DESIGN THINKING IN HIGHER EDUCATION

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Abstract

These days the human being is witnessing everyday developments in technology, products, services that people implement in their lives. 300 years after the invention of the wheel as a potter’s wheel, someone figured out to use it for transportation. To realise the need of users is very important for evolution.

In presented paper the authors’ team does not invent the methodology of design thinking - only apply it in wide range of courses in Computer Science, Information Technologies.

The University of Library Studies and Information Technologies is a principal investigator of the European Erasmus+ project Design Thinking for Digital Innovation 2016-1-BG01-KA203-023719. The main goal of the project is to develop a course (curriculum, methodology, guidelines for implementation) in Design Thinking. Inspired this approach the project team discover the nugget education for vocational training in security 2018-1-BG01-KA202-047919. Its main idea is to be created micro modules to support the hot topic training in cyber security.

The goal of the research team is to implement the Design Thinking process and to put in the shoes of the potential expert in security. It is a real challenge for the project. The first one is to identify needs of business, i.e. the competencies which should be developed.

The reasonable implementation as a first step is the construction of the learning activities and to throw trainees in real business cases.

The natural sequel of the collective academic force is to create a list of modules, their curriculum and the guidelines for better understanding. The combination of the Design thinking process with Competence-based learning provide powerful synergy for vocational training

Keywords: Innovation, technology, design thinking.

1 INTRODUCTION

As the world’s business landscape evolves, universities are attempting to keep up by fostering teaching that supports an interdisciplinary and new approach to solving problems. From this point of view, Erasmus+ project Design Thinking for Digital Innovation 2016-1-BG01-KA203-023719(DigiThink) aims to modernize the current HEIs educational approach to face up to the current and future challenges. It will better integrate entrepreneurship and innovation activities in the established curriculum as a horizontal element in different fields of study (ICT, engineering, business) and as a subject in its own right (digital and innovation skills).

This refreshing approach to curricula with human focus orientation, entrepreneurial spirit promotion and multidisciplinary perspective fits quite well with both Universities Learning-Teaching Model (University of Deusto, Spain and University of Library Studies and Information Technologies, Bulgaria). This learning model pedagogy based on competences is founded on the Ledesma-Kolvenvach model. This last model, widely applied in Jesuit universities around the world, is based on an integral training facing four dimensions. “Utilitas”: People competent to solve technical, social and human problems; “Humanitas”: people aware of themselves and the world they live in, sensitive to our contemporaries’ aspirations and concerns; “Iustitia”: people committed to building a fairer world, compassionate to others and concerned for structural social problems; “Fides”: people capable of exploring questions related to life and transcendence. This pedagogy model, which has proved to be successful, can be the foundation for education of young professionals who will face an uncertain changing world needing answers for social issues.

Transformation towards a digital world implies, on one hand, that ICT competences will be increasingly relevant in every social and economic aspect and, of course, education cannot be left out of this transformation. On the other hand, not only more ICT professionals will be needed, but their
scope will exceed the merely technical one promoting business and social disrupting transformations. That’s why the course and methodology proposed in this project complies currently ICTs frameworks, the European Qualification Framework, the European Digital Competence Framework and the UNESCO ICT Competence Framework. Despite the multidisciplinary nature of innovation and digital entrepreneurship, the relevant role that ICT professionals will have aimed this course to train digital professionals skills. So, the course is also aimed to fulfill the European Framework for the ICT profession framework.

Using Design Thinking to generate new digital and social businesses implies to deploy an approach structured in the six-step iterative process that goes through these phases: Empathise, Define, Ideate, Prototype, and Test. Design Thinking has been defined as the application of the way in which designers think to craft new solutions (products and/or services) that satisfy real needs, not because the team that is in charge of developing the solution is very creative but because they live with customers, they suffer the same pain and so, they are able to feel the need in the same way as the customers; based on this knowledge, the team is able to offer some potential solutions (some of them co-created with the customers) that will be tested among them to improve once and again the prototype until “a good enough” solution is sufficiently valued by the market and can be launched onto it. The challenge of this course is to combine this mindset with the digital tools to design innovative products and services responding to real customers’ pains. The essence of the course is “to fall in love with the problem and the ones who are suffering it” instead of with some brainy solutions that, at the end of the day, only satisfy the ego or the bio of their inventors.

