

Global Engineering Internship Program – GEIP an innovative initiative

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Abstract

This work presents the Global Engineering Excellence (GEE) initiative and one of its principal programs, the Global Engineering Internship Program (GEIP). GEE is an initiative established with the purpose of studying the impacts of globalization on engineering, and particularly on engineering teaching, but also to evaluate and propose appropriate ways to give the student of engineering additional training that qualifies him better for the engineering job in the global market. The Global Engineering Internship Program (GEIP) is an innovative program combining the resources of industry, universities, and students. The program is conducted by a German-based automotive supplier and seven top research engineering universities from around the world. GEIP intend to offer an international internship experience in a global context. The internship program has basically three modules: academic program, internship project and intercultural workshop. Through the academic program the student get an introduction to project management and must read and discuss major texts about globalization. The internship project involves worldwide collaboration with multicultural teams. The intercultural one-week workshop is sponsored by the company and put together GEIP peers. The students receive an intercultural training, visit a manufacturing plant, and work as a team on a global case study, presenting solutions. The goal of GEIP is to prepare top engineering students to perform successfully in a global working environment. The first obtained results are encouraging, which stimulate the partners to strength the network, consolidating the developed projects and discussing new projects to improve the education process of engineering students in the context of a global economy.

INTRODUCTION

Due to globalization, companies and consumers are changing radically (faster and faster) the way they produce, distribute and consume goods and services. Engineers are a fundamental part of this dynamic process. They need to work in group in projects with members of various nations and continents. They need to have international mobility, physically or virtually. The Global Engineering Excellence Initiative - GEE looks for analyzing and evaluating the undergoing process, showing its main barriers and difficulties, and proposing specific actions, as the Global Engineering Internship Program - GEIP, aiming to provide a better way to prepare current engineering students to act in this new international scenario.

THE GLOBAL ENGINEERING EXCELLENCE INITIATIVE

The German company of the automotive sector, Continental AG, indentified in 2005, that there was no globally conducted study, performed in partnership by universities and companies, on the subject global engineering, and particularly on the preparation of engineering students, expecting to give them better conditions and competences to act professionally in a global world. Although many academic and non-academic institutions have performed some work in this subject, they did not focus on education aspects, neither were conducted in a plural and multi-institutional way, with a worldwide representation of leading universities. So, as a consequence of the ability from Continental to identify such gap, and with the leadership from Technische Universität Darmstadt, it was built a consortium of

eight leading universities, from six countries and four continents, that joined worked on a study performed in 2006, leading to the publication of a book on this subject. The members of the first project phase (Figure 1), involved in the study were (in alphabetic order):

- Eidgenössische Technische Hochschule Zürich – ETH-Zürich, Switzerland
- Escola Politécnica da Universidade de São Paulo – EPUSP, Brazil
- Georgia Institute of Technology – Georgia Tech, USA
- Massachusetts Institute of Technology – MIT, USA
- Shanghai Jiao Tong University, China
- Technische Universität Darmstadt – TU-Darmstadt, Germany
- Tsinghua University, China
- University of Tokyo, Japan

The study was conducted in 2006, after a kick-off-meeting in Frankfurt with the introduction of all participants, and discussions on how to proceed with the work. At the very beginning it could be identified that the greater interests and competences would be to conduct a work that could be unified in a unique text and that could handle basically two aspects. First, in a national perspective, it should contain a discussion about how engineering is conducted in each country. Second, in an institutional basis, it should present a vision about how engineering education is provided by each school. In both cases the remarks should be related to the international aspects. Finally, as a consequence of the presented scenario and its evaluation, a set of barriers were identified, leading to recommendations to increase the incentives to intensify the activities related to an education with global background for engineering students.

It is important to highlight that, based on an evaluation of the universities representatives, an auto critic was performed to state how each country consider its own engineering in a global scenario. The various statements are available in the published documents. These evaluations considered, for instance, the presence in each country of companies from abroad, as well as the presence of national companies in other countries, and so allow the analysis of how disseminated are the global engineering activities in the country, considering the industrial activities (production) or those in the services sector, considering aspects like design and maintenance, among others.

Figure 1 – “Global Engineering Excellence” Initiative Logo



Using a similar approach, it has been evaluated the insertion, influence and respectability of each school in the international academic world. Of particular importance were the considerations about the actions and programs developed by these universities aiming to offer better opportunities to the students, when taking the global work market into account, and not only the local one. In this sense, with a few punctual differences in how to achieve a higher international level, all schools shown to give high importance to this matter. Escola Politécnica has, already for some years (and more intense since 2000), various academic interchange programs, at undergrad level, notably with European schools (showing up France, Germany, Italy and Spain), including many double degree agreements.

