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Scientific association knowledge improvement activities in Construction Technology Management field

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Abstract

The scientific association is an organization of students working in a higher education institution, whose purpose is the scientific and self-education of its members. Scientific circles can function as informal groups and as registered structures. The official condition of the existence of a circle at many universities is its enrollment in the special register of student organizations. Some circles gain a lot of independence by registering in court - but then they should be treated as non-governmental organizations.

At the Poznań University of Technology there are currently 87 officially registered scientific circles, of which 7 are in the Faculty of Civil and Environmental Engineering. One of the circles that focuses on innovative technologies in building management is the Construction Innovations academic association.

The paper presents a brief description and main interests of the ConInno scientific group, including the most important from the perspective of construction technology and the management of undertaken activities aimed at broadening the knowledge of students enrolled in the circle.

In addition, the article explores interest in participating in the research circle by analyzing historical data on the number of people enrolled in the scientific field, including students of the third degree studies, to draw conclusions about future interest in participating in the mentioned student organization.

Association activity has a very positive impact on raising the awareness and knowledge of members of the organization in the field of construction technology and management not only related to Polish local technological and technical solutions, but also to the world because of the number of foreigners who are in the circle. What is more, there is a positive impact on the promotional work of students from the ConInno circle, which is a direct result of the close cooperation and a good atmosphere in the organization between students and tutors.

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1. Introduction

The scientific association is an organization of students working in a higher education institution, whose purpose is the scientific and self-education of its members. Scientific circles can function as informal groups and as registered structures. The official condition of the existence of a circle at many universities is its enrollment in the special register of student organizations. Some circles gain a lot of independence by registering in court - but then they should be treated as non-governmental organizations [1].

Association activities have a very positive impact on raising the awareness and knowledge of members of the organization in the field of interests and has influence on the future career of the students. Such organizations are very much needed in higher education institutions and they raise the quality of education and open the horizons for new solutions.

The aim of the article is to present the student associations role in the university life with brief description of the most important ones actively working at the Faculty of Civil and Environmental Engineering at Poznan University of Technology with the focus on actions related to Construction Technology and Management field. What is more authors present the scientific work that is associated with the actions taken by Construction Innovations Associations which is directly related to construction sector and civil engineering and since 2011 is growing steadily.

2. Role of students organizations

Students organization plays important role in education process and most universities accepted the role of student organizations as beneficial to both students and the university itself [2]. For the students they can provide an informal support structure, guidance and friendship while studying at the universities [3]. 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. 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 [4].

Recent studies showed [5] that attending the additional meeting where students who were engaged in extracurricular student organizations rated themselves higher on both leadership traits and behaviors than those who were not involved in student organizations. Other studies presented [6] greater academic and social support, greater confidence in the institutional environment, and increased contact with faculty that influence directly not only the student but the university.

From the universities perspective creation of academic association is increasing of social responsibility of universities for improvement of the quality of higher education and development of students' socio-professional values [7]. They provide add-value because they are an example of informal learning that are a good supplement of the formal education. According to many studies and theorists [8], learning outside the formal environment greatly affects the performance and acquisition of knowledge [9], which at the end influence not only the students, but the level and in consequence the rank of the university.

It should be also noted that student's organizations may provide a successful tool in accelerating the development towards aware and motivated students [10]. Its members may play an active part in the transformation towards a sustainable society [11] and causes the student to enter, even if unconsciously, a learning network [12], which, by the contacts with other persons interested in the same field can result in easier job find after finishing the studies.

3. Academic associations at Faculty of Civil and Environmental Engineering (FCEE) of Poznan University of Technology

At Poznan University of Technology there are currently 87 officially registered scientific circles, of which 7 are present at the Faculty of Civil and Environmental Engineering. There is also established special body - Council of Academic Associations which is advisory body of the Poznan University of Technology on issues related to student research [13]. This body advises on propositions for the distribution of material resources throughout, academic circles and student organizations. Its main task is to work for the associations, develop and integrate of student research movement. What is more it is responsible for cooperating and organizing student support in the academic capacity, for carrying out projects promoting the university and the achievements (scientific and cultural) of students. The Council consists of representatives of all academic scientific circles and student organizations. It is the students and graduates who seek to help and support their colleagues through contacts, organizational and scientific skills.

3.1. Brief description of academic associations at FCEE

On the FCEE according to the Council of Academic Associations [13] there are 7 actively working academic associations out of which 1 is directly related to construction Technology and Management. Detail description of each association with their logo presents Figure 1.







