Global Entrepreneurship Education for Engineer: Convergence of Technology, Law, and Business

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Abstract

In the technology driving modern society, the role of engineer has been drifted from the researchers in the laboratory to the responsible figures in the society. Society asks engineers their needs of social justice and ethics, uniqueness of individual customer, and reasonable prices and safety. Furthermore, recent global issues such as the global warming, the energy shortage, and the global economic crisis due to high level of globalization based on information technology are expected to be solved by the future technology. Considering these social needs, revolution of the engineering education has been tried in many ways. Convergence education has been acknowledged as one of promising and revolutionary education method due to its capability to provide students trans-disciplinary knowledge and skills between engineering and management. However, in order to cultivate more socially figured engineers, legal foundation is imperative to meet the ethical and cultural standards. Therefore, in the present paper, a new convergence of technology, law, and business is presented. The main goal of education is to provide entrepreneurship to engineers so that they can build up new company and present their engineering products in the market.
Techno entrepreneur is educated to cross two Death Valleys lie between engineering and cooperation, cooperation and market. The curriculum of global techno entrepreneurship and mentor guided individual production study are presented which have been actualized in the Global EDISON Academy(GEA) in Handong Global University as a one of convergence education for HCERCSE. The paper also provides the method of globalization of the convergence education in line with the activity of UNESCO and UNDP. One year operation of the present program was made successfully and it was found that the present method is very effective to nourish normal engineering students with the entrepreneurship in the global perspective.

Key words
Global Techno-entrepreneurship, Convergence Education, Technology, Business, Law

Introduction

In the human history, there is no such a grand era of globalization like these days. In debt of information and transportation technologies, every individual has been exposed into the globalized world. There are many dimensions of globalization in the globalized world. Geological dimension has been shrinking down as a pro but all kinds of global disasters such as global warming threat individual. Although the recent crisis of global economy enforces countries to reconsider opening their market but more opportunities have been given due to the enhancement of global openness economy. But this global economy enlarges the gap between poor and rich in the world. Technology in the present is also highly affected by the globalization. The innovative progress as shown in the semiconductor industry frequently bursts bubbles leading instability in the social and economic area. Furthermore, we are standing in the middle of cultural conflicts among religions and ideologies. As Mr. Friedman noted, social dimension is getting flat and flat. Therefore, we may say the current world as a post modern or post industrial era. As noted in the Table 1, the present globalized world is distinguished in many dimensions from the previous industrial era and it needs revolutions in every aspect of life. Engineering and engineering education cannot be an exception in the revolution. The

slogans of “mass production based on standardization” in the modern times is now replacing into “prosumer design and production”. The engineering education in the industrial era was targeted to produce engineers for a unit of the engineering process. The engineer needs to be standardized to replace other engineer in malfunction. Mass education and standard curriculum has been made for this purpose. However, in the post industrial era, consumer wants to participate in the design and production of their goods to make them unique which is the core value they are searching. In terms of economy, this new target of engineering is very tough to achieve. Therefore, we need revolution in the engineering education.

The present paper is prepared to introduce a new engineering education to provide engineers the global entrepreneurship(we can call it global techno-entrepreneurship). In order to explain this global techno-entrepreneurship, I will briefly mention globalization, entrepreneurship, and techno entrepreneurship. In order to achieve the education of techno entrepreneurship, convergence education among technology, law and business is introduced and simultaneously the need of mentor guided individual education is described. As an example of this specific convergence education, Global EDISON Academy at Handong Global University is introduced with experience. Also, the vision to make global entrepreneur is presented with brief introduction of the Global Entrepreneurship Education Program (GEEP).

Table 1 Pro and Cons of Globalization

Dimension	Pro	Cons
Geological Dimension	Shrink	Global disaster (global warming)
Economical Dimension	Open	Gap between rich and poor
Technological Dimension	Innovative	Bubbles and Energy shortage
Cultural Dimension	Mixing to evolve	Conflict (Terror and War)
Social Dimension	Flat	Flat and Borderless

ENTREPRENEURSHIP

In the process of innovation, the role of entrepreneur is not properly recognized. Especially in the engineering area, the entrepreneurship has not been counted seriously. However, actually, all engineers before 20th century were full of entrepreneurship because they needed to sell their goods in the market by themselves. Engineers like other disciplines opened their own small business and provided services to the customer with their capability. Therefore, every engineer had at least understood their customer’s need to their skin. However, in the 20th century, many research institutes have started to provide engineers stable jobs. It was partially associated with the military needs during the world wars. Some successful mega projects such as the “Manhattan Project” stimulated governments and global companies in the establishment of research institutes. Once engineers hired in a large research group, they do not need to consider the customer and market any more in general. Only the thing they should do is to fulfill the task given by the projector manager. This situation gives engineers a habit to stay in the laboratory and factory. Automation in the production line has also removed engineers from the real world. Therefore, it may not so strange if we say 20th century as the lost century of techno-entrepreneurship. All entrepreneurships were occupied by the business man. Therefore, engineering education in the industrial times has been focused into technology only. It is very safe area because there is no Death Valley to cross.