“Design thinking incorporates constituent or consumer insights in depth and rapid prototyping, all aimed at getting beyond the assumptions that block effective solutions. Design thinking—inherently optimistic, constructive, and experiential—addresses the needs of the people who will consume a product or service and the infrastructure that enables it. Businesses are embracing design thinking because it helps them be more innovative, better differentiate their brands, and bring their products and services to market faster. Moreover, nonprofits are beginning to use design thinking as well to develop better solutions to social problems. Design thinking crosses the traditional boundaries between public, for-profit, and nonprofit sectors. By working closely with the clients and consumers, design thinking allows high-impact solutions to bubble up from below rather than being imposed from the top”.

Implementation of the DigiThink approach in other subject is shown in this paper as example for the course development in Internet of Things security nuggets under the Erasmus+ project IoTnuggets: Internet of Things security nuggets 2018-1-BG01-KA202-047919

2 METHODOLOGY

This methodology is developed under the project Erasmus+ DigiThink: Design Thinking for Digital and Social Innovation Erasmus+ Project № 2016-1-BG01-KA203-023719 granted by European Commission. DigiThink aims at teaching students how to apply the Design Thinking Methodology to unearth a wide range of new options and ultimately to create innovation in a world that is facing digitalization rapidly. In this respect, it is developing new methodology and content, based on ICT, as it foresees full utilization of such tools and development of digital skills for students. Specifically, this includes helping them start digital business by using step-by-step process based on Design Thinking to generate not only concepts but prototypes, i.e. ICT innovative products and services, internet based business, and even adding digital perspective to traditional ones, all of it during the learning process.

With an emphasis on listening, user empathy, whole-brain thinking, collaboration, and experimentation, the design thinking process offers a complementary approach to existing courses.

The training is developed the following areas:

- Discovering the main effects for society, in general, and business, in particular, of Globalization and Digitization, mainly from the innovation point of view.
- Realizing that innovation is not merely a matter of technology, but knowing intimately the user/customer, and her pains and gains.
- Learning to comprehend the Design Thinking Method (foundations, phases, skills and tools) to develop a customer centric innovation.
• Identifying a wide range of opportunities of innovation, beginning with the user/customer and finishing with a prototype to be tested in society/market.

• Applying the DigiThink Method to create digital and social innovations.

The teaching-learning approach seeks to facilitate learning to think and to promote research and development work, which are key aspects of university work and study, to offer solutions that can be brought to market if the proper (intra) entrepreneur is founded.

2.1 Five stages

To facilitate and enhance the good running of the implementation of the model, learning units are designed and developed according to a number of learning cycles that, following a sequence of stages, promote the development of this independent, meaningful learning. Inspired by the model of Kolb [1] and St Ignatius' teachings [2] five stages are proposed for the development of a learning cycle:

✦ **Experiential context:**
This first stage seeks to give students an insight into the topic or issue under study. “From known to unknown”: The aim is to motivate students through their own experience and context so that they can have an initial general overview on the subject and the context in which it is especially relevant, or where the contents to work on can be applied.

Learning should be related to personal experience (analysis of concerns, diverse experiences, information on the subject to contextualize it, relationship with other contexts, future expectations, issues on how we learn, participants’ common and differing perceptions). This can be done collaboratively, by exchanging and contrasting individual experiences and approaches on the subject.

✦ **Reflective observation:**
The aim of this stage is to encourage students to ask questions, to question themselves, as there cannot be significant learning if one does not ask oneself or questions about it. It can be a question, a number of questions, a conflict, or a gap between what I know and what I need to know or do; all that drives students into action and hence, to the construction and reconstruction of knowledge.

✦ **Conceptualization:**
The aim of this stage is to bring students closer to the theoretical approaches that have been developed in a specific scientific or technical area: the answers given by authors and schools to key issues in each discipline. Conceptual learning is based on the acquisition of knowledge, scientific terminology, facts and data, methods and strategies, principles and theories that make up the scientific and technical knowledge of each discipline. As the aim of the course is to move knowledge into action, it should be noted that Design Thinking is a new discipline in the academic world and the scientific approach is being done not only by academics but by real practitioners. So, there are many real examples that can illustrate this phase.

✦ **Active experimentation:**
In this fourth learning stage, we consider how students can apply the contents they have just worked on. It refers to the theoretical/practical relationship and includes any activity (exercises, internships, projects, research work, designs or any other active proposal to be carried out by students on a specific subject, year or degree) that promotes the development of students’ competences concerning the application of concepts, theories or models in order to strengthen them, use them for problem solving or to design or implement a model or strategy.