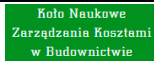
Logo	Name and main activities
	Construction Innovations Academic Association Members of the organization are students of second-degree of two specializations Construction Technology Management and Structural Engineering and PhD students. Due to the international composition of circle meetings are conducted in English. Direct supervisor is prof. Jerzy Paslawski, Head of Department of Construction Technology and Management. Organization deals with the following topics: flexibility in construction, sustainable construction and passive construction process management, technology, construction, management team, the software in construction, as well as many others.
	Scientific Association of Environmental Engineering (PL: Kolo Naukowe Inzynierii Srodowiska) Main activities are related to: organization of educational trips, conducting experimental demonstrations connected with energy-saving and passive construction, participation in trade fairs - meetings with designers, practices related to Environmental Engineering, Preparation of additional classes, laboratory exercises by students, tutoring for younger students, promotion meetings for high school students, promotion of environmental engineering and Poznan University of Technology in high school, popularization of reading literature and trade press through actions "book for half price" and drawing of trade journals, Integrating the academic environment of environmental engineering and presenting industry knowledge.
	Bridges Academic Association (PL: Kolo Naukowe Mostowcow) The Circle aims to broaden students' interest in the issues of general bridge construction connected with analysis, design, construction and maintenance of bridge structures. It is realized by trips to construction sites, attending scientific conferences, cyclical meetings of the members with conducting presentations on bridge construction objects.
	Academic Association of Construction Students (PL: Kolo Naukowe Studentow Budownictwa) Association is one of the largest scientific circles at the Poznan University of Technology. It brings together nearly three hundred people studying at the Faculty of Civil Engineering and Construction. Members of the association are ambitious young people who constantly want to broaden their knowledge and gain valuable experience that in the future will certainly have a positive impact on the development of their professional careers. The Circle was created in response to the expectations of ambitious students wishing to broaden their knowledge and acquire new skills in construction.
	Iron Road Academic Association (PL: Kolo Naukowe Studentow Drog Zelaznych) Association operates at the Bridges and Railways Construction Division at FCEE. It mainly consists of students of specialization of Railway Roads Faculty of Construction and Environmental Engineering. The Scientific Circle carries out activities based on scientific and professional interests of students, serves to increase scientific, professional and social activity, and enables the development of independent and team skills to solve scientific and technical problems. The members of the Circle take an active part in the research work carried out by the Railway Division The Scientific Circle of Students of Iron Roads co-operates with other Scientific Associations of the Poznan University of Technology and with companies and organizations dealing with issues related to the activities of the Circle. The members of the Circle take part in scientific seminars organized by SITK, Poznan.
	Scientific Association of Water Protection Technologies (PL: Kolo Naukowe Technologii Ochrony Wod) Research activities are related to wastewater treatment and industrial water treatment technologies, participation in conferences, apprenticeships, cooperation with industrial plants. As part of its activities students has the opportunity to: face real technological problems and seek out the best solutions, carry out laboratory and technical research on real objects, participate in the implementation process of new systems of water renewal and waste water treatment, study design, acquire skills, design with the eyes of the contractor and user of the designed systems, design in accordance with the latest standards, completion of engineering and master's work, training in industry and industry, organization of laboratory workshops for schools.
	Cost Management in Construction Academic Association (PL: Kolo Naukowe Zarzadzania Kosztami w Budownictwie) Academic circle are interested in costs estimation and cost management in construction. Participants take part in conferences and other scientific events at Poznan University of Technology.

Fig. 1. Main activities of the academic associations at the Faculty of civil and Environmental Engineering [13]

4. Construction Innovations - ConInno

The scientific circle ConInno history is dated back to 2010 when first ideas of its creation appeared. With the help academic tutor - professor Jerzy Paślowski it was entered into official Register of Student Organizations - Scientific Circles at Poznan University of Technology on 22nd December 2011 [14]. The Association was created at the request of three originators of the project: Kamil Koczwar, Łukasz Kaćpak, Wojciech Dłubała. Their request was motivated with interest in exploring knowledge in the field of modern building technology, developing practical laboratory research skills, and expanding entrepreneurial knowledge. Since that day ConInno is actively taking part in university life and is steadily growing recruiting new students interested in broadening their knowledge in construction innovation field in technology management.

4.1. Members of ConInno

Associations consists of mainly students of 2nd cycle studies - Construction Technology and Management specialization at Poznan University of Technology. In the research group there are also involved doctoral students from the Division of Construction Technology and Management, who provides necessary help in scientific projects and actions taken by the ConInno. Current amount of active members in the associations is 71 people out of which there is 5 doctoral students. Graph representing change in the amount of ConInno members is presented in Figure 2.