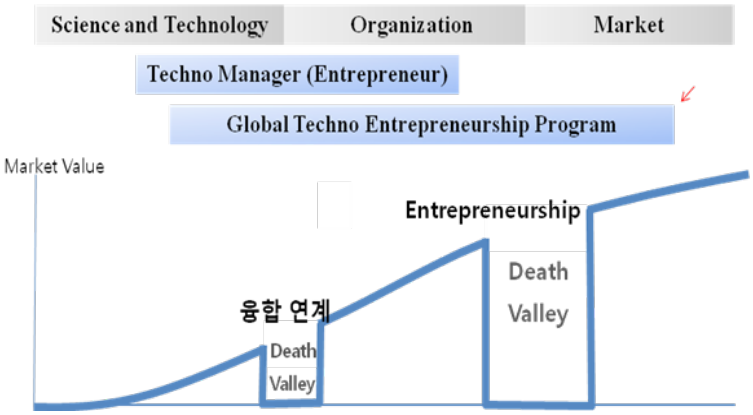
To the merchants, Death Valley is very used area. As shown in Fig1, however, the ancient merchants made a way in the middle of cliff to carry tea and horses. Also Arabian merchants crossed the desert with Camels. They crossed the Death Valley to bring their product into the market and to meet with customers. So we need to check the Death Valley from engineer to customer. If we have such a dangerous Death valleys and that’s why engineer hesitates to

march into the market, we need to introduce the spirit to cross the valley like the ancient merchants.

Fig.1 The entrepreneurship of ancient merchant crossing the Death Valley.

Let us consider the chasm or Death Valley in the process of development, entrepreneurship is key spirit what engineer to have. The first Death Valley do engineers meet, not deep and wide but very horrible to many engineers is the valley between the engineering and management. Basically engineering education is so strong and well designed. So once the student is accustomed in, it is very hard to accept such vague topics in the management. Some students of engineering school ask the governing equation in the management. But it is hard to formulate. Recently techno-MBA programs are designed to make the bridge to cross the Death Valley between engineering and management.

Fig.2 Two Death Valleys in the whole spectrum of innovation



However, the real Death Valley lies in front of market. Even though engineer cross the valley and entered the hill of management, engineers need to cross the wide and deep valley between cooperation and market. In this stage, engineer need to find the financial supporter and simultaneously royal customers. The know-how is not only the braveness but also the knowledge of human and times. It is not so difficult job for humanity division but for the engineers it is really hard part to understand. Therefore, an engineer needs to have the education of law.

As I already mentioned the globalization in the introduction, such an entrepreneurship need to become global, so the role of law education is very obvious. We check the economic dimension and social dimension simultaneously as listed in Table 2. The major tool to cross the death valley are the engineering products at first, business plan to get financial support, and the knowledge of law to set up all activity in the sound legal foundation.

Table 2 Death valleys in the globalized world for engineers

Global Entrepreneurship

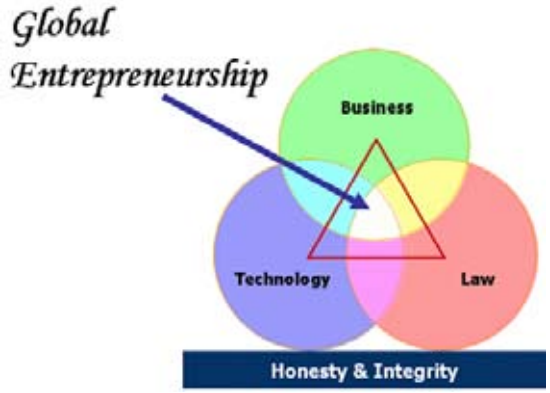
Globalization + Entrepreneurship

Dimension	Product	Death valley	Remark
Geological Dimension	Road Network	Infra	IT & language
Economical Dimension	Global entrepreneur	Credits and budget	Business plan and finance
Technological Dimension	High & Humble technology	Character of Customer	Incubation Education
Cultural Dimension	Beauty	Nationalism	Dignity of difference
Social Dimension	Justice	Competition & corruption	Law

