1 SCALE – Smart Cities Advanced Learning Education

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In the SCALE project, the Department of Construction Design and Economics, together with partners from the European Union, is working on a concept for imparting smart city-relevant content for university teaching. The project is funded by the EU through Erasmus + and started in November 2018 with a duration of 2 years.

1.1 Smart Cities in the European Union

The growth of cities and urban areas is one of Europe's greatest challenges. The European area is comparatively densely urbanised, residential areas are crowded onto relatively small spaces and are increasingly penetrating, fragmenting and consequently sprawling over the European cultural landscape.

Experts and political decision-makers in Europe are concerned about this development and are looking for strategies for "smart" urban growth within the European Union. With the implementation of the European Innovation Partnership for Smart Cities and Communities (EIP-SCC) [1], the European Commission is pursuing the goal of bringing together the actors of cities, from their areas of administration, economy, research, finance, but also their citizens in order to improve urban life and the quality of life through sustainable solutions. Greater energy efficiency, efficient mobility, participatory involvement of citizens, integrative planning and administration, innovative business models, intelligent use of information and communication technologies (ICT) are the key areas for which innovative Smart City solutions are being developed and implemented. The "Marketplace", a digital platform, helps cities, communities and other interest groups to share knowledge and to network within this smart cities initiative. [2] With the launch of this platform, the European Commission highlights both the importance and potential for the Smart Cities sector of sharing knowledge and of networking.

Inspired by the idea of the "Marketplace", the aim of the project presented here, SCALE, is to impart Smart City-relevant know-how and prepare it for the special demands of this young industry. Graduates will be provided with the knowledge and core competences they will need to pursue highly skilled jobs in the Smart City sector.

Universities, research institutions and industry-specific companies are working together to learn and study at the intersection of university teaching, research and practice. A learning platform on which the programme is completed is publicly accessible and aims to make the innovative content available to a wider public. The European Union supports this project through the Erasmus+ programme "Cooperation for Innovation and the Exchange of Good Practise", thereby recognising its great value for the European Union's education landscape.

1.2 Project Participants

The lead, that is the management, of the project consortium was assumed by the Università de Valladolid (UVA) in Spain. The consortium includes university partners as well as companies

that work in the field of innovation and technology development. Thus, three university institutions with different specialist areas face three industry-typical companies with varying profiles:

- Universidad de Valladolid, Fakultät für Informationswissenschaften (ES)
- Fachhochschule des Mittelstands (FHM) GmbH in Bielefeld (D)
- FH JOANNEUM GmbH, Institut für Bauplanung und Bauwirtschaft (BBW), Graz (A)
- World University Services of the Mediterranean (WUSMED) in Girona (ES)
- Energie Impuls OWL e.V. in Bielefeld (D)
- Innovation Service Network GmbH (ISN) in Graz (A)

As the names of the institutions clearly show, all project partners work in different disciplines, ranging from information technology to the energy industry or innovation research to building. At first glance, the institutions seem to have few shared intersecting areas, but they do all in fact share a common interest: the Smart City.

1.3 What is a Smart City?

In the long history of urban culture, the smart city is still a very young phenomenon - the term appears for the first time in the 1990s, especially in conjunction with information and communication technologies (ICT) and e-government in cities and municipalities. [3] Today Smart City is the spearhead of urban development amongst cities competing for modernity, innovation, sustainability and quality of life. When experts for urban development and urban processes meet, the discussions about what a Smart City actually is lead to very varied opinions. In general, it can be said that Smart City stands for cities and neighbourhoods where technical as well as economic or social innovations contribute to a more sustainable life and at the same time a high quality of life. [4] Computer science and digitization advances are pushing us towards the technologization of our everyday lives and the driving force behind this development is above all economic: life in our cities is becoming more efficient, more intelligent - simply smart! The most prominent examples of the 'smart' design of everyday life, as perceived by the public, can be found in the transport sector: the 'Navi' leads us or our car in accordance with the traffic situation on the 'fastest' routes through the city, for example, to work or the smartphone shows us the departure time of the school bus in real time and reassures us with the information that our children will arrive at school punctually. This image is confirmed at major international trade fairs, such as the Smart City Expo World Congress (SCEWC) [5], which is held every year in Barcelona: one of the most frequently advertised products in 2018 was probably mobile apps for searching for parking spaces competing for future users in terms of slight differences in user-friendliness. Compared with the likewise exhibited models and systems of autonomous driving electric vehicles, these apps did not seem very innovative. The question of the goal of these developments was summed up in the title of a famous lecture given by Cedric Price in 1966: "Technology is the answer, but what was the question?"

The objective becomes clear also in interdisciplinary discourse. For example, when a solution is sought for the congestion of our limited urban space owing to motorised traffic: for town-planners, the pedestrian-friendly "city of short distances" and the avoidance of traffic made up of

private cars is a solution for an intelligent city, whereby for the mobility experts, it is the autonomous driving electric vehicle, which will clarify the questions of future mobility in limited urban space. A Smart City should follow the principle of maximum quality of life using minimum resources. This means that `smart' involves the sustainable use of our existing and natural resources. The meaning of quality of life in this context is to be clarified at the political level.