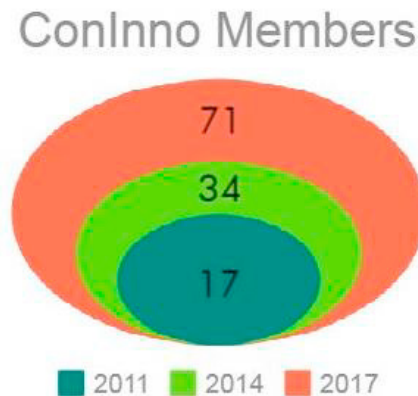


Fig. 2. Members amount graph of ConInno Academic Association

It should be noted that in the association there are many students from abroad that are taking construction technology and management course which was prepared with the help of European Project Engineer for the Future [15, 16]. In Figure 3 there are presented countries that are represented by the members of the ConInno association. There is variety of cultures and countries present in ConInno, which results in constructive discussion regarding both scientific projects and education issues, which is beneficial for all active participants of the group.

4.2. Activities of ConInno Academic Association

Group is actively working in many fields and is undertaking activities aimed at broadening the knowledge of students enrolled in the circle. The most important of these are:

- organization of training for students,
- cooperation with construction companies (trips, mini-projects)
- help in preparation of promotional work for students,
- organization of conferences and workshops,

- joint scientific publications.

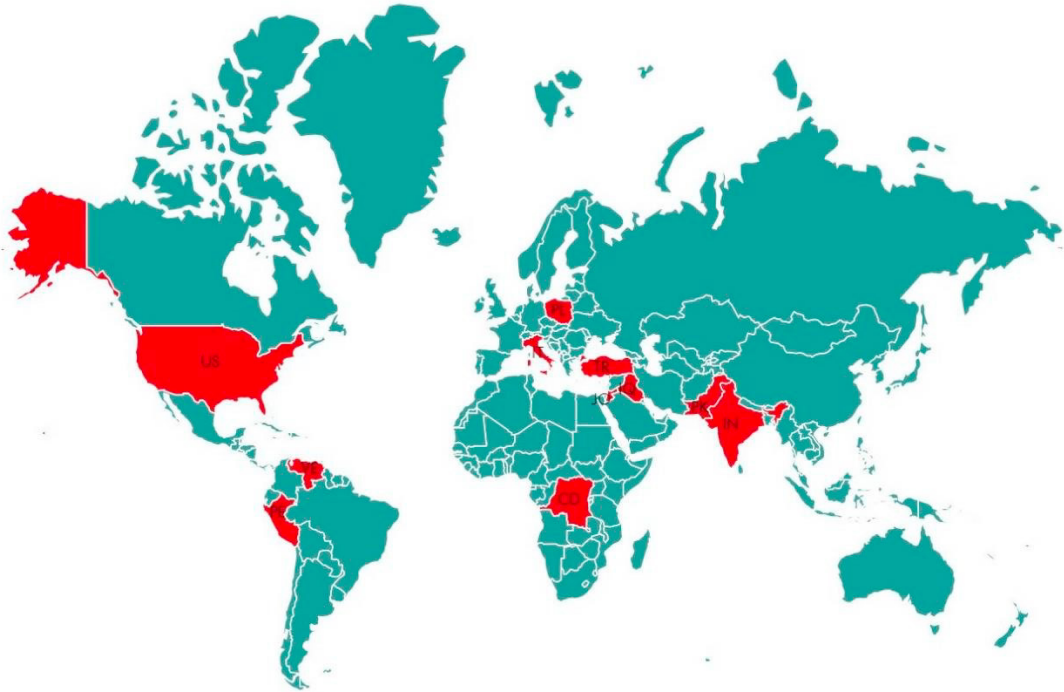


Fig. 3. Countries from which members of ConInno Academic Association came from.

Above actions are directly related to Industry-University-Student triangle where university educates students, that are employed by the construction companies during internship and in this way students during education has direct contact with the real problems, and they can solve them with the help of tutors during their master thesis preparations.

At the end they are more experienced and better prepared to step into adult life after finishing studies.

4.2.1. Training for students

Since year 2011 students participating in the organization prepared and organized trainings related to construction technology and management field. Those training were both conducted by the professionals form the industry and by students who have particular experience/knowledge in the given area. Courses and trainings were related to special constructions software (Abaqus, Autocad, Revit, Tekla), new production technologies (wood-frame construction, Lean Management), and new management approach (BIM, PMBok, LCC). All the trainings were open for interested people and majority of them were free of charge, what increased the accessibility level.