✦ **Assessment:**
We cannot complete a learning cycle without asking ourselves what we have done and what we have achieved. This is a final point to a learning cycle and it can be the beginning of a new one to refine all the concepts and skills that have not been sufficiently achieved in the previous one. So it helps go deeper into the subject in an iterative way.

This learning approach allows the training to be:
• Interactive: among participants themselves, and among them and the users/customers, the teachers, tutors and business people that can take part in the training.
• Participatory: making the team the base of the learning process.
• Practical: learning by applying the skills and concepts gained through the class-hours.
• Elicitive: drawing from the personal context and experience of the participants.

2.2 Training Methods
The DigiThink Model offers a very flexible approach to digital and social innovations, so the course itself has been designed in a very flexible way (the different phases of the model go back and forth, and so the course can do, taking into account the foundations of the model). The teaching-learning process considers the trainee as the center of the process, and as the DigiThink Model defends, the teachers/tutors walk with them all along the training process instead of command them to go one given way.

Challenges (real or OR simulated) are fundamental in the process of learning the Model. To delve into each of the phases, to better understand them and to better apply each piece of knowledge gained through the teaching-learning process; it is advised to confront the participants against little challenges (personal or team tasks) before they can go for the “big one” in the global field action project they have to develop to pass the course. The appraisal offered by the teacher/tutor and/or the user/customer after completing these partial tasks will be very useful for the participants in order to complete the global field action project.

2.3 Learning methodology
The course is designed to be deployed through team learning, although some of the tasks and exercises could be developed on a personal basis. Through workshops, some small projects (i.e. with regard to one of the stages of the model) are advised in order to be able to develop a real project.

Ideal groups consist of four persons lead by a team leader. Less than three members or more than six are not advised for a proper development of the course (few insights or communication problems can arise). The web platform is the main aggregator of the materials video and audio materials offered to the leaners.

Nowadays the need of fast knowledge and skills training is very important for professional development. One respond to it is the micro and nugget education. The Learning nuggets is a standalone mini learning activity [3], usually less than 5 minutes in length, that would vary in size and scope that learners undertake in a particular context in order to attain specific learning outcomes. Nugget (micro)-learning involves learning in smaller steps and goes hand-in-hand with traditional e-learning. Activities that are usually for short-term lessons, projects, or coursework that is designed to provide the student with 'bits' of information. The learning pathway is describe but learners be able to choose only parts of it.

Main approach for identifying the learning outcomes is a competence-based curriculum development methodology. The extract of the competence framework is employed for the IoT security.

3 RESULTS
The main objective of this training is to develop the core skills for innovation through a practice-led approach, teaching Design Thinking skills through a mix of lectures, workshops and assignments, and a global field action project. Although the course could be applied to “brick and mortar” businesses and organizations, the aim is to apply it in the digital sphere.

The specific objectives of the course are:
• to connect concepts, ideas and different perspectives to provide new and innovative valuable propositions,
• to test them and re-elaborate with experience.
• to incorporate elements from other creative and design disciplines.

At the final of this training, the student could:
• Have an awareness of the role of Design Thinking in Innovation and how it can be applied in a wide range of contexts, especially in digital domains. (In this case the IoT security)
• Adopt innovation attitude to turn ideas into solutions that add value to a product, process, or service applying the Design Thinking model.
• Apply design thinking frameworks to articulate a project question aimed at addressing a problem or creating and pursuing an innovative idea from empathising with the customer/use to prototyping/creation.
• Use creative techniques in generating novel and useful ideas and defining and prototyping products, services and business models that allow visualizing possible solutions.
• Develop empathy with peers and clients and apply human-centered methods to research and build towards a solution for a problem or new service.
• Use divergent and convergent thinking, synthesize unconventional ideas and points of view to uncover new solutions.
• Collaborate within a multidisciplinary context and leverage the diversity of perspectives and differences to build robust solutions.
• Use sketching as well as various prototyping techniques for products and services.
• Communicate effectively in oral and written format the output of their thinking and generate interest and support for the adoption or implementation of the idea.
• Evaluate the potential of a design or solution through analytical and synthetic thinking approaches.
• Use computing tools and online environments to aid/apply design thinking.

All the general and specific skills developed through the course will improve the employability of the participants in the next years. In fact, the course could enhance the entrepreneurial skills in the students which would be very much appraised by the existing business community.

4 CONCLUSIONS

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