

Scientific activities in Construction Technology Management filed of Construction Innovations Academic Association

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Poznan University of Technology is a university with a technical profile, with 10 faculties, including the Faculty of Civil and Environmental Engineering. The university is also open to developing interests and passions of students, through the existence of numerous scientific circles. Officially, there are 74 academic and 15 student organizations. Among them is the Scientific Circle Constructon Innovations, whose history dates back to 2010, although it has been officially started in 2011. It associates students not only of Polish origin, but also from distant countries, such as: Democratic Republic of Congo, Iraq or India. Its main goal is to promote the Poznan University of Technology, Faculty of Civil Engineering and Environmental Engineering and the specialties of Construction Technology Management in the student environment and in the nationwide construction industry. From year to year there is an increase in its members. The article confirms that the activity of scientific clubs has a very positive impact on the development of students' interests. Confirmation of this thesis, on the example of ConInno are research projects from year to year, with a variety of interesting topics

1 Introduction

Scientific activities play very important role in the academic associations because they strengthen the need for search for new ideas, methods and problem solving for subjects that are related to the knowledge provided in the course of studies at the universities. Not only the activities itself but also participation in a student group for young people is a good way to ignore position and power hierarchy, which are replaced by collegiality and dedication to achieve both academic and professional success and enable creative thinking[1] This is especially important since for many students, education does not simply mean obtaining a university degree and, consequently, a good job. There is also a need to attain personal satisfaction and a sense of responsibility for the community in which one lives [2] What is more, formation of the personal orientation and readiness for professional work at the future engineers should be conducted in conditions of innovative educational activities [3],

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which confirms the necessity to take scientific actions by academic associations at the universities.

2 Scientific associations at Poznan University of Technology

Poznan University of Technology is a state-owned university with a technical profile, located in Poznań. It has 10 faculties, 27 fields of study and over 100 specialties. Among them, there is also the Faculty of Civil and Environmental Engineering, with majors such as: Construction, Environmental Engineering and the newly created Sustainable Building Engineering- Sustainable Construction. Over 20,000 students study first and second cycle, doctoral studies and postgraduate studies, which education is provided by over 1200 academic teachers. The Poznan University of Technology as the first of Polish universities was admitted to the group of CESAER members (Conference of European Schools for Advanced Engineering Education and Research) - a European organization associating the best technical schools. He is also a member of SEFI (Societe Euro peenne pour la Formation des Ingenieurs), EUA (European University Association), ADUEM (Alliance of Universities for Democracy) and IAU (International Association of Universities).[4]

Students choose studies at the Poznan University of Technology due to the high level of teaching, perfectly prepared staff, as well as the opportunity to fully realize their interests in actively operating scientific circles. These organizations are aimed at bringing together students whose main goal is self-education and implementation within the chosen subject.

At Poznan University of Technology there are officially 74 scientific circles and 15 student organizations. Among them there are 7 scientific circles belonging to the Faculty of Civil and Environmental Engineering, also the Scientific Circle of the Poznan University of Technology: Construction Innovations (Con-Inno)[5,6]

2.1 Con-Inno academic association

The Con-Inno Scientific Circle aims to promote the Poznan University of Technology, Faculty of Civil Engineering and Environmental Engineering and the specialties of Construction Technology Management in the student environment and in the nationwide construction industry. During circle members' meetings, among others, the following issues: flexibility in construction, sustainable and passive construction, management of the construction process, technology in construction, team management, software in construction. The history of ConInno dates back to 2010, when it was the idea to create it. The circle was officially registered on December 22, 2011 with the help of dr hab. Eng. Jerzy Pasławski.

An important distinction for the ConInno Scientific Circle is the fact that it took 10th place in financing competition at the Poznan University of Technology (among the 51 Scientific Teams), thanks to which it received high budget for 2018. The circle is also ranked 1st among all the Scientific Teams of the Faculty of Civil and Environmental Engineering based on the same rank.[7]

3 Recent research projects in Con-Inno

Every year ConInno conducts many important research projects. These scientific undertakings are characterized by a large involvement of students. The submitted theses always find scientific proof. Confirmation of general assumptions of ConInno's activity are conducted in 2017 - 4 research projects [9], the course of which is described below.

