Return to School of Engineering in Korea? 
-Significance, Issues, and Prospect

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1. Introduction

Enter the engineering school in case you cannot enter the medical school? Enter the engineering school without considering about the medical school! There were recent important reports about the status of engineering schools in Korea. The compared average level of Korea SAT(Seolkastic Assessment Test) for the high school graduates admitted by the department of mechanical engineering of Seoul National University(SNU) to those of the local medical schools had been gradually lowered until the year of 2008. After the 2008, however, the average score of SAT of SNU freshmen at the same department has been slowly raised and it was finally reversed compared to that of medical schools located in provinces. Not only the engineering education communities but also the CEO’s of industry, who have been struggling to attract the talented engineering graduates, welcomes this latest news in Korea. There have been the big spiritual climate problems such that many capable students want to enter the medical schools, not engineering schools, just because of high paid and stable jobs.

We believe that there are no ones who claim that the engineering schools do not need capable graduates from the high schools. There are of course enough reasons for it. The experts who have actively participated in their engineering fields after graduation are called as the professional engineers, who are very important persons for the nation’s economic development. The profession in engineering fields is for the job to create the wealth of nation and to maintain the security of the country. Capable engineers are already recognized as the most important group to flower the future food, national defense, environment, and the medical industry. The South Korea lacks of natural resources and the country therefore needs to increase the profits by the corporations which generate the added value by selling the products and systems developed by engineers. The importance of engineers for national security also proved even in ancient times as the King (1162-1227) of Mongolia ordered his soldiers to leave enemy’s technologists alive for future development of Mongolian arrows, spears, swords, and shields.

The profession as engineer is also for the job to enjoy his/her everyday new life. The engineers always try to develop any new items and products to help the human beings to enjoy more comfortable and convenient lives by obtaining the convergence technological knowledge. The engineers are enjoying either small or big happiness from the practical application and pursuing their lifetime efforts to find new findings. The job which provides the people who are living under the hard and dangerous environment in the underdeveloped countries with the warm technology of human being is the profession of engineers. Around 15% of the world population, one billion people, are living under the very hard conditions, where the large amount of bacteria and viruses raged in all their fury because of the lack of electricity and drinking waters. Engineers are the professionals who may contribute for the poor neighbors and change the society with their warm hearts even after the retirement at the average age of 100 years old.

The preference of students for becoming engineers should be, therefore, continued and extended among more creative and talented students. The schools of engineering must also welcome the future young engineers with the advanced educational system which goes together with the paradigm shift of society. The schools of engineering in Korea have had the tendency being strongly depending upon the government related funding for the special educational programs. There have been of course many positive programs of the government for the schools. There are however other negative things as well such that the schools have spent so much energy in receiving only good review points and applied for any government funding programs regardless of their educational specialties. Under the recent reality of just following the various funding programs the university might be in possible difficult position to educate students properly. The university must be interested in securing the budget and public relations by prioritizing the educational specialty first. The engineering educational system should be changed to produce engineers who are needed to obtain industrial competitiveness and are also to be changed according to the status of nation in the world economy.

The Republic of Korea has already had enough experience in practicing the combination of western and Japanese, and Korean programs during the past 70 years. Korea is now facing another stage to be jumped up not only in economic development of Mongolian arrows, spears, swords, and shields.

2. Current Issues in Korean Engineering Education

Even though there have been fruitful outputs by the financial supports of Korean government, Ministry of Education and Ministry of Industry, Trade, Energy, there are still many issues that the schools of engineering might go
into the wrong direction based on the long term objective of each school.

The first issue is that the efficient engineering education has not been easy because of financial situation at the Korean universities for both public and private colleges. Engineering is the professional area to apply the basic principle of natural science to make the life of human being more comfortable and convenient by developing the products and systems. The school of engineering therefore needs more financial supports to educate students based both on the laboratory experiments and by the small group of training than in the school of liberal arts. The Korean schools of engineering have more dependence on their government financial supports since the other financial sources except the tuition fee of students have been very limited. The donated environment by private companies and individuals to schools have not been significant in Korea. There have been therefore various government financial supporting programs for the universities, Even though the amount of money to support the schools are not much, the universities should try their best efforts to obtain those government money. The current those programs are the LINC(Leaders in Industry-University Cooperation) of Ministry of Education, RIC(Regional Innovation Center for Engineering Education) of Ministry of Trade, Industry, and Energy, NCS(National Competency Standard) of Ministry of Labor, and the others. As far as the universities are concerned for their competitiveness other than the financial situation, there are also global evaluation programs such as the annual announcement of world university ranks by QS(Quacquarelli Symonds) in England and Accreditation of Engineering Programs by ABEEK(Accreditation Board for Engineering Education of Korea). The schools of engineering are still under the very hard environment to set up their long term educational objective under these conditions and continue to stick to their own programs. The more important thing is that the universities must lay off the current staff members and give up the task force team in case the government financial supports are to be diminished by the change of policy.

