

Community Service Engineering

From postgraduate course to undergraduate curricula and network learning

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INTRODUCTION

This paper presents the development of an international, multi-campus, multidisciplinary curriculum for engineers. Focus is placed on the societal role of engineering and the potential added value of technology for organisations in the

social profit sector and for vulnerable groups in society that are the target public of these social profit organisations.

1 THE DEVELOPMENT OF THE CURRICULUM

1.1 The Cera Award[1]

For more than ten years, Cera, a Belgian social cooperative, has been supporting Corporate Social Responsibility projects by encouraging and offering incentives to students to take on challenges of various kinds in society and come up with engineering solutions in fulfilment of their academic requirements.

From undertaking the projects in the Cera Award two notable results have been observed: (1) the social profit sector (care centres for the elderly, organisations that support people with disabilities and at-risk populations; youth organisations, community services, social welfare organisations, etc.) has clearly benefited from the innovative skills of engineers; (2) engineers have been much more successful in this area when they understood more clearly the needs and challenges of the people their engineering projects serve. These findings formed the impetus to shape the curriculum for Community Service Engineering (CSE).

1.2 Mission and vision

The curriculum will give engineers insight into target groups and organisations in the social profit sector and build bridges between the worlds of technology, the social profit and the profit sector. The course entails course contents and 'real life' projects. The training will enable engineers to develop solutions, applications and tools that truly meet the needs of end-users and organisations in the social profit sector. Co-creation is a key word. At the same time engineers will acquire insight to facilitate the implementation and sustainability of the developed technology and acquire the ability to identify innovation opportunities within the sector. Moreover, the course helps to detect the potential of existing technology within the social profit sector.

Community Service Engineers will ensure that technology is developed, implemented and used to address societal challenges, in close interaction with the target group. They will also make sure that the market potential of this technology is discovered and/or optimised.

Graduated Community Service Engineers can play a role in the social profit sector itself, companies in assistive technology and standard companies (product and market development for the social profit sector).

Community Service Engineers will be widely employable in the labour market because they have been trained at the crossroads of different disciplines and have interacted with a variety of audiences and organisations.

1.3 Uniqueness of the initial partnership and each partners' strengths

Financial support for the development of the programme was sought and found at the American [Fetzer Insitute](#). Fetzer supports worldwide projects that contribute to an inclusive society, engaging with people around the world to foster awareness of the power of love and forgiveness in our global community.

The curriculum will be started up and tested in the academic year 2013-2014.

The initial partnership consists of Thomas More, KU Leuven, RVO-Society, Cera and Olin College. From the start, this partnership was expanded with partners in the field through a steering group.

The project that gives shape to the curriculum is coordinated by Thomas More's group of Biomedical, Behavioural and Social Sciences. The domain of social work is the closest involved. It operates from Gheel, a city that has a history of inclusion[2]. The domain was recently declared best social work training in Flanders, because of its closeness to the work field and its good internationalisation practices. The domain offers its network and expertise and involves its social work students in the shaping of the Cera Award projects. Thomas More's domain of social work is experienced in developing a virtual campus[3]. This expertise was important to set up the blended learning environment.

KU Leuven is the Flemish offshoot of the oldest university in the Lower Countries which was originally founded in 1425. KU Leuven holds all engineering degrees whose students can apply for the new curriculum, i.e.: Masters of Engineering Technology, Masters of Engineering Science, Masters of Engineering Science: Architects, BioScience Engineers and Business Engineers. KU Leuven, together with Thomas More is responsible for the academic level of the educational programme. KU Leuven as a partner clearly brings in knowledge of great value in regard to technological topics, technological guidance of students and topics related to humanities. The Academic Development and Support Unit within the Teaching and Learning Department has an important role to support in an integrated and interdisciplinary way the curriculum, with a focus on pedagogical, media, technological and organisational aspects.

RVO-Society is the partner which is experienced in organising the Cera Award. Project proposals will start from this partner. RVO-Society has an important role in the good guidance of projects, the cross fertilization between projects, tapping the market potential of project results, ...

Cera is the organisation in which the philosophy of communal cooperation is incorporated. They still financially support the organisation of the Cera Award today.

Franklin W. Olin College of Engineering in the US has a significant amount of knowledge, experience and know-how in the field of promoting "creative enterprises for the good of the world" by prioritising "human and societal needs". 46% of female students are enrolled in their curriculum. Partners pair up with Olin College in order to deepen the curricular dimensions of the programme. Olin College is considered "a consultant" for the development and first year's evaluation of this new curriculum.

1.4 The curriculum in practice

The tuning methodology[4] was used to shape the curriculum.

The virtual learning environment is the central meeting point within the curriculum. Learning activities will be organised across physical and virtual spaces. All activities will be announced on the virtual learning platform. A symbol will indicate whether an activity is face-to-face or virtual.

Face-to-face meetings are important for kick off and team building. Experts in the course contents part will mostly give face-to-face lectures. Field visits and testimonials represent physical learning activities as well.

