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Experience-Based Courses in the Product Management Specialization of the Engineering Management Bachelor Program

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The Engineering Management program at the Budapest University of Technology and Economics integrates engineering, business, and management knowledge into a curriculum. The program combines breadth of knowledge of general engineering with depth of business and management disciplines. Students achieve depth of knowledge by acquiring a formal module in a selected specialisation program in the last 2 semesters of their studies.

At the beginning of the above mentioned 2 semesters, students' learning environment decreases from a large number (150-250 students) to a smaller group (approximately 25-40 students). Teaching methods also have to be changed from frontal lectures with great headcount to practical and more personal smaller courses. Previously acquired economic and technical knowledge is transposed to "reality" by conducting a research or a project in a real working environment. The name of our specialisation program is Product Management which refers to students working together with a product manufacturer, developer or a distributor company

Courses require special and wide range of teaching methods. We apply training techniques, combined personal consultations, case study solving, practical lectures mixed with minor theoretical frontal teaching. Teachers develop students' ability as well as social skills, in order to prepare them for the private sector (for example presentation technique, teamwork etc.). Reaching good performance in the Product Management specialisation sets a great challenge to the students: they need

- to find a company and then to build relationship with it,
- to communicate and to bridge the gap between the company and the scientific expectations of the university,
- to manage own resources and time,
- and to solve new problems.

This article summarizes and shares more than 400 graduated participants' perception and 10 years of teaching experience.

Introduction of the Product management modul

In Hungary 'module' refers to specialization (one of the units that together make a complete course). Before 2010, the program lasted 10 semesters, out of which the last 3 terms were the so-called modules. In 2010, the Bologna system was introduced by the Budapest University of Technology and Economics. At the present time, the Engineering Management Bachelor program takes 7 semesters long, and the modules last 2 semesters. Students can choose out of four modules, which are the following.

- Management (includes marketing, leading and organizing, human resource, production and chain management, and quality management)
- Environment Management
- Financial Management
- Product Management

Students' decision is influenced by two main factors: the personal professional interest and the reputation of the modul. Our modul is publicly known that it requires a lot of effort and work such as mandatory attendance at lessons or working in a real company area. Despite of the great challenges, a large proportion of students choose us as you see below.

Table 1. Data about the program and the students' choices

Period:	2003-2006 (mean)	2007-2010 (mean)	2011-2017 (mean)
1. number of modules	7	6	4
2. number of students in Engineering Management program choosing module	139	179	117
3. average number of students per modules	19-20	29-30	29-30
4. number of students choosing Product Management Program	28	34	38

Table 1 contains the main data from 3 periods. The first period (2003-2006) and the second period (2007-2010) were the traditional, 10-semester-long Engineering Management Program. In the third period (2011-2017), during the Bologna system, more students chose module than earlier. As you can see in the third and fourth lines in Table 1., more students chose Product Management module than the average numbers of students per modules during every periods. One of the reasons of the

successful result is that students believe that our module is real life-like and they are able to enhance skills which help them be successful as employees. One of the reasons of the successful result is that students believe that our course is in touch with real life and they are able to enhance skills which help them be successful as a workforce.

Students as future workforce

First of all, we summarize what skills are the most essential for the students in order to be effective and well-paid employees. It is important, that our expectations for students should not be contrived autocratically, but so that they meet the preferences of the market. By means of doing so, the gap between the skills learnt at the university and those which are really used and paid in the real market can be narrowed. According to the report of the World Economic Forum (2016a), the following skills are needed beyond traditional skills (such as numeracy, ICT literacy, scientific literacy etc.), to succeed in the evolving digital economy: problem-solving, collaboration, communication and creativity.

After overviewing 213 studies, scientists determine that the skills developed through social and emotional learnings result in more remarkable accomplishment and long-term benefits, such as higher rates of employment and educational fulfillment. Beyond having the abovementioned competences, students have to be adaptable, initiative, persistent, socially and culturally aware and have to have leadership skills in order to hold on as future employees.