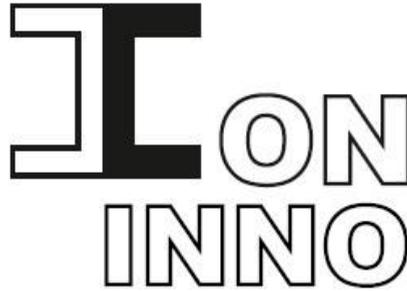


Fig. 1. Logo of Construction Innovations Academic Association [8]

3.1 Accuracy of BLE systems for the H&S improvement in construction

It is a research project carried out by three members of the circle. Its effect is to complete the Master's thesis with two participants and research for the doctoral thesis. On the basis of the research, a publication [10] was also created, which was presented at the 2nd International Workshop on flexibility in sustainable construction conference in Poznań, on 24-25.04.2017

The subject of the project is primarily a problem related to the exposure of health and safety of workers in the construction industry. There are many solutions on the market that are struggling with this problem, one of them is BLE localization technology. The authors of the study decided to investigate Bluetooth devices and perform a range test on devices received from a European manufacturer. The navigation signals are based on Bluetooth Low Energy (BLE) technology, which is a medium-quality data transmission standard for low-cost devices with long-life batteries. The results turned out to be promising, and the effect of the work was used in the course of further research work of other members of the circle

3.2 Quality Improvement of Ground Works Process with the Use of Chosen Lean Management Tools–Case Study

Another research project created by a two-person team. The result of the project was the completion of a master's thesis through one member and a dissertation. On the basis of this project, a publication [11] was also created, presented at the conference World Multidisciplinary Earth Science Symposium, in Prague, on 11-15 September 2017

The main theme of the project is the introduction of selected Lean Management tools to improve the quality of the earthworks process. These tests were carried out on the basis of an analysis carried out at the construction site of a vehicle inspection station, which is located in Poznan. Process assessments were made on a different basis, assuming that all three main groups of employees were directly involved in the process. They were: manual workers, construction manager and construction engineer. What's more, the studies took into account and compared 3 points of view on problems that could have occurred during these types of work, with the analysis of details and the reasons for their creation. The authors also checked the change of approach of workers directly involved in the mentioned processes concerning the introduction of the Lean Management methodology. It illustrates the problem of people's scepticism towards new ideas who are used to using traditional methods while working.

The introduction of Lean Management tools is especially important because earthworks are one of the first processes during the construction process. Various types and solutions for foundations were developed depending on the ground conditions. They are the type of soil or groundwater level. Well and solidly made foundations are the basis of the building, and well-made guarantee a long life of the structure and guarantee smaller, future costs associated with possible repairs.

3.3 Formal and Legal Aspects of Buying and Commissioning Flats

A research project created by a three-person team. Its effect was the use of data for a doctoral dissertation. On the basis of the project, a publication [12] was also created, which was presented at the 2nd World Multidisciplinary Civil Engineering Conference - Symposium Urban Planning, in Prague, on June 12-16, 2017.

The subject of the research are formal and legal issues and analyses accompanying the procedure of purchase and collection of apartments in Poland. This is a very current topic and concerns a wide group of buyers. Every year in Poland I sell and take away many flats. However, not all buyers are aware that its purchase requires not only knowledge from the construction side, but also legal aspects. The project speaks primarily about the rules related to the purchase of a flat, the process of acceptance of works, removal of detected defects, failure-free receipt or enforcement of a guarantee. The author also presents a logical connection between the three sides or their indirect and direct dependencies. The parties are the buyer, developer and general contractor. The survey also presents all kinds of problems resulting from delays in completion of work due to the developer's fault and talks about possible legal paths to claim their rights.

3.4 Review of the Air-Coupled Impact-Echo Method for NonDestructive Testing

A research project prepared by a three-person team. Its effect is also the implementation of research for the doctoral thesis and preparation of the publication [13]. It was presented at the 2nd World Multidisciplinary Civil Engineering conference.

The main topic is the concept of the Air-Coupled Impact-Echo (ACIE) method. It is one of the non-destructive testing (NTD) techniques that is used in construction. The main advantage of Impact Echo (IE) is that you only need access to the structure from one side of it. This facilitates testing in road facilities and places where access is difficult

The aim of the research project is to provide knowledge about the Air-Coupled Impact-Echo method based on a publication available at the Thomson Reuters Web of Science Core Collection database (WOS). From the analysis, it was concluded that ACIE methods can be widely used to perform non-destructive testing on concrete structures. This method is also faster than the IE method thanks to sensors coupled with air.

4 Conclusions

The data presented above on the activities of the academic association - Construction Innovations last year at the Poznan University of Technology prompts the following conclusions:

1. Interesting subject of works carried out in cooperation with the scientific circle arouses from year to year growing interest among students of the Poznan University of Technology.

2. The Con-Inno in 2017 carried out 4 large research projects whose effects were reflected in the form of scientific publications and promotional works of students implementing them.
3. Con-Inno was appreciated for its scientific activity, taking the 10th place among all academic associations at the Poznan University of Technology and the 1st place among the active student groups at the Faculty of Civil and Environmental Engineering.

The above article confirms that the scientific circles have a very positive impact on the development of Poznan University of Technology students. They have the opportunity to find answers to bothering questions and to solve problems in their field of interest.

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