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Documentation of pilots

Product Development, UCN

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Introduction

This document contain the documentation of Product Development for the PTIA0920 class at UCN. The document contains a description of the settings and the motivation of the case, as well as an overview of the key performance indicators (KPIs) for the pilot. The execution and documentation of pilots are part of larger process, named Educational Framework, aimed at transforming educational programmes for future Industry 4.0 capabilities. The case/pilot is chosen based on two initial analysis, respectively focused at industry and the institution. For further information regarding the overall process, please see the document 'Educational Framework'.

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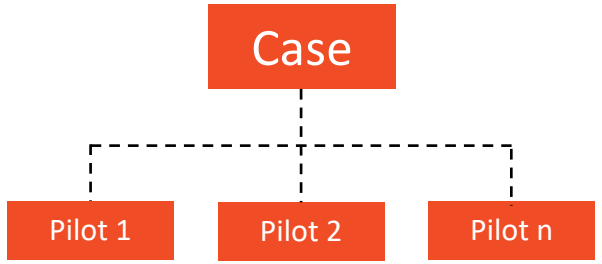

Fig. 1. The figure shows the relationship between the two terms: *case* and *pilot*.

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Description of the pilot

This pilot at UCN is a course at the educational programme “Product Development and Technical Integration”. Students from manufacturing, IT and automation (EQF level 5) can enrol into the education. The education is at EQF level 6, with a total extent of 90 ECTS. This pilot is a 5 ECTS course, during the first semester (3 semesters in total).

In this pilot, our aim is to increase the knowledge of the students on the topic of product development, namely on the front end of product development, including problem understanding. Each lecture consists of an introduction to the theory, and a research paper, introduced by the lecturer. The students give inputs and bring a) examples from their profession and b) literature to share with the class.

The success criterion of the pilot is to enhance the interdisciplinary product development knowledge for the students and at the same time, increase the domain-specific knowledge of front-end product development of the students. The competencies among students should be expanded, with topics that they were not familiar with beforehand, while also bridging the knowledge to their specific domains (manufacturing, IT and automation).

To achieve these two success criteria, the awareness of learning competencies among the students must be enhanced. By a higher consciousness, the students will be able to pinpoint their own learning needs, and thereby increase their ability to bridge knowledge gaps with related fields.

This goal corresponds with the industrial analysis, which pointed towards interdisciplinary knowledge as a necessity, where interdisciplinary is the enabler of implementing integrated systems rather than isolated stand-alone solutions. Furthermore, the goal is to give the students a more holistic understanding of product development, empahssising a digital and business mindset into their project.

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Description of the pilot

The course, Product Development, is based on the following learning goals from the curriculum:

Knowledge

The student has:

researchbased knowledge of the practical and theoretical methodological structure in project work.

an understanding of practice, applied theory and method for product development processes in all its phases - including the financial consequence of the project both during manufacture / construction and operation, and can reflect on how they are used in a business context.

Skills

The student can:

use methods and tools for identification and collection of company data base and on that basis contribute to the development and optimization of processes across the organization.

master the planning of the development work, testing of the product / solution (proof of concept) and identify the quality of a technological project work in terms of results, validity, reliability and relevance.

assess practical and theoretical issues in the meaning and application of concepts in context of developments in technical language and technology as well as justify and select relevant concepts

convey practical and professional problems as well as solution models to peers, users and partners from a business context, including environment and sustainability considerations in product development.

Competences

The student can:

Handle both business and technologically appropriate product development and build a project design for a technological project work based on selection, analysis and delimitation of an issue.

Independently enter a professional and interdisciplinary collaboration across the organization and current professional boundaries, with a view to implementing product development, and assuming responsibility within for the framework of a professional ethic.

identify own learning needs and develop own knowledge, skills and competencies in relation to product development

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KPIs and how they are measured

Based on the aim of pilot three focus areas are identified and operationalized, thorough KPIs. The three focus areas are: 1) The student's ability to identify new learning needs related to product development, 2) the student's ability to integrate a digital and business mindset into their project, and 3) the student's readiness for future jobs.

Identified KPIs and methods for measuring

1. The student's ability to identify new learning needs related to product development.

After the course, the students are asked to identify their own learning needs in writing. The students own identified learning needs are afterwards compared to the results of a multiple-choice test held at the end of the course.

1. The student's ability to integrate a digital and business mindset into their projects.

During an evaluation/examination after the course, the student's ability to integrate a digital and business mindset into the product development process is evaluated by the examiners.

1. The student's readiness for future jobs.

At a mandatory institutional evaluation after the semester, the students are asked to evaluate their own readiness for future jobs.

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Implementation of the Educational Framework

Educational activity sketch

The course will consist of 5 lectures, with a week in between. Each lecture will rely on a flipped-classroom approach, where the students will have to gain knowledge themselves before the lecture, and the lecture will be targeting discussion, reflection and supervision.

In the first lecture, the lecturer introduces the program, including the task. Furthermore, the self-study for all lectures will be presented, consisting of reading materials, videos and audio material.

In the remaining lectures, the students are expected to have prepared for lecture, and the task of the day will be presented. This task will show a detail of the product development process, and part of the assignment is to develop a product concept.

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Implementation of the Educational Framework

Relation to Authentic Task Design

The educational framework is implemented through a case with an ill-defined problem, which the students must produce a solution to during their semester project. The course takes place over one 7 weeks, which lets the students investigate the problem field form several different perspectives and describe and implement relevant course material into their semester projects.

Groups formed by the students solve the task, concerning both personalities (tested by the Insights profile tool) and qualifying EQF 5 education. The case topic is product development (a wheelchair), which iall can relate too, personally.

The output will be a concept presentation of a product, which is a finished product on its own. It will be evaluated continuously within each lecture, and reflection upon integration within work-life routines are required. The students will assess each other during the project, allowing for competing products.

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Implementation of the Educational Framework

Elements

The learning process is iterative, as the students will get an overview in the first lecture, and the knowledge will be expanded in each lecture in the same topics.

Blended learning and flipped classroom – the students will receive learning content online for completion out of class. This gives room for more reflective feedback.

Supervision and feedback – The reflection will be facilitated through feedback, both in class, but also in an extended, online session with written or audio feedback available in extended timeslots.

The students will meet the context either physically, or in the flipped classroom environment.

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Results and Evaluation

[A description of the results (KPIs) and an overall evaluation of the pilot. This is filled in after the pilot is executed]

The pilot was conducted according to the plan. The only change, due to the COVID-19 lockdown of our institution, was an online flipped classroom setting. The students reported positively towards both the content and the organisation of the course based on the feedback received through the lecturing. Even though they found the cross-disciplinary work and the open-ended assignment difficult to handle, they recognized the protentional of learning. The mixed technical educational backgrounds of the students allowed the students to gain a preliminary insights into related fields, also strengthening their understanding of their own discipline.

On that basis, the students reported several learning-needs within both the content of the course (product development) and the interfaces between their own and related disciplines. This includes learning needs within both the human, business and technical perspective.

More than half of the students reported that they had strengthened their disciplinary and interdisciplinary skills to some or high extent. Furthermore, they also report to understand the intersections between the technical, user and business perspectives of the product development to some or a high extend.

In total, the students have expressed a high learning output of the course.

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