From Morse Code to the Internet of Things

POLE in cooperation with ITU
Organisation POLE

Lead POLE

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University students are nowadays increasingly challenged within their specific core disciplines; in addition however, they are also supposed to develop skills in order to apply this particular knowledge in practice. This ideally goes hand in hand with a sense of maturity of the individuals’ characters vis-à-vis the social, cultural, and economical environment. The practical application of theoretical knowledge can thus only be implemented successfully if these three basic elements are taken into account.

In addition to university students’ disciplinary knowledge, the ability to work efficiently within multicultural environments has become increasingly important. Universities are therefore looking to expand and deepen this particular aspect in order to provide the necessary expertise in this field. This realisation has led to universities becoming more proactive with regards to networking and offering joint courses, which is where POLE (Project Oriented Learning Environment) is actively involved in. In the course of this new collaboration, it has become apparent that the complementary aspect has gained in importance. An example for this is the liaising between strongly research-oriented and more practically oriented universities with the common goal of being able to implement the according results as soon as possible. Apart from contributing to more comprehensive and efficient process work, the POLE courses lay particular emphasis on improved cultural know-how. In order to do this, students are encouraged to contribute their experiences within international teams, regardless of geographical and language barriers.

POLE sees itself as a learning system cooperating with other European or international universities. It does so within a reflexive context, taking into account the various cultures involved in order to create new methods of resolution regarding teaching and learning methods. The students are at the core of this concept, and are given the option to develop process-oriented expert knowledge through trans-disciplinary teamwork. Simultaneously, they learn to work independently and to deal with current problem cases through the use of modern information and communication tools.

Processes within POLE are largely organised within the individual teams themselves. The according goals are set and committed to within the teams; in case of resulting conflicts, weight is given to iterative processes in order to find solutions. A further characteristic of POLE is an increasing tendency for the overlapping, or even amalgamation, of various lines of work in order to give way to new, holistic, and trans-disciplinary perspectives. POLE is a comprehensive platform which gives students the opportunity to contribute their full potential. Each individual’s attitudes, characteristics, and abilities are taken into account as a whole in order to allow as much space as possible for independent development of students’ responsibilities and skills. A contribution to the concept of
'Campus in Mind' is made by POLE in providing the multi-disciplinary teams with learning facilities that are based on experimental and interactive technologies.

The teamwork in the POLE courses allows the students to further expand their specific professional skills, on the other hand, it also gives them the opportunity to develop more generic competences, which nowadays is one of the key qualifications in order to be able to adapt to a continuously changing environment. The course also enables students to evaluate their ability to function in a team and to analyse their styles of communication. Through practical examples, students are given the opportunity to explore how well they are able to work in a team, and to what degree they are flexible to accept members’ concerns from other disciplines, i.e. how they can integrate these into their own work and patterns of thinking.

Experts and mentors which do not form part of the university, but are active members of businesses and the industry in general, are an essential part of POLE courses. Their participation contributes a high degree of practical knowledge to the projects, pointing out the actual ‘state of the art’. In this manner, POLE manages to link academic education and professional practice. The intensive interaction between these two elements guarantees a rapid transfer of technology, while at the same time ensuring that the students involved are motivated to a high degree.

POLE is not only about to significantly remould the landscape of teaching and learning at universities, but it also intends to yield substantial influence concerning decision-making and the creation of practical work processes. In association with university teaching staff, the mentors are instrumental in contributing expert knowledge and regular feedbacks to the teams, while they are also actively involved concerning the evaluation of processes and related products. The latter will be of increasing importance in the future, as scientific research has been initiated in connection with reflections of certain POLE processes. It is the intention of this kind of research to support students with regards to the awareness of their personal learning styles. The findings will then be made accessible for future work in a broader context.

Further POLE research issues include for example the creation of knowledge databases, which will serve as a tool for more rapid evaluation of solutions and decision making processes in the future. These efforts are based on the knowledge that a large part of creational, construction, and design processes are substantially shaped by re-design.

The initial POLE courses had been launched as a result of the ever increasing demands in the current building trade, which is of a highly complex, segmented, and competitive nature. Experts from the fields of architecture, civil engineering, and construction management are clearly demanding a broader education, along with more
diversified core skills for engineering students. The POLE learning environment and its associated methodology is not limited to this initial context, but allows students from practically any discipline to apply their theoretical knowledge in practical cases. Through collaboration in interdisciplinary teams guided by process management students, students from fields such as architecture, urban planning, civil engineering, interior design, plastics engineering, mechanical engineering and economics were given the opportunity to cooperate in POLE projects and thus better understand the individual processes involved and acknowledge their relation to the social, economical, and political dimensions.