Group interaction (including contacts with students from other disciplines and countries) and individual assignments and feedback are organised mainly virtually. The group composition will vary per topic to maximise contacts between students and to maximise the learning potential from one another. Students working in a group can make their own arrangements per week to learn about each other's project's

proceedings. Students can work at a time, place and pace that is convenient for them.

Course contents and project work have an equal share in the curriculum. Projects are present throughout the curriculum, and occupy an increasing proportion of student effort.

For the course contents “social work modules” and “technology” have an equal share. For the project work both technological and social guidance is offered to the students.

As an assignment next to executing the projects, students are asked to gradually tell and visualise the story (narrative) of their projects. This serves as a basis for interaction during the course contents part.

We can formulate this in a different way: the technical project result is important as well as the process that students go through. This process will be “lived” by the student step by step. An assignment for each course content will be to describe the part of the projects that is related to that specific course content (e.g. getting to know the context, co-creating technology, technical criteria, user criteria, implications to other fields,...). This is what we will further on call “assignments in bits and pieces”. The result of the sum of all these assignments will contribute to the narrative of the project work as a whole. There will be two narratives per student as students will be working on two projects throughout the course (a specific case and a ‘real life’ project).

The structure is visualised in figure 1 below:

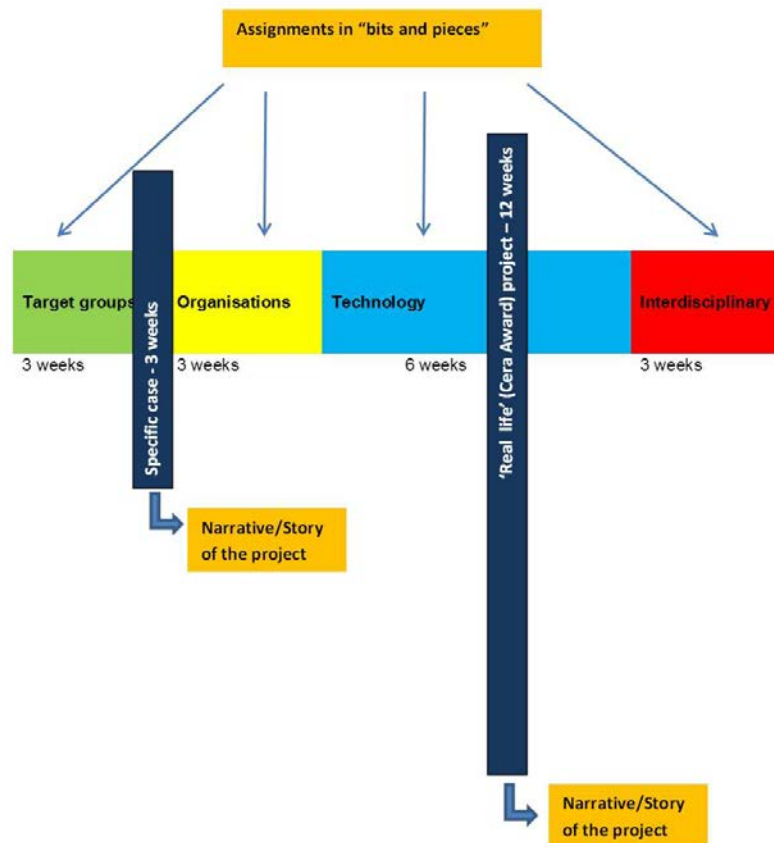


Fig. 1 Overview of the curriculum and the assignments

1.5 Learning by developing and network learning

The projects serve as input for the learning by developing[5][6] teaching model partners intend to take as a basis. *Fig. 2.* shows the model.

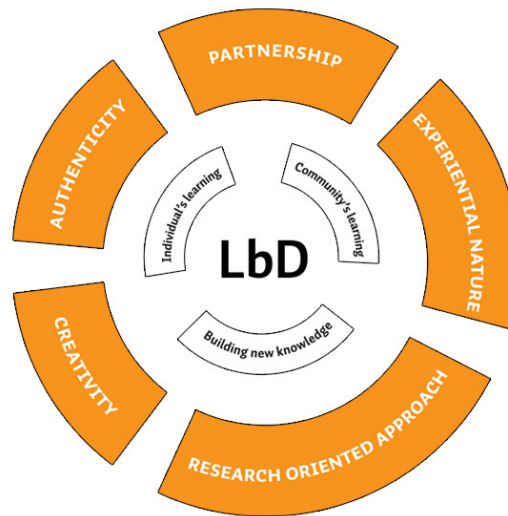


Fig. 2. Pedagogical Learning by Developing model
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This model is closely linked to connectivism as a theory of learning. It is expected that different students will undertake different activities and that new learnings will emerge through interactions of students engaged in those activities. The role of the teachers in the model is to connect people and organisations and to provide incentives for interaction in order to enhance the learning outcomes of students on the one hand and to strive for project results ready for market uptake on the other hand.