4.2.2. Cooperation with construction companies (trips, mini-projects)

This point plays important role in the ConInno activities. With the real contact with numerus industry partners (Figure 4) students have the possibility of solving real problems and see during organized trips how companies are organized, what processes are crucial in different sector as well as get to know in person possible future employers. After each trip students are asked to prepare mini-projects reports summarizing the trip with the focus on possible scientific cooperation with each company. Those projects are further developed and with the help of tutors form university became promotional work subjects that are both interesting for the future and real (not theoretical).



Fig. 4. Companies with which ConInno Academic cooperates.

4.2.3. Help in preparation of promotional work for students

Academic circle interests and strong cooperation with industry partners resulted in number of promotional works of students graduating from Poznan University of Technology. Subjects of the thesis are related to wide area of construction technology and management with 3 main axis connected with:

BIM

- Benefits of using BIM solutions on an example of an installation company;
- Life cycle analysis using BIM approach;
- Using of BIM tools in problems of Construction Management.

Quality Management

- Quality management of construction operation on Baltic office building;
- Quality management in improving the process of ready mix concrete production;
- Improvement of the quality management system on the example of the procedure for selecting subcontractors.

Lean Management, Six Sigma and Flexibility

- Use of Lean Management in improving of construction processes;
- Flexibility in heating systems based on renewable energy sources;
- Evaluation procedure for subcontractors based on the Six Sigma method.

Works are of course not limited to mentioned areas as each can student have his/hers idea on the master thesis topic and tutors working with the academic circle are open for discussion and different topics related to construction technology and management.

4.2.4. Organization of conferences and workshops

ConInno in its history participated in organization of the following scientific events:

- 15th German-Lithuanian-Polish colloquium and Meeting of EURO working group OR in Sustainable Development and Civil Engineering June 19th - 21st, 2015, Poznan, Poland;
- ORSDCE2016 International Workshop on flexibility in sustainable construction July 7th -8th, 2016, Poznan, Poland;
- 2nd International Workshop on flexibility in sustainable construction. April, 25th -26th, Poznan;
- 2nd International Joint Conference on Innovative Solutions in Construction Engineering and Management – Flexible Approach, 24th May Poznan, Poland.

The main responsibilities were connected with providing help during the event regarding organization, IT help, materials preparation and distribution and other necessary actions for making sure the event will be a success. All effort put by students was recognized, as each time active participants receives special confirmation that are needed for receiving scholarship, and are recognizable by future employees. At the moment ConInno is actively working on preparation of 3rd International Joint Conference on Innovative Solutions in Construction Engineering and Management – Flexible Approach, planned in Poznan in 2018.

4.2.5. Joint scientific publications

Except from already mentioned activities students together with doctoral candidates and professors involved in scientific association prepare joint publications based on the research that has been taken usually with the partner companies. This activity has very positive impact not only on the student who is gaining experience in preparation scientific reports and articles, nut also on the faculty and university since publication activity is nowadays very important. Below there are 3 examples of recent publications prepared together with the students of ConInno academic association:

- Lean Management in construction processes - case study on column concreting [17];
- Improving construction processes using Lean Management methodologies – cost case study[18];
- RTLS systems as a Lean Management tool for productivity improvement [19].

Described above activities are not the only one taken by the ConInno members, but are the most important from the point of view of student and university development as well as strengthening the much needed cooperation between university and industry.

4. Conclusions

Analysis of the subject related to student's academic associations working at Poznan university of Technology, detailed analysis of actions taken by Construction Innovation academic association as well as literature review on the importance of students' organization led to the following conclusions:

1. Student's organizations play important role in education process and their role is beneficial to both students and the universities.
2. At Poznan University of Technology there are numerous students group out of which one is directly related to construction technology management field.
3. The Industry-University-Student triangle with the help of ConInno academic association proved to be effective way to guarantee employment for students after graduation from university.
4. Active participation in ConInno academic association resulted in numerus research activities and works that helped students to prepare interesting and connected with the real problems final Master Thesis.

5. Doctoral students receive huge help from the younger colleagues in conducting their research since they can build a team interested in the same scientific field that can speed up the process of PHD research.

Authors are of the opinion that it is important to encourage young people to participate in students organizations that are working at the universities since it results in positive scientific, personal, organizational effects for all involved parties.

Authors plan to perform deeper research in the nearest future on the relationship between participation in the academic associations and the satisfaction form the education process at Poznan university of Technology to check the actual level of importance of the academic association for the students and university.

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