In 2015 POLE goes into its 15th year. It will bring together the disciplines of industrial and product design, design management, scenography, mechanical engineering, electrical engineering, mechatronics, computer science, plastics technology, psychology, medialogy and process management. POLE invites students and faculty from the University of Applied Sciences North Western Switzerland (leading house); Tecnológico de Monterrey, Campus Guadalajara and Queretaro (Mexico); Aalborg University, Campus Copenhagen (Denmark); Merz Akademie, Stuttgart; BTK, Berlin (both Germany); Windesheim University, Zwolle (The Netherlands), Illinois Institute of Technology, Chicago, Minnesota State University, Mankato (both USA), Technical University of Lodz (Poland), Zurich University of the Arts (Switzerland).

Responsibilities of POLE and its Partner Universities

POLE considers itself as a learning platform which enables and facilitates trans-disciplinary processes. It has also proven to offer an excellent test bed for research in the field of modern teaching and learning as well as in the field of evaluation of novel learning spaces. At the same time it is important to put on record that the responsibility for the disciplinary supervision of the students remains with the sending home universities. This relates also to the grading of the students’ contribution. POLE on the other hand will provide a qualification on the team processes and on their interaction patterns. (It is suggested that students who successfully participate in POLE projects receive academic credits based on the ECTS.) The experience during the previous POLE courses has revealed that this double responsibility of the student towards his/her POLE team and towards the home university and professors, respectively, may also bear conflicts. POLE demands that team decisions be respected what the approach and the agreed objectives is concerned; POLE leaders are convinced that within this frame work there is ample tether to adhere to high academic standards in the disciplinary work.

Saying this makes it obvious that a close accompaniment and monitoring of the project by the faculty of the partner universities is essential and highly welcomed by POLE. The involved faculty will receive full access to all documents of the POLE project. Their participation during the kick-off events, the reviews and the final presentations will add to the multidisciplinary depth and thus to the quality of the project and to further developments of POLE.

Assessment

POLE has the ambition to continuously improve its learning and teaching platform. One step to do so is by integrating an external assessor into the process, who will participate in as many of the POLE design activities. POLE has cooperated in this field of evaluation and assessment with the Department of Education of the University of Applied Sciences North Western Switzerland and with Stanford University since the very beginning in the year 2000. The participatory assessment will focus on the effectiveness of the design processes and the adequate use of collaborative communication technologies.

The Partner ITU

The International Telecommunication Union (ITU) is the United Nation’s specialized agency for information and communication technologies (ICT). ITU allocates global radio spectrum and satellite orbits, develops the technical standards that ensure that networks and technologies seamlessly interconnect, and strives to improve access to ICT to underserved communities worldwide.

The International Telecommunication Union’s mission is to connect all the people in the world – wherever they live and whatever their means are. Through its work, ITU tries to protect and support everyone’s fundamental right to communicate. ITU is unique among the United Nation’s agencies by having both public and private sector membership. So, in addition to its 193 Member States, ITU memberships include ICT regulators, leading academic institutions and about 700 private companies. In an increasingly interconnected world, ITU is the single global organization embracing all players in this dynamic and fast-growing sector.

In the area of the Internet of Things (IoT), ITU is carrying out fundamental studies through ITU’s Telecommunication-
tion and Standardization Sector (ITU-T) with the goal to develop recommendations, such as the Joint Coordination Activity on IoT, the Global Standards Initiative on IoT, the Focus Group on machine-to-machine (M2M) service layer and fosters the ITU-T study groups, in accordance with their respective scope and mandates.

**History of ITU**

ITU was founded in Paris in 1865 as the International Telegraph Union. It took its present name in 1934, and in 1947 became a specialized agency of the United Nations. Although its first area of expertise was the telegraph, the work of ITU now covers the whole ICT sector, from digital broadcasting to the Internet, and from mobile technologies to 3D TV. An organization of public-private partnership since its inception. ITU is headquartered in Geneva, Switzerland, and has twelve regional and area offices around the world.

Today there are billions of mobile phone subscribers, close to five billion people with access to television, and tens of millions of new Internet users every year. Hundreds of millions of people around the world use satellite services – whether getting directions from a satellite navigation system, checking the weather forecast or watching television from isolated areas. Millions more use video compression every day in mobile phones, music players and cameras. Virtually every facet of modern life – in business, culture or entertainment, at work and at home – depends on information and communication technologies. The global international telecommunications network is the largest and most sophisticated engineering feat ever created. You use it every time you log on to the web, send an e-mail or SMS, listen to the radio, watch television, order something online, travel by plane or ship, and of course every time you use a mobile phone, smartphone or tablet computer.