According to another study of the World Economic Forum (2016b) 371 leading global employers were asked about the changes they realize in work force, and more importantly, which skills are competent nowadays on the labor market.

Table 2. Top 10 skills in 2015 and in 2020 (Source: 2016b)

TOP 10 SKILLS	
<i>in 2020</i>	<i>in 2015</i>
1. Complex Problem Solving	1. Complex Problem Solving
2. Critical Thinking	2. Coordinating with Others
3. Creativity	3. People Management
4. People Management	4. Critical Thinking
5. Coordinating with Others	5. Negotiation
6. Emotional Intelligence	6. Quality Control
7. Judgement and Decision Making	7. Service Orientation
8. Service Orientation	8. Judgement and Decision Making
9. Negotiation	9. Active Listening
10. Cognitive flexibility	10. Creativity

All in all, we can it can be stated that social and emotional skills need to be part of the education system (beyond theoretical knowledge) so that graduated students can be successful and effective as future employees.

The above mentioned approach is affirmed in a recent Hungarian article (Sebők, 2017). According to that article, soft skills (such as adaptability, self-esteem, independence, proactivity and cooperation) are also required beyond hard skills such as professional competence, language knowledge, work experience, etc. that are almost expected. The employers search for those good at problem-solving, who can find creative answers to challenges. It is essential above all that beyond having basic professional knowledge young employees should be motivated, eager to learn new things and can easily integrate in new communities. The above-mentioned skills are the most essential competences nowadays. In the following we introduce how our courses integrate this approach.

The teaching philosophy of the modul

The aim of the modul is to increase general knowledge, and moreover, to foster students' curiosity, interest, and motivation. Students leaving courses or missing lessons are actual problems faced by teachers, therefore there is a five-hour-long Project Exercise session which is used for teambuilding, too. Those occasions provide opportunity for the students to

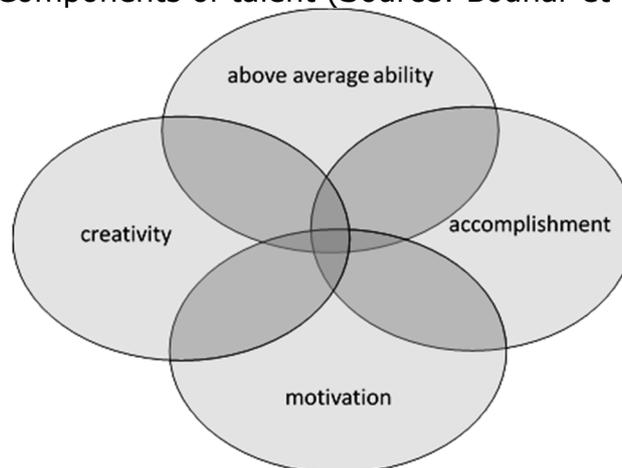
connect to each other and to get involved with teamwork. The members often go through recognizable stages as they change from being a collection of strangers to a united group with common goals, therefore our practises follow and ensure forming, norming, storming, performing stages. The Product Management students have to deal the following difficulties:

they need to to choose their diploma topic,

- to find a company,
- to specify their topic,
- to choose proper research questions,
- to make their research plan,
- to consider and optimize their resources,
- to make empirical research,
- and to summarize the appropriate conclusions.

During the semester, exercises follow each other one by one in order to decrease students' tasks, moreover, the stress. Kotter (1999) argues that it is essential to seek success throughout the process and to celebrate them in order to achieve changes. In our course, we focus on changing students' attitude: at first they are passive due to previous frontal lectures with great headcount. We aim to make them be independent, creative, proactive, and better problem-solving participants. During the practises students are emotionally and physically secure. It means that we build an atmosphere where effective feedbacks are welcome and we let the students experience success, too. According to many researches and theory, Bodnár (2014) says that talent - independent from the age - consists of the following elements.

