

# Chapter 11

## Online Computer Engineering: Combining Blended E-Learning in Engineering with Lifelong Learning

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### ABSTRACT

*In today's complex and competitive world of technological innovation, determining the accuracy, financial viability, and utility of new discoveries increasingly depends on a well-educated engineering workforce, but at the same time, European industry worries about engineering skill shortages. In order to develop a well-trained cadre of engineers who meet industry requirements in the field of Computer Engineering, the Online Computer Engineering (VHN-TIO) project fosters national cooperation at the university level. This project offers a unique, forward-looking way to focus on the qualifications needed by engineers in terms of up skilling, i.e., increasing required engineering skills, usually through training and multiple skilling across many fields.*

### INTRODUCTION

The European Union is one of the world's major powerhouses of technological development and innovation, but the complex nature of today's innovative industrial products requires the engineering workforce to have world-class skills.

Therefore, a Europe-wide catalytic activity in engineering education is a significant concern in order to avoid skill shortages and preserve regional competencies. This requires fine-tuning engineering education by creating cooperative clusters of excellence to meet educational needs. The Project Online Computer Engineering (VHN-TIO, in German called "Virtuelle Hochschullandschaft Norddeutschland–Technische Informatik On-

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line”) (WL-7, 2011) fosters national cooperation to create clusters of excellence at the university level. This requires analyzing the demand for skills, which has to take into account the recent evolutions and trends in computer engineering and European educational system reform. European educational system reform, the so-called “Bologna process,” will eventually result in unified standards for higher education throughout Europe. (WL-8, 2011) Planning the new online computer engineering study program within the Bologna framework requires the use of e-learning which will allow the program to be independent from time and location and part of Lifelong Learning (LLL). LLL, in this context, refers to formal and informal learning options throughout a lifetime, which foster continuous development and improvement of the knowledge, skills, and competencies needed to retain/obtain employment. It will share mixed connotations with other educational concepts that relate to learning beyond the traditional educational system at the high school and university level. Thus VHN-TIO, as a body of knowledge, will be able to contribute to an analysis of how to achieve an adequate, well-trained workforce to counter skills shortages (Kerres & Lahne, 2009).

The continuous development and improvement of knowledge, skills, and competence can, therefore, be seen as a pragmatic agreement of sectoral frameworks or systems that take specific traditions and needs into account. Hence, the expected learning outcomes help to construct descriptors clearly and to classify the levels of qualifications in LLL more easily, such as:

- Upgrading job skills
- Learning about a subject to extend knowledge
- Developing self-confidence
- Developing personal skills
- Participating in social networking

But LLL requires educational institutions to adjustment the curricula and the administration

to apply new structures in advanced education and training courses and/or continuing education (Meyer-Guckel, et al., 2008). Often the detailed requirements and their role in the learning process are not specified, and the administration of the educational institutions is often still too inflexible for reorganization in the context of the LLL paradigm. Hence, an appropriate embedded e-learning framework as part of LLL can be helpful in making LLL independent of time and location. This also allows educational institutions to avoid access barriers and to account for the needs of different target groups.

In today’s e-learning research, it is common knowledge that the success of e-learning-based programs can best be realized as a part of “Blended Learning” (BL). In short, blended learning is an approach that combines the best of both worlds: online and presence learning (Hoic-Bozic, Mornar & Boticki, 2009). VHN-TIO goes a step further by combining BL in engineering with LLL. Therefore, a specific learning environment should be developed and transferred into a new framework to allow learning independent of time and location. The concept and development is described in detail in this chapter. In the next section, we present background information on these topics. Based on a literature review, we define important terms and determine the state of the art in online learning. Thereafter, our approach, combining BL in engineering education with the LLL paradigm, is introduced. For this reason, the development of the curriculum by analyzing the needed skills and requirements at the university level is described. The pedagogical and didactical concepts chosen to work with the BL approach in the VHN-TIO study program are presented. The technical development of the VHN-TIO framework is discussed in the section, “Implementing the e-learning system.” This section focuses on the software strategy and optional standards, e.g., input and storage of content, learning management systems, and front-end design. Finally, future research and other emerging questions, which arise when working

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