All of this is thanks to ITU and its membership: ITU makes phone calls possible: whether to the office next door or to a friend in another country. ITU standards, protocols and international agreements underpin the global telecommunication system. ITU coordinates the world’s satellites through the management of spectrum and orbits, bringing you television, satellite navigation directions, weather information and online maps, and enabling communications in even the remotest parts of the planet. ITU makes Internet access possible. The majority of Internet connections are facilitated by ITU standards. ITU enables communications to continue working during disasters and emergencies. ITU supports and guides the ICT industry in building tomorrow’s networks. ITU powers the mobile revolution. Standards for transport networks, among others, make mobile and broadband possible. ITU works with public and private sector partners to ensure that ICT access and services are affordable, equitable and universal. ITU empowers people around the world through ICT education and training.
Task
From Morse Code to the Internet of Things
Over the past 30 to 40 years the Internet has grown to a worldwide network that serves more than a billion users. The miniaturization and cost reduction of electronic devices allows the development of so called smart objects, i.e. physical things that are enhanced by computational features to connect to the cyberspace established by the Internet. This way the gap between the physical objects and the information world is being bridged.

“The connection of physical things to the Internet makes it possible to access remote sensor data and to control the physical world from a distance. The mash-up of captured data with data retrieved from other sources, e.g., with data that is contained in the Web, gives rise to new synergistic services that go beyond the services that can be provided by an isolated embedded system. The Internet of Things (IoT) is based on this vision. A smart object, which is the building block of the Internet of Things, is just another name for an embedded system that is connected to the Internet. There is another technology that points in the same direction – the RFID technology. The RFID technology, an extension of the ubiquitous optical bar codes that are found on many every-day products, requires the attachment of a smart low-cost electronic ID-tag to a product such that the identity of a product can be decoded from a distance. By putting more intelligence into the ID tag, the tagged thing becomes a smart object. The novelty of the Internet of Things (IoT) is not in any new disruptive technology, but in the pervasive deployment of smart objects.” (From Hermann Kopetz; Internet of Things, Springer 2011).

In order for the International Telecommunication Union (ITU) to fulfill its coordinative function, it is crucial to proactively anticipate future developments in this fast-growing field of R&D. And it is for this reason that ITU has mandated POLE to think of future scenarios in the context of the Internet of Things that take technological as well as sociological changes into account. The students participating in the POLE project 2015 “From Morse Codes to the Internet of Things” shall envision novel applications in this field by defining potential users and their needs and wishes in any field of everyday life (e.g. being in transit, shopping, control of houses, working environments) and/or scientific or technological applications (e.g. in medicine, economy, finance, production) et cetera. The
student teams are asked to do a (mega-)trend research - which may also include hypotheses about countercultural developments - and, from this, create scenarios for their chosen prototypical scene. The findings must be visualized by using appropriate media (interactive devices, movies, posters, filmed dialogues, etc.) in a way that also non-expert visitors of the planned exhibition at the UNO’s premises in Geneva can gain knowledge and understanding. The opening of the show is scheduled for May 17th, 2015. This means that the work presented at the end of the POLE project must already fulfill the high standards of a convincing international exhibition.

Process Design & Deliverables
POLE as a platform for learning and teaching not only focuses on the product but puts strong emphasis on the structuring of the design process. The following list of deliverables shall facilitate the work process for the teams as a back bone.

Physical Kick-Off (February 9 to 14, 2015 in Windisch, Switzerland)
Team Building and Trust Building
Thematic Inputs by Faculty
At the end of the physical Kick-Off
• Written statement of team's objective(s)
• Statement on distributed collaboration and information management framework
• Description of the expected contributions of each team member

Design Review I (Videoconference; March 5, 2015):
(duration of presentations 15 minutes/team; discussion 15 minutes)
Trend Research and User Story
• Mega Trends, Technology Forecast
• Product Ideation
• Product Selection and Rationale for Decisions
• Research on Selected Scenarios
• Reflection on Distributed Team Collaboration (including the role of each team member)
• Project Timeline and Milestone Check
• Questions to Coaches

Note: Final versions of all of the materials that will be used in the design review presentation (PowerPoint presentations, spreadsheets, sketches, etc.) must be uploaded to the team’s intranet platform 1 day prior to the review to make sure that all sites have access to them.

