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An innovative approach to teaching sustainable design and management

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Abstract

For many years the market leadership was driven by offering better price on more product functions and services. The world is currently shifting towards social responsibility thinking. This changes the market behaviour, and leads to more innovations, such as designing new product/service/system using re-usable parts, new electric motor concepts, or inventing new chemical production procedures generating less waste, and many more opportunities.

This paper introduces a research valorisation activity that aims at developing a program of training and coaching to prepare students and industry partners to this emerging innovation wave. The most outstanding particularity of this program is that it combines management and engineering aspects of sustainability in a form that empowers trainees to deploy sustainable approaches in practice. The particular target group of design engineers get equipped with fundamentally important sustainability knowledge enabling them to include sustainability considerations in their products and systems design. Eco-design is positioned as a key lever towards achieving sustainable product-service systems.

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1. Introduction

Sustainability has become a global megatrend under the pressure of the climate change, and increasingly stringent resource scarcity. Organisations should better act in a sustainable manner in order to preserve the environment, and, to be socially responsible, while still preserving their economic orientation.

In recent years, important global issues around energy security, unstable fuel prices, greenhouse gas emissions, as well as sustainable procurement, ethical trade, and corporate social responsibility (CSR), have led organisations increase their commitment to moving towards more sustainable products, services, processes, and associated business models. The most popular improvement vectors are in the area of carbon footprint and energy efficiency. The United Nations' Division for Sustainable Development confirms these tendencies in the report [1] by registering a steep increase in the number of companies certified to fulfil the environmental

management and social responsibility standards ISO 14001 [2], and ISO 26000 [3] respectively. They also indicate an increase in the number of consumers feeling concerned by social and ecological issues. Revenue figures from fair-trade products have grown to 2.9 billion euros per year despite the recent economic troubles. The same report reveals that governments are also following the sustainability trend by highlighting sustainable procurement policies, both in developed and in developing countries.

The research valorisation work presented in this paper aims at contributing to filling an emerging gap in current education, and in professional training programs. This gap is located in teaching actionable key knowledge in the area of the sustainable design of organisations, products, services, and products. This teaching material is designed in a way that it can actually be applied successfully in both engineering and management activities in order to make them more sustainable. This paper presents the research objectives and approach that are underlying this training program design

activity in section 2. Section 3 gives an overview of the trainings' main elements, while section 4 explains the training approach that has been chosen for their implementation. As a conclusion to this paper section 5 presents the upcoming activities to furthermore develop this training program.

2. Research Objectives and Approach

The larger context of the presented research valorisation activity is a collaborative work of a European project consortium including the following organisations:

- Denkstatt, Romania (coordinator);
- Bicero, Slovenia;
- EMIRAcle, Belgium and France;
- Grenoble INP, France;
- ISCN GmbH, Austria;
- Polytechnic University of Timisoara, Romania.

The main partners' goal is to develop and provide a training program, which combines both the management and engineering aspects of integrating sustainability in organisations, and in their products, services, and processes. It shall also deal with the assessment of an organisations' sustainability performance and provide a practical approach to setting up relevant programs, objectives, and targets in a strategic sustainable manner. Furthermore, the program shall be certified by the influential European Certification and Qualification Association ECQA. This certification provides numerous added values to the training:

- training architecture and modular ISO 17025 [4] compliant certification according to the European Qualification Framework EQF [5];
- assurance of a high quality level of the training materials and certification procedures;
- clear certification procedures for trainers and trainees;
- learning and exam portals provided and driven by the ECQA;
- sustainable and continuous development managed by a Job Role Committee composed of representatives from academia, and from industry;
- international promotion of the program.

The higher objective of this collaboration is to establish a new certifiable skill set around sustainability engineering and management on the European level. The training program therefore aims at addressing a wide range of target groups, as achieving sustainability requires the collaboration, and the interaction of several different stakeholder groups.

Responsible Managers and Directors of industrial, academic, and governmental organisations will be empowered to develop business strategies leveraging sustainability. They will learn how to successfully deploy them for a better sustainability performance, and for an improved corporate image.

Designers and Managers of products, services, and/or processes will learn essential multi-dimensional sustainability principles, as well as how to take these principles into account in their daily creative work. They will understand that sustainability should be integrated consistently into products,

services, and processes by designing from the very earliest phases onwards. Therefore, the designers and managers have significant roles in achieving their organisations' sustainability performance objectives. The training teaches them practical methods and tools to support them in fulfilling these roles.

Master and PhD Students as future young employees in industry and academia should be able to assume key roles in fostering and implementing a sustainability mindset in an organisation. They are increasingly expected to understand sustainability methods and tools, as well as being able to apply those methods and tools in real-life industry and research projects. The training program is therefore designed to be complementary to their studies. It addresses both managerial and practical sustainability topics in a concise and applicable form. This will give them a broad – yet practical – basis to build upon when assuming their future professional positions.

The training development process goes through the following main stages:

- need-analysis for the training in all the participating partner countries;
- development of an EQF-compliant skill card largely based on the results of the needs-analyses;
- development of e-learning enabled training materials in English language for all the skill elements of the skill card;
- several pilot training loops all over Europe, and subsequent improvement of both the skill card, and the training materials;
- translation of the training materials in all the languages represented in the consortium;
- deployment of the training in the e-learning environment of the ECQA;
- development and deployment of a pool of test questions and competence recognition criteria for certification;
- foundation of an expert committee ensuring the continuous improvement of all project outcomes, as well as supporting the decisions about the certification of prior competencies, and the contracting of education and training organisations.

The whole process will last two years. It has been halfway run through at the time of writing this paper. The results of the need-analysis have been published in [6]. This paper focusses on the identified key subjects that are currently being elaborated in the form of e-learning enabled training materials.

3. Training Program Design

This section explains the main subjects covered in the training program resulting from our research so far.

3.1. Understanding sustainability leadership

To begin with, the program devotes several training elements to shape an understanding of sustainability in the context of different types of organisations, standards, and regulations that have been developed around it.

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