The second issue that Korean engineering education community is facing is to move to the first mover from the fast follower position at the right speed. The South Korea is becoming very close to the seventh country which may join the 30-50 club in the world. The qualification of being a 30-50 club member is only for the country which satisfy both the 30,000 US Dollars of individual income per year and the population of 50 million people. The six countries who already joined this club are Japan, United States of America, United Kingdom, Germany, France, Italy. The engineering education of the country must be also changed as the economic situation of the country is being changed because the schools of engineering are to produce the future engineers of industry. The Korean engineering education system is not to be the fast follower any more and go to the first mover position because of this reason. The Korea engineering education community has also overcome the hardship period during the past 70 years to catch up the national competency of industry after passing the dark ages of Lee Dynasty and Japanese occupation period. The successful outputs came somewhat so far from the fast follower of those of advanced educational system, such as Japan, USA, German, and France. As the Korea is therefore becoming close to 30-50 club, it is more clear that Korean must go further steps to lead the world engineering education community.

The third issue is that there have been still less active communication, cooperation, and share among three important groups, professor, university, and government. There are still more engineering professors who insist on doing their major research activities including mechanical, electrical, chemical, civil, material engineering rather than spending meaningful time in engineering education. The independence of professional areas are of course to be acknowledged in each research direction of sharing information. The more effective engineering education has been however known and achieved by combining the advanced research work with educational pedagogical methodology. The more converged research and educational works are needed to utilize the transferred information from the other technical areas as well. It is therefore very desirable that the diversified experts get together to discuss and share the new ideas for more efficient engineering education such as at KSEE(Korean Society for Engineering Education). The reality is however that the professors of KSEE are mostly the chairman of the department, directors of IECC, deans, the education majors, and not the professors with no administrative position. This has not been desirable because those professors with administrative positions are being changed every one year or two years following the traditional circumstances of the university. This undesirable thing for spending most of time on research than education has been still repeated.

The chairmen and deans of Korean universities do not have the equivalent right of employing faculty members, planning and executing the annual budget, the long term objective of setting up the curriculum of the school and the department. It is mainly due to the “rotated” system of dean and chairman positions every one year or two years, whose tradition in Korea has not been changed for long years. They are also spending much time in just responding to the documents asked by the office of academic and research administration of University. As soon as the deans and chairmen return to their normal professorship they are also becoming the normal professors with no administration more focusing on research in their technical fields. The long term friendship to share and cooperate the forefront information among deans and related leaders are not possible. There is not enough solid established system to plan the future vision and strategy to carry out the detailed program by them. It is also proven that Korean deans’ participation to the global activities with GEDC(Global Engineering Dean’s Council) is very limited.

The last issue is whether schools are to provide the industrial society with the quality engineers or not. The industry is not able to be interested in engineering education since they are very busy to make more profits for their company. The university has also had difficulties to educate basic science together with its application for the industry. The more wisdom is needed to receive the suggestion of curriculums by the industry also considering the importance of the basic science. The cooperative team teaching classes using the SNS (Social Network System) also
3. Innovative Direction of Engineering Education in Korea

The schools of engineering must participate in the financial supporting programs being lined with maintaining their specialized education and research objective in order to survive for more than a century in the future society. The university is however easy to apply for any financial projects just to obtain the funding and the higher rank regardless of their unique program because of the unstable economic situation of the university and the society. The university must consider to obtain the funding projects and the advertisement by clarifying the education as the first priority. Each ministry of government might accelerate the lower standard of education by wasting the administration cost with one way uniformity and the duplicate of engineering government’s supporting program. The university must suggest the change and the right direction of innovative engineering education based on keeping the basic education theory. The phrase “Haste makes waste!” is not the exception for this matter.