CONVERGENCE EDUCATION OF TECHNOLOGY, LAW, and BUSINESS

In terms of process from idea to market, knowledge needed has certain structure. In the ideation, design, and demonstration stage, engineering rigorousness is essential. However, after demonstrating the engineering ideas, business plan and managing cooperation are crucial. So we may learn such management knowledge when it is needed. However, in the real world, there is no time to study such skills after launching business. Therefore, we need to provide a special education program to change normal engineer into the global techno entrepreneur. As described above, technology, business, and law are essential elements of the entrepreneurial education. Convergence education of three educational elements as shown in Fig.2 is the model what I tried to present. It is not mechanical convergence. It should be chemical convergence. Therefore, we do not need to provide all knowledge of business and law to student. We need to provide all important back bones of business and law for the techno entrepreneur. It is very natural to design the curriculum. For instant, if we simply assume that a student just developed an engineering product and he wish to commercialize. Then at least the student checks whether the intellectual properties of the product is protected or not. The knowledge of intellectual properties needs to be included in the law program. If the student finds the fact that the product is very unique and available for patent, than the student need to prepare business plan. Normally in the engineering school, technical paper or report writing have been emphasized but normal engineering student has no experience of business plan. So the next education after the intellectual property is the writing business plan. However, it needs knowledge of business. Once the students succeeded in writing business plan and it is buyable to capitalists than the student stands in the cliff of Death Valley to the market.

Fig. 3 The convergence education of business, technology, and law for global techno entrepreneurship



However, engineering product need to be carefully educated. Normally, idea of product is too specific to classify into a specific discipline. In general, the product needs knowledge of multidiscipline. Therefore, a specific education method for the engineering product is to be designed. We called it "Mentor guided individual study for engineering production".

MENTOR GUIDED INDIVIDUAL STUDY FOR ENGINEERING PRODUCTION

In the engineering education history, the standard education method is the education of apprentices. Apprentices get the apprenticeship from the Master. Therefore, apprentices get every detailed skills of craftsmanship. However, such an education has been lost due to the mass production of engineers in the engineering school. In order to fulfill the needs of industrial resources, curriculum has been standardized and educational methods were engineered. Therefore, individuality in the education should be trimmed away in the 20th century.

However, the engineer to commercialize the engineering product in the global market needs to keep one's individuality. If not at least one cannot make any success in marketing. Customers in current market always seek something remarkable. Therefore, individual education is essential in the process of engineering production. The process is following almost the standard route: ideation, design, and demonstration.

Students normally believe that they can design engineering product after finishing all courses in the engineering school. Log of knowledge may very helpful in the development but sometimes it disturbs the will to produce. They always concern on their lack of knowledge. However, once the master or mentor guide the student, normally the real problem is not knowledge but the practical skill and will. Mentor senses the character and attitude of Mentee and provide him advise with full of wisdom.

It is not surprising thing that the student with poor score in the traditional mass educational class shows outstanding achievement in the mentor advised individual study. In general mentor also gives a good advice in the preparation of business plan.

EDUCATION OF TECHNO-ENTREPRENEURSHIP IN GLOBAL EDISON ACADEMY

Handong Global University decided to open a new engineering major in the undergraduate school. In spite of success in the industrial reputation, the university wants to give student more chances in the career development. HGU has the ambition to educate future global CEO in the engineering school. They fully understand the merit of convergence education. Also HGU has 10 years experience of double major's education. Double majors provided students niche jobs between two majors. They can be a moderator and mediator between two majors. Sometimes they create new idea because they can see each conflict.

Therefore, HGU introduce the global techno entrepreneurship (GTE) major into the existing double major system. Student has the freedom to choose two majors including GTE major. In this case, one major should be the major in the engineering school. The professor in the engineering major becomes a mentor for the engineering product. However, if the student's vision needs mentor from outside, we allow the mentorship.

The title of EDISON is not the name of the inventor Thomas Edsion, but an acronym representing the educational philosophy of global entrepreneurship:

Fig.4 The acronym of EDISON as the educational philosophy

E : Education of Competent and Honest Global Leadership
Global Vision and World-Competitive, Professional Ability Education
Education of Global Perspective - Communications, Intercultural Competencies

D : Dynamic & Creative Cross-Disciplinary Academic Curricula
Fusion among Technology, Business, and Law with Character Education
Education of Individual Talent and Creativity No Designation of Major at the Entrance: Free Choice of Courses and Double Major

I : Integrity and Uprightness for Sound Character Building
Ethics and Morality Education
Education of Honesty Unsupervised Exam (Honor Codes)

