NEW TRENDS IN GLOBALIZATION OF SCIENCE AND ENGINEERING EDUCATION

N.D. Turgunova

Scientific Supervisor: PhD. A.N. Aleinik

Linguistic Advisor: PhD. V.V. Verhoturova

Tomsk Polytechnic University, Russia, Tomsk, Lenin str., 30, 634050

E-mail: ousa@rambler.ru

Annotation

Three decades ago most research and design were conducted in each country independently. But the world has become quite different since then. Global changes in technology and society changed the concept of an engineer. There is the need for engineers who can work effectively in changing global and technical environments. Less interest has been paid to the globalization of science and technology. This article reviews the stimulus, that impact the engineering profession and gives the recommendations concerning the profession of engineering, the technology and innovation.

Introduction

Globalization may be thought of initially as the widening, deepening and speeding up of worldwide interconnectedness in all aspects of contemporary social life, from the cultural to the criminal, the financial to the spiritual [1]. The impact of globalization on the economy and culture is immense. It can be seen in the manufacturing sector, finance and energy. Foreign investments and ownership of business operations in many countries are growing. The world's economy is driving towards multinational corporations. The competitiveness shows significant changes in economy resulting from increasing globalization. The United States is today a net importer of high-technology products. Its trade balance in high-technology manufactured goods shifted from plus $54 billion in 1990 to negative $50 billion in 2001 [2]. Engineering education must not only face the challenges in a global business but it must also cope with cultural changes. Innovation is based on collaborative knowledge and global knowledge sharing. With the rapid change of technology, profession boundaries have become wider. Integration in technology and engineering has become very important. Pool states, "Look closely at any technology today, from aircraft to the Internet and you'll find that it truly makes sense only when seen as part of the society in which it grew up"[3]. Demographics and rapidly evolving technologies are the most driving forces in the role of engineering in society. Rapidly changing technology requires far broader skills than simply the mastery of scientific. Thus, the students are beginning to understand, that the changes will provide opportunities in their careers. As a result, the education must prepare the students more effectively. The importance of national security demands a new priority for engineering research. But the students are less interested in scientific and engineering careers nowadays. It raises serious problem about current approach to engineering.

Globalization and Engineering Technology

The engineering technology education mainly includes the usual skills in writing, oral communication, science, math and technology. The most modern practice today could be obsolete in the nearest future. So it would be more important to teach students how to implement new technologies, rather than teaching them

the current technology. The graduates must be competent in nanotechnology, green manufacturing, renewable energy, biotechnology, or some other yet undefined technology. More over, the skills have to be transferable from one industry to another. In addition to technical skills, experiences in entrepreneurship and leadership is very important. Educational programs must share the relative importance of fundamentals, technical specialization and other non-technical skills. Education at least as delivered by most of the nation's colleges, universities and technical schools is no longer quite the economic cure-all it once was, nor the guarantee of financial security [4]. The engineering education needs a fresh start and teaching engineers to think, in the broadest, cross-disciplinary sense, is critical [5]. Consider, for example the changes in the training programs of one the largest universities in the United States, Arizona State University (ASU). Within ASU, the Center for Asian Studies hosts a plethora of activities, including teacher training, curriculum development, public symposia and exhibitions related to global/Asian issues. In particular, ASU's presence in China is intended to "secure a unique and enduring niche in higher education, research and policy in China," with projects and partnerships in 11 different Chinese cities and regions [6]. Students from Peru, Thailand, Taiwan, Mexico and India continually interact with US-born students, creating a living presence and awareness of globalization within the department on a day-to-day basis.

India started construction of new institutions two decades ago to build a chain of Indian Institutes of Technology, that now produce the talented scientists, engineers and managers. China's leaders, while starting only a decade ago, are more focused to train young people in the science and technology skills necessary to produce world-class scientists and engineers. Perhaps because Chinese leaders have backgrounds and experience in science and engineering themselves (unlike American leaders, most of whom have law and business backgrounds), they also place a far higher priority on engineering research and education [7].

Results

Modern economy is a knowledge-driven. Advantage in technological innovation requires leadership in engineering research to bridge scientific discovery and practical applications. It follows that engineering education must exploit knowledge and technological innovation. To compete with talented engineers in other nations the beginner must be able to add significantly more intellectual span than his counterparts abroad. It is very important to elevate the status of the engineering profession and to attract outstanding students. Therefore the universities must provide the opportunity for significantly broadening the educational experience of students. More over the engineering profession must achieve the higher status such as law and medicine. To achieve these, some objectives for engineering practice and education must be performed.

1. Engineering societies should strive to create a guild-like culture in the engineering profession to react to market pressures.
2. It is very desirable, that the government launch a number of Discovery Innovation Institutes at universities to link fundamental scientific discoveries with technological innovations. This will allows to build the knowledge base for new products, to meet the needs of society.

3. The higher education working closely with industry should offer practice-based opportunities for the post-baccalaureate level as the entry into the engineering profession. Undergraduate engineering should be reconfigured, providing the students with more flexibility with the goal of preparing them for a further learning rather than professional practice.

4. Because of rapidly accelerating technologies it is essential to create lifelong learning approach for practicing engineers. This will require a significant commitment by educators, employers and professional societies.

5. It is very important to bring all resourcesin the engineering community to achieve a racial, ethnic and gender diversity.

Conclusion

Globalization appears to be complicated in many respects. Economics calls for leaders who are able to understand design, operations and supply chain systems. The students must have the thinking abilities to assimilate data and information from multiple sources to make wise decisions. But academia does not change easily. There is the need in an understanding of what to change to. All these actions will meet resistance from many companies, because they continue to seek low-cost engineering talent. Unlike the professional guilds that captured control of the marketplace such as medicine and law the great diversity of engineering disciplines continues to generate a conflicting objectives that inhibits change.

References

1. Manfred Steger Globalization: A Very Short Introduction Third Edition 2013 p.176.

2. Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Future, Committee on Prospering in the Global Economy of the 21st Century: An Agenda for American Science and Technology, National Academies Press, 2006, pp 13.

3. Pool, R., (1997). Beyond Engineering: How Society Shapes Technology. New York, Oxford University Press.

4. Gosselin, P.D. (2006). "That Good Education Might Not Be Enough,"latimes.com, March 6. http://www.latimes.com/news/nationworld/nation/la-na- outsource6mar06,0,4152173.story?coll=la-story-footer

5. Grasso, D. (2005). "Is it Time to Shut Down Engineering Colleges," http://www.insidehighereducation.com/views/2005/09/23/grasso, 23, September.

6. ASU in China, http://www.asu.edu/china, accessed 3-17-2006.

7. Friedman, Thomas. The World Is Flat: A Brief History of the 21st Century. New York: Farrar, Strauss and Giroux, 2005.