The EU Commission defines a smart city on its website as follows:
"A smart city is a place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and business. A smart city goes beyond the use of information and communication technologies (ICT) for better resource use and less emissions. It means smarter urban transport networks, upgraded water supply and waste disposal facilities and more efficient ways to light and heat buildings. It also means a more interactive and responsive city administration, safer public spaces and meeting the needs of an ageing population." [6]

Urban policy and city administration pursue these goals with 'smart governance', the involvement of the civilian population in urban developments: urban planning and decision-making processes are made transparent in dialogue and on a participatory basis with city dwellers. Open data, open government or e-participation are just a few of the fundamentals that modern governance models require. The use of technology to strengthen a civil society is a double-edged sword as can be seen in the development in China: the "Social Credit System", which is currently being tested in 40 Chinese cities, uses nationwide video surveillance, image recognition, social media channels and rating systems to influence the behaviour of the population through reward and punishment systems. [7]

Smart City also means a radical change in the way we understand the individual disciplines and their common interfaces. Urban planning today regulates not only space, infrastructure, social and economic interrelations via legal instruments, it is a process on which telecommunications and information technologies have a massive impact: data on energy, traffic and material flow, on the behaviour of city dwellers, new forms of communication and social media and, above all, planning technologies such as BIM (Building Information System) increasingly determine planning processes.

Developments in the field of artificial intelligence are bringing us to the threshold of tremendous change and we are already seeing an ever-widening gap between technological progress, innovation and social behaviour.

In addition, if we take a look into the future, we are confronted with global problems, the extent of which far exceeds our previous scope of experience and knowledge: climate change and the necessary adjustments, a scarcely regenerative environment due to our actions, scarcity of resources and problems related to the migration of millions of people (climate refugees).

1.4 The teaching and training concept for SCALE

So how can we prepare students for this young industry from which we expect solutions to the problems ahead? How can we train these students?

A teaching concept based on purely theoretical knowledge acquisition is of little value if the content has been neither tested nor determined. Therefore, both training content and the required competences have to respond directly to the specific requirements of the industry and future problems (Problem Based Learning). The cooperation between universities, research companies and the business sector of Smart Cities should close the gap in dialogue, communication and understanding between the relevant actors in the Smart City sector.

For the training of such relevant and interdisciplinary competences such as innovation and communication skills, teamwork, organisation and planning, analytical thinking, creativity as well as e-skills for working in the digital age, the Smart City industry should serve as a model and a test environment. These competences cannot be conveyed through a classical university education, nor can they be substantiated by current official examination procedures.

The training program currently has three levels, the first two of which are completed in the virtual space of a Moodle platform.

In the first stage, the platform is used as a knowledge pool for selected Smart City examples. The students are given access to technical information material, results of accompanying scientific research, collected press material and videos of interviews with participating smart city actors.

In the second stage, students work on a "Smart City Challenge", in which they use the platform as a work and communication space and practise the above-mentioned skills. In interdisciplinary as well as international teams, they develop project ideas for the smart cities presented and devise additional projects. The students are supervised and moderated by teams, which comprise university lecturers as well as actors from research and economics. Similar to a competition procedure, the projects are then evaluated by an international jury. The project evaluation also forms the basis for the student selection process for the third level of training.

The third, and therefore highest, qualification level is an internship that enables the students selected to visit one of the two international partner universities in the project. Within the concrete context of the smart city on site, students work on their Smart City Challenge project and benefit from contact with the university's trainers, research institutions and local businesses.

Students will gain highly specific know-how and can use the contents for a bachelor's thesis, master's thesis or for a PHD. A possible realisation of the award-winning Smart City Challenge projects on the smart city market by participating companies and municipal organizations would be the logical continuation of a smart city industry-oriented teaching and training concept.

1.5 Summary

Students work at interdisciplinary and international levels

With the development of Smart City curricula and concepts for adequate teaching in university education, SCALE makes an innovative contribution to the European education system as well as to the improved cooperation of universities and their partner companies from research and

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industry. The implementation of the project in the three EU countries - Germany, Spain and Austria - also promotes networking of the European education and research landscape.

SCALE is a project that fulfils many aspects of an innovative university education:

- Students meet experts from science, research, business and administration and learn from professionals
- Representatives of science, research, business and cities work together to develop smart city-specific content
- Students develop innovative and practice-oriented projects at the interface of science, research and economic implementation
- Students work at interdisciplinary and international levels

Literature

[1] European Union (2012). European Innovation Partnership on Smart Cities and Communities, Marketplace.<https://eu-smartcities.eu/> Information called up on 28.02.2019

 [2] European Commission. <https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_de#european-innovation-partnership-on-smart-cities-and-communities/> Information called up on 28.02.2019

[3] Abolhassan, Ferri. (11.12.2017). Das Haus, die Fabrik, die Stadt–Alles smart oder was? < https://www.linkedin.com/pulse/das-haus-die-fabrik-stadt-alles-smart-oder-dr-ferri-abolhassan>. Aufruf am 04.02.2019

[4] Hadzik, Tobias. (2016). Smart Cities: Eine Bestandsaufnahme von Smart City-Konzepten in der Praxis. Epubli Berlin

[5] FIRA BARCELONA. <http://www.smartcityexpo.com/en/general-information> Information called up on 02.03.2019

[6] European Commission. <https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en> Infor-mation called up on 01.03. 2019

[8] Botsman, Rachel. (21.10.2017). URL:https://www.wired.co.uk/article/chinese-government-social-credit-score-privacy-invasion.abgerufen am 2.3.2019