

THE IDEA OF CREATIVE WORKSHOPS AS AN INSTRUMENT OF AN ENGINEER'S EDUCATION IN THE CREATIVITY-BASED ECONOMY

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Abstract: *The purpose of the paper is to identify the role of the engineer in the evolution of the market economy. This identification made it possible to present the engineer's new roles in the creativity-based economy emerging in the first decade of the 21st century. These roles require changes in the widely understood engineering education process. We believe that one of the fundamental tools in this education should be a creative workshop, being the space for shaping innovative, enterprising and social competences, attitudes and behavior. The evolution of the engineer's role is the natural consequence of changes taking place in the economy. More and more significance in various domains of the economy is played by information techniques, the transfer of technology, integrated management systems, the need to increase quality and productivity as well as the workplace culture. This evolution forces the need for a comprehensive education for engineers who will have a substantial impact on the level of innovativeness and competitiveness of the Polish economy.*

KEY WORDS ENGINEER, EDUCATING, MARKET ECONOMY, ENTREPRENEURSHIP, CREATIVITY

Introduction

The dynamic changes in the global economy result in the need for a new outlook on the engineer's role and tasks in a company. Research conducted between 1986 and 1993 in the group of 15,000 managers from various countries shows that engineers in the USA and in Great Britain were not a group actively participating in the management of companies and their impact on the workplace culture - as compared to lawyers and economists - was significantly lower than it could be expected. In turn, engineers in Germany, the Netherlands, Sweden and Japan – due to historical and economic conditions, were the dominant group and had a substantial impact on the workplace culture and environment¹. It turns out that the future engineers in these countries received managerial knowledge in the process of education – apart from technical knowledge. The education of engineers-specialists focused only on production processes and hard skills was recognized as a unique relic. Therefore, the problem of the managerial preparation for engineers is still valid, also with regard to Central and Eastern European countries, especially those that went through political and economic transformations in the 1990s. Poland belongs to this group of countries that began the process of creating foundations for the creativity-based economy. The determinants of this new concept of economy emerging from the knowledge-based economy include: the creative class, *smart technologies* and the tolerance towards diverse attitudes and behavior².

The purpose of the paper is to identify the engineer's role in the evolution of the market economy. This identification made it possible to present the engineer's new roles in the creativity-based economy emerging in the first decade of the 21st century. These roles require changes in the widely understood engineering education process. We believe that a creative workshop should be one of the fundamental tools in this education, being the space for shaping innovative, enterprising and social competences, attitudes and behavior. The evolution of the engineer's role is the natural consequence of changes taking place in the economy. More and more significance in various domains of the economy is played by information techniques, the transfer of technology, integrated management systems, the need to increase quality and productivity as well as the workplace culture. This evolution forces the need for a comprehensive education for engineers who will have a

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From mass production to mass creativity

Requirements set for engineers by contemporary companies are completely different than those formulated by industrial companies in the 20th century (see Table No 1). They are manifested on the background of new phenomena in the economy, such as: the growing importance of ethics and responsibility, working with people in decentralized management systems (network structures), shorter and shorter as well as faster and faster life cycles of products, production diversified to the maximum etc. In this situation, it seems justified to pose a question about the engineer's education model which needs to meet new requirements in the creativity-based economy, also market requirements. In practice, this means extending the technical education (age of mass production) and the economic education (age of mass marketing) with creative, enterprising and innovative content (age of mass creativity).

¹ Ch. Hampden-Turner, A. Trompenaars, *The seven cultures of capitalism, Value system for creating Wealth in the United States, Japan, Germany, France, Britain, Sweden and Netherlands*, Charles Hampden-Turner, 1993.

² These determinants were specified in the works by R. Florida. (See R. Florida, *The Rise of the Creative Class*, New York Basic Books 2004; R. Florida, *The Flight of the Creative Class*, New York Harper Business 2005).

Table No 1. Features of development phases in the market economy

PHASE OF DEVELOPMENT	NATURE OF THE MARKET	NATURE OF COMPETITION	DOMINATING ROLES OF ENGINEERS
Age of entrepreneurship until 1900	Exceptionally receptive, but with poorly stimulated needs. Stimulated needs on the basis of inventions from the 19th century.	"Predatory" competition, aiming more at domination or stealing the competitor rather than at direct meeting on the market.	Engineer inventor
Age of mass production 1900-1930	Receptive and hardly discriminating market with regard to the diversity in the utility parameters of products and services. Pursuit of the satisfaction of basic needs	Boundaries of industrial activities are clearly identified. The winner is the one who offers the product for a lower price (production line). Pursuit of achieving the benefits of a large production scale (<i>Economics of Scale</i>).	Engineer specialist, inventor
Age of mass marketing 1930-1960	Demand close to saturation. Customers demand the satisfaction of more sophisticated needs. Market segmentation appears.	The emergence of sales focus. Growth in the importance of distribution, market research, promotion and advertising.	Engineer designer-salesman, specialist, inventor
Age of mass customization 1960-2000	The emergence of wealth on the market. Customers demand diverse products, even within specific market segments.	Cost competition loses significance for the benefit of capacity and the speed of adjustment to changes on the market (operational flexibility). Focus on the economics of a group of goods (<i>Economics of Scope</i>). Growth in the importance of symbols, brands, signs.	Engineer manager, specialist, salesman innovator, stylist
Age of mass creativity from 2000	Development of economy on knowledge and creativity. Development of <i>smarts products</i> . Socially responsible company. Protection of intellectual property.	Turbulent changes in the environment. The competition moves to the area of innovations and skills, creating new market niches and their deep penetration. Competition - <i>winner takes all</i> . Global, glocal and local strategies.	Engineer manager, specialist, salesman, innovator, stylist, entrepreneur, creator