Figure 1. Components of talent (Source: Bodnár et al., 2014:8)



Talented students have more abilities, knowledge than the average, because in Hungary only they can get into the Technical Management program due to high entrance points. When they apply for the specializations, only those can get into their first choice, who have high cumulative average, so that works as a filter, too.

Because of the above-mentioned, our attention is rather on the other three components: creativity, motivation, and accomplishment. Our goal is

to provide Product Manager students with opportunities to evolve their talent.

In the subject called Project work, students meet exercises through which they can enhance their creativity. They always get some help but not ready solutions, in order to force them to use individual and original ideas. Flexibility (as one of the main characters of creativity) appears for example in the diversity of the methodologies that students have to know and use. Those methodologies include focus group analysis, Q-methodology, eye-gaze tracking, projective technique etc. Another aspect of flexibility is that they have to meet requirements of the university and of the company at the same time.

In the course 'Project work' they have to use their creativity to create something from pieces of information. In order to achieve that, we introduce them various creativity tools, such as mindmapping.

Students' motivation is approached by different angles. First of all, all tasks are challenging but reachable at the same time. On the one hand, students are told the purpose of what they need to do, what the aim of the exercises is. On the other hand, the practical lessons and the methodologies are diverse but not explained thoroughly. As a result, students' curiosity can be kept high.

Our experience is that students - who are used to frontal lectures - enjoy and appreciate self-experienced methodologies, moreover, they find their motivation and get easily involved. The empowerment manifests itself - among others - for example in the fact that students are free to choose their topic of diploma work. This results in that students are more involved; moreover, this approach helps them discover their intrinsic motivation.

Beyond creativity and motivation another very important part of talent is the accomplishment. Evolving talent is not possible without producing something real or creating something with no existing specific solution. We assure those with handling the exercises iteratively. After the theoretical summary and self-experience based and experimental lessons, students have to show their half-ready papers. They are given very precise feedback and developmental proposals in order to advance their thesis.

The diversity of the methods was already mentioned, meaning that we employ various teaching techniques for example drama and movement games. The exercises usually have to be solved either in pairs or in trios, sometimes in small groups. Students form a group/pair etc. either at random in order to work with different people, or they are asked to do an activity with someone they know in order to deepen their relationship. In some cases the forming of the group is guided so that the students can help each other since the topic of their thesis is similar, or their personal characteristics suit.

Continuous development

Well-crafted, continuous development is important, because it delivers benefit to education. It ensures that students' capabilities keep pace with the current standards and maintain and enhance their knowledge and skills. In order to keep students' knowledge relevant and up-to-date, our courses and teaching methods have to be renewed from time to time. We have to be aware of the changing trends and directions. Therefore our graduating students are asked to fill in an online questionnaire. The feedbacks are taken seriously and we focus on finding new solutions for the mentioned problems.

One of the changes is the freedom of choosing the topic of the thesis. As it was mentioned before, it helps students in many ways: they are more obligated, and, not lastly, more enthusiastic. However, difficulties occur at the same time: students have to get and then keep in touch with a company. According to the feedbacks, the number of those experience-based lessons should be increased, in which students have the opportunity to acquire skills such as debate techniques, problem-solving, goal-orientation, growth mindset, etc.

Students helped us find the optimal ratio of consultants to their supervised students, too. Based on the feedbacks and colleagues' experience, it is advisable to create a learning group of five attendees. On the one hand, approximately 80% of the students' questions are the same – that way the consultants can save time and energy. On the other hand, students can help each other with ideas, solution tips, moreover, the fact, that they see how others get on with their work, can encourage, motivate them. The learning group members reported that they learned a lot from each other, especially tacit knowledge.

In the future, we focus on developing more soft skills. As the world changes, so do students' personalities, motivations too and education has to adapt and keep pace with it.

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