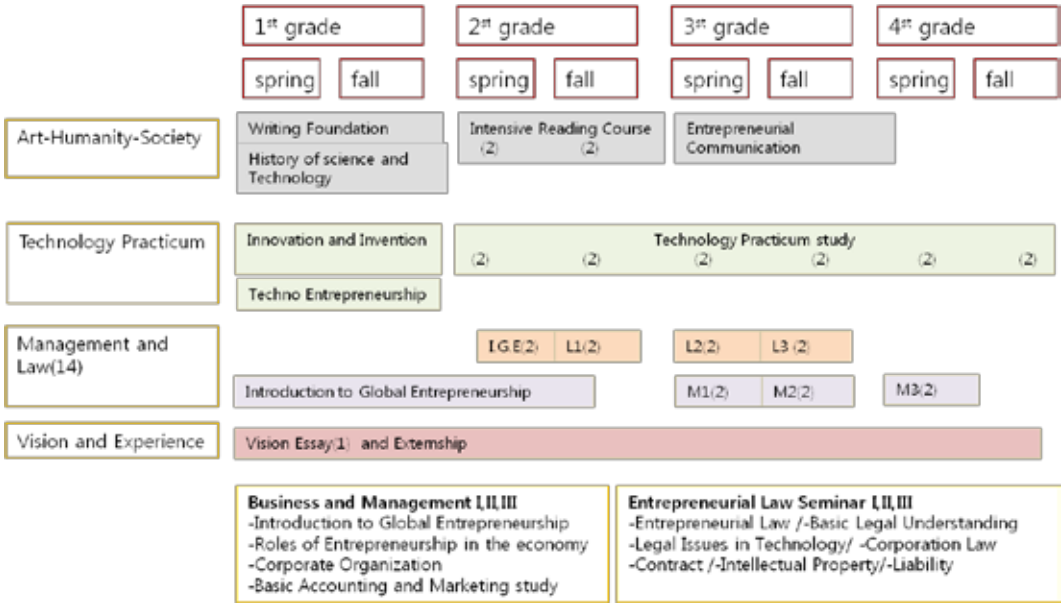
S : Synergistic Outcome through Cooperation
Team Work and Mentorship Education
Education of Community: Dormitory Life Training, Teams with Professor and Team Leader

O : Open and Borderless Global Educational Partnership
Help Capacity-Building for Developing Countries through Education
Oversea Field Research, Handong Discipleship School(HDS) Out-Reach

N : Nurturing of the Whole Person with Comprehensive Worldview
Education of the whole person : Intellectual, Moral, Spiritual
Informing the World for Global Peace and Prosperity

The curriculum is underdevelopment but at the present, GEA open 33 credits for the GTE. Normally, each class has 2 credits which have one lecture credit and one practicum credit. Also, as the graduation condition, each student need to hand out engineering products including product, paper, and patent and business plan.

Fig.5 Curriculum for the Global Techno entrepreneurship



Also Globalization education is specially designed by outreaching to developing countries to find the items to make the global entrepreneurship. A short course of entrepreneurship in the GEA is made to provide the entrepreneurship to the people in the developing country. The Global Entrepreneurship Education Program (GEEP) is designed and supported by MEST of Korea and UNDP. As shown in Fig. 4, the global networking between the developed countries and developing countries are essential global educational system of the present education. At this moment, GEA

has the students of junior and sophomore. Students are very motivated and enthusiastically participate in the class. Also, GEA invited many tech-entrepreneurs in the Colloquium to share the practical entrepreneurship and empower students. In the techno-entrepreneurial practicum, students developed their own products such as bio fuel cell, dye sensitized solar cell, modem for electric communication, etc. However, some students have confusion due to the freedom in the subject choosing. Also, the mixture of technology, business, and law embarrassed them. However, it is the natural stage for the emergence of creativity. Therefore, GEA expects creative product in the near future. In order to evaluate the GEA education, GEA is preparing evaluation program which will be made by the professional education support team in the university.

CONCLUSIONS

In the present paper, the need of entrepreneurship for the engineering students are described in terms of the postmodern times and global world. Since the gap between the producer and consumer is reduced, engineer need to enlarge their working area from the laboratory of factory to the real world including market. Two death valleys lies in front of engineers can be overcome with the techno entrepreneurship which is educated by the convergence education of technology, law and business. Engineering education is made by the mentor guided individual education. It focuses the product. The final outcomes of the techno entrepreneurship are not only the grade but also the paper, patent, product, and business plan. They will encourage student to be future CEO with their product. Also, they can be an innovative member in the exiting company because they understand the whole process of the commercialization.

Innovation of engineering education basically comes from the change of spirit. If we add new spirit such as the global entrepreneurship to the exiting engineer ship, definitely engineering education make something remarkable. In this way, engineers spread into the techno society not in the simple title of engineer, but with various titles society needed.

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