Since we start off as a postgraduate course, we can expect our initial target public will be professionals that are already independent learners (versus undergraduate students who still need a lot of “nurturing”).[7] Mature learners are the perfect profile for network or connectivist learning.

2 COMMUNITY SERVICE ENGINEERING: A DOMAIN

2.1 Stakeholders

We make a distinction between three types of stakeholders.

The first type of stakeholders are directly involved in the curriculum. These are potential students for the curriculum:

- Master degree engineers
- Both male and female students that can find interest in the profile of a “CSE”
- Engineers looking for a career shift
- Engineers already working in the social profit sector looking for further training/insight
- Engineers at the end of their career, interested in community service work

Furthermore HEI management, teachers, researchers of the fields of engineering and humanities are directly involved as well as staff of HEI responsible for media, technological, pedagogical and organisational aspects.

The second type of stakeholders represent social profit organisations, vulnerable groups (the elderly, youth at risk, people with disabilities, ethnic minorities, people in poverty,...), companies in assistive technologies and companies unconscious of the social profit market potential of their products or services. According to the latter, partners believe and several cases have demonstrated that businesses often are not aware of the way to enter the social profit market and of the potential their products have within the social profit sector. These stakeholders will directly benefit from the outcomes of the students' projects. Vulnerable groups will be empowered by the projects' results. Social profit organisations, companies in assistive technologies and other companies can engage engineers with the CSE profile and benefit from their skills. Companies could also use the outcomes of the students' projects to build further upon and develop the market potential.

Thirdly we name the stakeholders who all have a certain interest in the outcomes of the curriculum: engineering associations, the employment sector (public and profit), umbrella organisations for the profit and social profit sector, regional development organisations, health services, funding programmes, bigger companies sensitive for Corporate Social Responsibility and organisations promoting technology.

2.2 Unleashing the domains potential

Enhancing the attractiveness of the engineering profession

Technology, entrepreneurship and the social profit sector are not an obvious combination. A recent UNESCO report[8] affirms the role of engineering as the driver of innovation and of social and economic development, but emphasises the need to transform engineering education, curricula and teaching methods to emphasise relevance and a problem-solving approach to various fields of engineering. The community service engineer could take up this role.

Engineers have, so far, not been very active in the social profit sector. There is a clear need for technology within the sector given the significant number of project proposals submitted by social profit organisations at Cera Award. The sector itself is mostly lacking expertise and time to address these projects with own resources.

The attractiveness of the engineering profession has been declining in Europe over the last decades. Many actors have been searching how to change this trend.[9][10][11][12]

It is generally known that female students are underrepresented in engineering studies.[13][14] This also is partly related to the public image around the profession of engineers and is linked to a recruitment problem.[15][16]

Related research questions – focus on inclusion

While elaborating the curriculum a lot of questions arise. These questions can be formulated into research questions. Community Service Engineering could evolve on term to a real specialty, a full discipline.

An enumeration of possible research questions:

- How can technology eliminate barriers and improve inclusion?
- What is the potential for inclusion of technology per target group of the social profit sector: the elderly, people in poverty, people with mental and/or physical disabilities, ...

- What is the market potential of the developed technology?
- Is there existing technology that would be of added value within the social profit sector?
- How does an engineer design for and interact with vulnerable target groups?
- ...

The postgraduate curriculum serves as a means to shape the curriculum. Partners will aim at a translation into undergraduate engineering curricula (e.g. via electives for regular students) on the longer run.

Elaborating on projects, rationale for an international curriculum

Students will be undertaking new projects in the Cera Award year after year. Two frames for project work have been drawn up in order to prevent fragmentation and to allow for projects to reinforce one another. At the same time these frames visualise the domain and set criteria for the approval of project proposals. One frame visualises the field of technology directly for the benefit of vulnerable target groups. The second frame visualises the field of technology strengthening the social profit organisations themselves.

With regard to projects partners can build upon the experience of RVO-Society and the Cera Award.

It's a given fact that project results often promise market potential in niche markets. The Belgian market in that case is too small for a sustainable business model. That's why partners look for international cooperation with other Higher Education Institutions who share the curriculum's mission and vision and who are open to student exchange and collaboration on projects.

Because of the context of the social profit sector "regular" business models are not always adequate for the sustainability of project results. Good practices of cooperatives exist and will also be taken into account as alternative for the market uptake of technology. RVO-Society as a partner has experience in setting up cooperative organisations. We will often enter the field of social entrepreneurship where finding a balance between social and profit motives is crucial[17]. Gradually international partners can join the organising consortium and help create a true international dimension.

3 SUMMARY AND ACKNOWLEDGMENTS

Community Service Engineering is a promising domain for the future. It will reveal potential and contribute to the development of technology to deal with societal challenges. Acknowledgements go to the American Fetzer Institute[18] who is funding the development of the curriculum and to Joos Vandewalle full professor of the Faculty of Engineering Science (KU Leuven) who is a member of the Fetzer Advisory Council.

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