The society of IoT(Internet of Things) has arrived due to the rapidly advanced digital communication technology. It implies that the 3rd industrial revolution of spending zero expenses for the electricity by using the solar, wind, and the other alternative energy has already been started as in Europe and Japan. The IoT provides the smart big data through the super speed network using the sensors obtaining all the activities on the globe. The number of sensors was 10 million in 2007 and rapidly increased to 3.5 billion in 2013. It is also expected to be 100 trillion in 2030. The giga bit speed of network was already commercialized in 2014. The direction of innovation in engineering education is also for training the leaders who are able to share, open, and communicate. It is also for the ‘prosumer’ which means the combined abbreviation of consumer and producer.

The role of professor is the most important in engineering education which is also the core component to prepare the future society. The professors, as the highest level of educator, must bury themselves in studying the related professional areas and therefore telling the students about the change of science and technology in the future society. Students will follow their master’s activities from his/her high level of personality, ethics, and morality. Professors are also eligible to process and analyze the big data, and must be respected and accepted by students who might obtain more valuable information through SNS. The period of teaching students by professors with one-way sharing the knowledge has already finished. The professors have to lead the lecture with two-way close communication with students, which is the new type of lecture discussing the creative knowledge being asked at the real time. The development of advanced digital media system being applied for engineering education based on IoT are to be also needed and the hardware and software of it should be actively developed. The KSEE, as the creative leader in Korean Engineering Community, must go together with ABEEK(Accreditation Board for Engineering Education of Korea), Korea Academy of Engineering, Korea Dean’s Council to develop the innovative engineering education for preparing the change of the future society.

The government’s supporting programs have played an important role somewhat to change the educational system of the universities. Those programs are however much depending on the political strategy of the ruling party and the new President of Korea whose terms are to be changed every five years. The universities are being in tendency just to follow the suggested criteria of the financial supporting organization which might result in missing the basic and the core contents of various education system. The most worried one is that the bottom up approach by students and parents, and schools might also be suppressed by the top down approach by the government because of the money strength. The government must keep in mind to understand the diversity of school of engineering and provide them with more rights to develop their specialties.

Biography

Dr. Kwang Sun Kim is presently the president of Korean Society for Engineering Education(KSEE) and the Honorary Chairman of Korea Association of Industry, Academy, and the Research Institutes (KAIARI). He is also a professor of School of Mechatronics Engineering, Korea University of Technology and Education (KOREATECH). He initiated founding the Korea Society for Semiconductor Display Technology Society, whose current registered members are more than 1500, in 2015 and served for the Society as a Chairman for four years from 2003 to 2007. He also served as a dean of planning affairs of KOREATECH from 1996 to 2000, and as a dean of graduate school of KOREATECH during 2000-2002 and 2004-2006. He also founded the Semiconductor Equipment Technology Education Center (SETEC) in 1996, which has been financially supported by the Korean Ministry of Industry, Energy, and Trade for 13 years. SETEC has educated and trained more than 30,000 industrial engineers since 1996. Before he joined KOREATECH as an assistant professor in 1992, Dr. Kim had various experiences in working at the Ministry of Defense of Korea during 1978-1984 as a deputy section chief and a research faculty at the chemical engineering department at Yale University in 1988. He has also industrial experiences both at Gibbs and Hill Inc., USA, and at Samsung Aerospace Inc., Korea, as a system engineer from 1986 to 1992. He was awarded the National Medal by the President of Korea for his contributions to scientific and technological education and fields in 2006. Dr. Kim was also nominated by the American Society of Mechanical Engineers as a fellow of ASME in 2007 and has been a vice president and auditor of Korea Society for Engineering Education (KSEE). He has been a chair of Semiconductor...
Equipment Commercialization Committee of Korean Semiconductor Association from 2006 to 2009. He is presently a general chair of WEEF/GEDC2016-Seoul, which is to be held during November 7th to 11th in 2016. Dr. Kim had served for IFEES as an executive committee member at the early stage of IFEES. He is a member of SEMI International Standard Committee and was awarded the Distinguished Engineering Service Award by the School of Engineering, University of Kansas in 2009. Dr. Kim received B.S. degree in Mechanical Engineering from Hanyang University (1978), M.S. (1983) and Ph.D. (1986) degrees in Mechanical Engineering from the University of Kansas, USA. Both as a IFEES executive member and as a general chair of WEEF/GEDC2016-Seoul, Dr. Kim intends to contribute more for IFEES members and to increase the globally strong cooperation in engineering education societies.