Design Review II (Videoconference; April 1, 2015):
(duration of presentations 15 minutes/team; discussion 15 minutes)
Conceptual Work & Proof of Concept
• Description of Selected Product (out of a series of many)
• Proof of Concept
• Sketches and Mock-ups
• Story Board (concept for final movie)
• Floor Plans of Envisioned Scene in Exhibition
• Reflection on Distributed Team Collaboration (including the role of each team member)
• Project Timeline and Milestone Check (including identification of remaining tasks and deliverables for project completion, binding specification of team members’ arrival in Geneva for installation of team’s contribution to exhibition)

Installation of teams’ contributions in exhibition spaces at ITU (May 4, 5 and 6 in Geneva)

Final presentation (May 6, 2015 in Geneva, Switzerland)
All relevant final deliverables must be uploaded to POLE’s Project intranet portal. (by May 4, midnight)
Visualisation, Demonstration of Exhibition Objects
(Movies, Animations, Posters, Installations, Interaction Devices, etc.)

A. Oral Presentation of Project Outcomes (audience: colleagues, faculty and jury; duration: 20 minutes/team)
• Concept Demonstration; Discussion of why and to what extent the proposed design fulfils product requirements
• Discussion of Individual Learning Insights (as members of a multi-disciplinary team)

B. Oral Presentation of an Executive Summary for a Delegation of ITU’s Directorate (duration: 4 minutes/team)

C. Physical Deliverables (due at final presentation)
• Physical Installation for Exhibition (Booth, Posters, Screens, Projectors, etc.)

• 5 Copies of a Comprehensive Final Project Report, which should include the following sections:
  1. Executive Summary outlining the key points of the proposed design
  2. Background Research section documenting any relevant background research that was conducted.
  3. Requirements Section documenting the final list of design requirement the team had created
4. Design Development Section documenting the different ideas that were generated and the decision-making process that was used to select the final concept (with rationale)
5. Design Specification section documenting the specifications of the proposed design (detailed engineering drawings, including materials information should be placed here)
6. Design Process section documenting the overall design development and interdisciplinary processes that were used by the team (including reflection on the multicultural and interdisciplinary aspects of the project).
   • 5 DVDs containing the final report, the movie(s), etc. plus possible appendices

Information and Collaboration Technologies ICT
POLE is offering a modern infrastructure with respect to information and communication technologies (ICT). POLE encourages the partner universities to support their students with respect to ICT as much as possible, in particular granting them access to their own information technologies. The following list of ICT tools characterizes the minimum and necessary standards:
   • 24 hours per day access to work stations, so students can work on their tasks and are able to communicate at all times
   • Access to telephones with international access for conference calls
   • Video conferencing facilities (available at least 2 hours per week and team)
   • Suitable IT support (firewalls, basic support)
   • Broad band internet access
   • MS-Office including PowerPoint, Acrobat Reader, ZIP and FTP programmes

During the kick-off sessions POLE will provide instruction in the use of data transfer tools for the sharing of the use of video conferencing as well as in disciplinary applications.

Team Composition
The POLE course 2015 is based on the cooperation of the University of Applied Sciences North Western Switzerland (with its Academy of Art & Design, the School of Applied Psychology, the School of Engineering) and six global partner universities.

Approx. 45 students in six to eight multi-disciplinary teams will work on the anticipation and the visualisation of “Future scenarios for the internet of things” under the guidance and supervision of more than 10 faculty members located at the partner universities.

Evaluation Criteria
The evaluation of the project results will be in the duty of an international jury. It will consist of one member of each discipline and two members of the POLE directorate as well as of members of ITU. Each team will receive a report with an acknowledgement of the contributions according to the following criteria: (1) fulfilment of the task (detailed specifications will be handed out during the kick-off week by ITU patrons), (2) usability, (3) innovative potential of solutions, (4) presentation of product, (5) general impressions.

Confidentiality Agreement
Due to the potential of such novel products, ITU and POLE have agreed to respect a confidentiality agreement which in turn has to be signed by all partners involved in the project. Individual copies for each participant will be sent to the selected students in advance and shall be ready for signature at the kick-off event. They are a requirement for the participation in the project.

Budget for Production Costs
Each team is granted a budget of max. CHF 1,200 for material and production expenses. Payments can only be made by POLE against bills or (signed) receipts.

Cost of Living and Accommodation
Thanks to the financial support of sponsors and the corporate partner ITU, POLE is able to partially subsidize the cost of living during the physical presence in Switzerland and those for the documentations and hand-outs for the participating students.

Insurance
Note: Each participant is responsible for her/his own insurance matters.
Project Agenda

Virtual Kick-Off (by Videoconference from Home Universities): January 29, 2015


Review 1 (by Videoconference from Home Universities): March 5, 2015

Review 2 (by Videoconference from Home Universities): April 1, 2015

Building up the installations at ITU’s premises in Geneva: May 4, 5 and 6, 2015

Final Presentations (all teams, faculty, jury, corporate partners): May 6, 2015

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