The barriers and recommendations were organized considering the following groups involved in the educational process of an engineering student: universities, companies and government. The main identified barriers, with the correspondent recommendations were:

- Preparing a student for the global practice is not seem as a mainstream in the education of an engineer: uni-

versities and engineering programs need to integrate, completely, studies and international experiences in their under-graduation programs;

- International mobility remains a challenge: problems involving visas, costs, cultural barriers, languages, curricular structures, national financial restrictions and other factors are challenges that must be overcome to achieve truly international cooperation;
- There is a lack of substantial partnerships between companies and universities with long term compromises: increasing the number of global engineers will require partnerships with such characteristics and purposes;
- Most international programs do not have a rigorous evaluation about their educational impact, performed with refined assessment of their structures, purposes and results: most programs are seriously conceived and prepared, and carefully implemented, but it would require a more rigorous assessment, using scientific methods to evaluate the educational impact; involvement of governmental agencies and participation of industries are essential in this process;

The results of this study were published as a catalog (resume), book and expanded book, which adds to the previous a set of data obtained during the study, and presented mostly as tables and graphics. All three forms are available in the project web-site: <http://www.global-engineering-excellence.org>.

GLOBAL ENGINEERING INTERNSHIP PROGRAM - GEIP

As consequence of the previously described work, a first program has been proposed, to implement an action to respond to the study own recommendations. The proposed program was an international internship, GEIP, with a co-participation of Continental and the universities of this consortium (with a few changes, due to different interests of some participants), with the purpose of offering an special internship program, not just an international one, but a program where universities would be deeper involved, and where interns could meet all together with universities and companies representatives in a workshop. The members of the first year of this program were:

- Eidgenössische Technische Hochschule Zürich – ETH-Zürich, Switzerland
- Escola Politécnica da Universidade de São Paulo – EPUSP, Brazil
- Georgia Institute of Technology – Georgia Tech, USA
- Massachusetts Institute of Technology – MIT, USA
- Shanghai Jiao Tong University, China
- Rheinisch-Westfälische Technische Hochschule Aachen – RWTH Aachen, Germany
- Tsinghua University, China

The GEIP main goal is to offer to students from the participating elite universities the possibility to take part in an international internship, with a strong global context, giving them better conditions to perform well when working in the global economy. The internship has been conceived to give the students the opportunity to interact before, during and after their stay in the industry, in a process that takes approximately one year from the very beginning up to the end. This means that the process is composed by activities requiring presence in real (internship and workshop) or virtually (internet meetings, email exchange, participation in virtual societies as face book). Furthermore the internship must be conducted abroad, and although many students have their internships in different periods of the year, at different places, and on different subjects, they all must cooperate through the GEIP network during the whole year. It is worthy to highlight a distinctive aspect of the program: it brings to an international internship the understanding of its insertion in a global world, as part of a global project in a global company.

The implementation of GEIP, whose first group was in 2008, has been conducted in the following way. Initially different internship models have been studied, considering the coordination of places and periods where they could be conducted. And very early it was noticed that there would be no way to ensure that all students could perform their internships in the same period, since there were dependencies on the periods when these internships would be announced as well as the periods when the students could attend. It would be even more difficult to conciliate all calendars, which are quite different from each other. The same applied also for the subject and local where the internship could be done, depending on opportunities offered by different departments of the company worldwide, and on the interests of the students. So, an on-going model was presented and taken. The company announces in a GEIP web-site all internships, as soon as they come. The students visit this site continuously looking for interesting opportunities. On different time-frames the universities conduct a local pre-selection of the students, announcing this

intern process to their students, who apply based on their interest. The names of the pre-selected students are sent to Continental, that forward these names to the corresponding departments for interviews. Finally the selected students are informed, and a contracting phase is started. There is a reference number of places that should be offered annually to each university, as a function of the total number of internship places associated to this program.

A website has been conceived to be the operational environment to support the program: <http://www.gee-geip.org>. Besides providing information about the program, oriented to a diversity of publics (students, schools, companies), the website serves effectively as a virtual environment for interaction and development of integration activities. Each student participating in GEIP has an account in this site, through which he/she can interact with peers, exchanging experiences, evaluating the program, being evaluated by the program, among some other activities performed in this platform. One of the main advantages of such type of technology is to facilitate enormously the spatial-time integration, allowing students at different moments (before, during or after their internship period) and from different places (home, their university or at the company) to talk and work cooperatively on questions related to the internationalization of their own internship activities.