Source: prepared by the author (columns 1-3 were prepared on the basis of Ansoff H. I., *Strategic Management*, Macmillan, London 1984).

In contemporary circumstances, it is necessary to educate not only engineers-technical specialists, designers and salesmen, but also engineers-creators and engineers-entrepreneurs. Such education requires the search for new forms of education at technical universities. According to the authors of this paper, one such form is "*the creative workshop*" which creates the space for confronting theoretical and practical content, confronting individual and team work, as well as is a place for creating social responsibility and the formation of new, creative concepts and values converted into new products, technologies and start-ups.

Creative workshop as an instrument for engineers' education at the Wroclaw University of Technology

The problem of engineers' education in the field of entrepreneurship is truly complex, requiring introduction of practical elements linked with theoretical issues.

Experience-based teaching methods are crucial for developing entrepreneurial skills and capabilities. Traditional teaching methods (e.g. lectures) do not match entrepreneurial thinking development. Approaches involving more interactive teaching (workshops, laboratories projects, interactive games), with the teacher being a moderator rather than a traditional lecturer, are demanded. Entrepreneurial skills rely mainly on crossing boundaries between disciplines, multi-disciplinary cooperation and collaboration with entrepreneurs.

The first attempts of the WUT in this respect are highly

satisfactory, due to the achieved results and benefits. (i.e. regional project "Shaping creative market attitudes in engineer education in the years 2010-2011"). Entrepreneurship knowledge is demanded among students. We believe that an effective solution to this problem is launching, for all WUT students, a creative workshop for shaping innovative, entrepreneurial and social competences, attitudes and behaviours.

Therefore, we offer introducing creative workshops to the engineers' education system. We treat them as a space for shaping innovative, entrepreneurial and social competences, attitudes and behaviours of technical students. Validity and usefulness of organizing such workshops were evaluated in a survey. The survey was to identify the degree of demand and preferences for such education among students and employers. The first – pilot study covered a group of 30 WUT students, and a group of 24 Lower Silesian employers. Survey interviews were conducted in June 2015 using CAPI methodology (Computer Assisted Personal Interviewing), - a variety of classic questionnaire survey (PAPI) in which a paper questionnaire is replaced with a laptop.

Validity was assessed according to needs' measurement principles, with three degrees of observing the examined phenomenon:

- level of needs of a statistical individual (in our case - a student)
- level of needs of a population (all students)
- level of needs of the population's environment (employer's expectations for a student as a future candidate)

An adequately designed questionnaire helped obtain information as to:

- technical university graduate's profile,
- graduate's skills expected by employers,
- methods of recruiting graduates,
- evaluation of current WUT educational programs,
- proposed modification and changes in the WTU curricula.

The survey results expressly indicate consistency of assessments of individual needs and environment's needs. The analysis indicates the need for radical changes in the university's education system, especially as to the issues of curriculum changes.

The most relevant and effective teaching tools/methods for programmes and subjects related to entrepreneurship, in particular for non-economic major students, are those based on "group and team techniques of generating new business ideas" and on "case studies". Considering the results of the surveys conducted among entrepreneurs, apart from the above tools, also "workshops on business plan preparation" (partially consistent with the first proposed category, confirming selection of group techniques and brainstorm, as well as new ideas' creation) "inviting guest speakers" (entrepreneurs) and "business simulations" prove effective.

The workshops prepared by us rely on the above methods, and we also highlight effectiveness of methods based on undertaking certain practical business activities, as well as creative exercises for development of ideas. In our opinion, traditional teaching methods are not synchronized with development of entrepreneurial features and attributes. On the other hand, multi-disciplinary cooperation is vital in building entrepreneurial capabilities. These unconventional or untraditional methods of education of students of WUT are treated by us as a tool for shaping

active entrepreneurial attitudes and behaviours. Such attitudes and behaviours meet expectations and needs of the labour market, not only in Lower Silesia.

Conclusion

Analysing the data from the survey, we recommend our workshops for crossing the boundaries between disciplines, and as a form of a team work. We intend to teach entrepreneurship by connecting students of economic and non-economic majors. Considering the employers' opinions obtained in the study, we would like to direct workshops participants to work on real business ideas. Our point is creation of a new learning platform through practical learning of management skills in cooperation with leading innovative companies and entrepreneurs in Lower Silesia.

Literature:

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