, it puts the student into the first phase of the research cycle. And that is probably what we want. At the start of the thesis, the student has to make choices on limitations in resources, time, etc. and has to manage the educational supervisor and company

supervisor and deal with the two objectives (products vs. process). Results should satisfy both demands.

At master level it needs to be proven that the innovation is not just a solution for a company, but to show that it is innovative. There can be a conflict of interest between school and company.

The Dublin Descriptors are very clear on what a student has to show to prove master level. Each descriptor has a rationale. More focus on research is something we decided to put in the profile.

Self-directed activities are important in master programmes. The five Dublin Descriptors could help in mapping the results in conclusion on someone's strength on certain elements. The relationship between company context and research question is master level.

The Dublin Descriptors could be taken as the ultimate source of wisdom. They show that it is not only about science. Because they are on a high level of abstraction, they give a lot of flexibility. The Dublin Descriptors tell something about the mental capacity of a person. To make it specific for the field, we need the program learning outcomes. To judge the quality of the result we could use the Dublin Descriptors.

A student should always have an answer to the question: 'Explain me why your solution is the best solution'. The student should show a broadened scope and a higher level of knowledge (more knowledge on sensors, data management, the content).

There is the need to consider what is graded: the product (solution, design) or/and the process, or/and the methodological steps or/and the reflection on the product, process and methodological steps?

The assessment committee advises more focus on the process of critical thinking and the innovative approach, based on the thesis reports they assessed during the visitation.