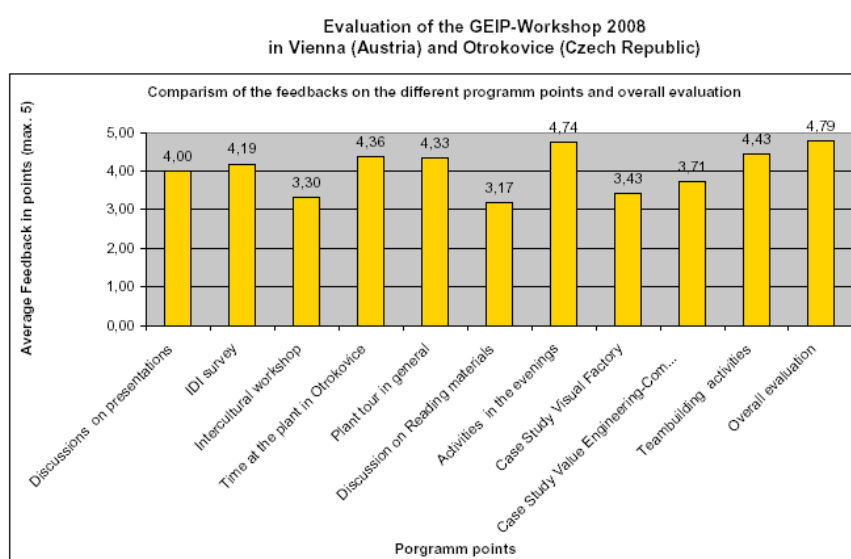
There are also some recommended texts, selected to give the students a good overview of globalization aspects, as well as about project management and inter-cultural development in engineering. The texts, which must be read, were:

- The world is flat
- The new titans
- The challengers- Emerging-market multinationals.
- U.S. DoD Extension to PMBoK®Guide, 2003. Section I: Chapters 1 to 3.
- Is your team too inward looking?
- Cultural dimensions

The internships took from three to six months. In this period the students worked in an industry project, performing simultaneously GEIP conceived activities, some of which have been proposed to give the student better conditions to understand and to reflect about the relationship of his/her work in the company and the global links of such work.

The integrative workshop is an event proposed to allow the presence meeting of all GEIP participant students in each period (every year), independently from where and when they have done their internships, in order to be able to debate their expectations and report their achievements, results and experiences, and therefore strengthening the GEIP networking (students, university advisors and industrial supervisors). The first workshop was held in Vienna, Austria, with a two days visit to the industrial tires plant in Otrokovice, Check Republic, during a week in July 2008. Figure 2 presents a consolidated evaluation of the students to the various activities performed during this workshop.

Figure 2. Evaluation of the GEIP-Workshop 2008



In the sequence, as example, are presented parts extracted from the internship reports presented by the four engineering students from Escola Politécnica that attended GEIP in 2008:

“... I consider the GEIP and its internship as one of the most important experiences for my engineering career as well as my personal life. It gave me hands-on experience on how to live and work in a very different cultural environment. Besides daily contacts with the German people, I also met lots of people from other countries (other students from GEIP, colleagues from the German class, etc.)”

“...I would like to thanks my colleagues for their patience in teaching me a lot about cars and its components (a car is much more complex than what I have ever imagined)”

“...I would strongly recommend this program to all engineering students who want to build a career inside an automotive company such as Continental. It is also a chance to improve their language skills and to gain international corporate experiences.”

CONCLUSION

The initiative *Global Engineering Excellence* (GEE) has allowed the participants to study the globalization impacts on engineering in a wide sense, and particularly on engineering education. Its internship program (GEIP) completed its first year with success, measured by the reports from the participating students and respective supervisors. In 2009 a second turn is running, simultaneously to a review and improvement of methodologies and operational procedures.

The already achieved results are promising, stimulating the participants to continuously support and strength the program network, considering the inclusion of new members, the consolidation of the already established programs and the proposal of new programs and activities, as part if this initiative, which might improve the education of engineering students in an international sense, aiming to give them better conditions to perform well in the new contexts of the global economy.

The coordination of this initiative started with the Technische Universität Darmstadt (2005-2006), followed by Georgia Tech (2007-2008), being currently with Escola Politécnica da USP (2009-2010).

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