Research on Current Situation and Development Strategies of Continuing Engineering Education under Knowledge-Based Society

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Abstract

The 21st century is an era of new-type knowledge-driven economy based on production, distribution and utilization of knowledge and information, an era that information society transits to knowledge society, and an era that one-time education cannot meet requirements of life long learning for people. Under that knowledge based society, continuing engineering education is a kind of education that renews, develops and improves knowledge and skills for in-service engineering technical personnel. Continuing engineering education is also an important component of higher engineering education, which shows concepts of life long education and life long learning. Based on the current situation of continuing engineering education at home and abroad, this paper analyzes times requirements of continuing engineering education and discusses development strategies and tendency of continuing engineering education under the current social situation.

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The 21st century is an era mainly characterized by economic globalization and knowledge-oriented transformation, and the competition of skilled personnel will become a focus of nations' economic competition. In order to keep up with the ever changing socioeconomic development situation and adapt to the fast development of technology, the modern engineers have to renew and supply knowledge in time, and an important way for accomplishing the self promotion is to accept continuing engineering education. At present, the continuing engineering education of China is facing great development opportunity, so rapid development of continuing engineering education will make a great contribution to the new challenge of China's knowledge society building.

1. Transformation tendency to knowledge-based society.

The concept of "knowledge society" presented by Peter F. Drucker, the most influential management writer of America, in "Post-Capitalist Society (1993)" has been attracting a lot of attention. It is generally acknowledged that knowledge can promote transformation and change of society and economy, so that a knowledge-based society can be formed. Taken in a narrow sense, the knowledge society is a society based on knowledge. Production, dissemination and application of knowledge become organizational rules of every aspects of human activity. Taken in a wide sense, the knowledge society is a more developed society.

Production, dissemination, absorption and innovation of knowledge in knowledge society infiltrate every aspect of society and become main activities of society, which determines representative situation of human society. Countries, careers and industries are developed with a core of knowledge, and the development of knowledge becomes a main power for social development. The routine life of human enters into a new stage characterized by knowledge consuming. The obstruction and contradiction between knowledge development and the knowledge's requirements for corresponding and harmonious development of regime and social development become a basic contradiction of human society development.

1.1 Understanding society in many ways.

From the benefit respect of knowledge, knowledge society is an industry society. The development of knowledge will bring new and continual motive force of development for every industry of society.

From the dissemination respect of knowledge, knowledge society is an information society. Maintenance, increase and dissemination of information are main means for building up knowledge society. Extensive, massive and effective information dissemination forms a base of knowledge society.

From the acquisition respect of knowledge, knowledge society is a learning society. In knowledge society, learning becomes the most popular everyday concerns. National learning and life long learning is the precondition leading to knowledge society, and knowledge society is a result of national learning and life long learning.

From the development respect of knowledge, knowledge society is an innovation society. In knowledge society, the relationship between inheritance and innovation will be re-understood. If inheritance played a primary role in the past human historical development, the function of innovation will be unprecedentedly enhanced in knowledge society. Since education and culture are popularized, the application space of new technology will be unprecedentedly enlarged.

From the foundation respect of knowledge, knowledge society is an education society. One of the absolutely necessary conditions for forming knowledge society is that people have equal rights for receiving education. Currently, many countries more and more have realized that in order to enhance the ability for producing, disseminating and utilizing knowledge, and in order to promote transformation from traditional society to knowledge society, they need to value education as a great strategy.

1.2 Education takes a heavy task on building knowledge society.

The key for building knowledge society is that in order to takes precedence to develop education, the educational modernization must be firstly realized. Only by realizing educational modernization can we really develop value and function of educational priority, thereby driving every social aspect and field to realize modernization as soon as possible.

The knowledge society building requires us to emphasize on fostering and utilizing innovation talents. It is a key for building and promoting knowledge society that innovating talents fostering and talents utilizing mechanism, using overall and free development of people as a point of departure.

The knowledge society building requires building and perfecting modern national education system, promoting life long education system, and establishing a socialist modernized education system with Chinese characteristics. Knowledge society requires further education popularization.

2. Requirements and content of continuing engineering education under the background of knowledge society.

Continuing engineering education has another name called “engineers’ education”. Internationally, continuing engineering education generally refers to a kind of professional education for in-service engineering technical personnel after graduating from college, with a purpose of keeping their knowledge advance and continuously developing the active innovation function of knowledge during working. Recently, continuing engineering education has been developed into a considerably systematical, comprehensive and necessary educational mode in many countries, and it also has become a continuing and developing part of the traditional education, which plays a promoting function for technological and economical development.

Under the background of knowledge society, rapidly flowing information becomes “blood” for the “social organism”. Since 1990s, China has been implementing the strategy of developing the country by relying on science and education, so that social services function of research university has been greatly developed and has become functions of research university together with personnel training and scientific research. It has become an effective

approach for universities and local governments as well as enterprises to cooperate and realize research findings commercialization and technical service that universities cooperate with local governments to develop strategic research and policy consultation, and to train higher management personnel and internationalized highly professional personnel for large and medium-sized enterprises. Universities have increasingly become driving force of economic development, social progress and technological innovation for countries and regions, and have become knowledge sources and talent banks in national and regional innovation system. Continuing engineering education of higher level is important content of social service function.

2.1 Object of continuing engineering education.

The object of continuing engineering education is mainly graduates and professionals who actually have achieved engineer level. There are two kinds of educational modes of continuing engineering education, wherein the first one is training class which is closely related to production, with the characteristics of strong pertinence and applicability; the second one is endeavoring to develop tendency of continuing engineering education in the future, with the characteristics of strong frontier nature and professional nature.

From the respect of knowledge content, the knowledge content of the former is mostly new branches of science mainly about imparting new knowledge and technique, and the knowledge content of the latter is systematic learning of higher level, which usually makes technological and academic discussion to some concrete subjects in production and scientific research. From the respect of time consuming, the former consumes working hours, while the latter mainly utilizes off hours. From the respect of participant number, the former is in the majority, while the latter is in minority. Take America as an example, 90% to 95% of in-service engineering technical personnel participated the former continuing education, while the latter only occupied about 5% (Jiandong Bu, 2002). With the coming of knowledge times, the covering range of continuing education is wider and wider, and life long education and knowledge renewal of all kinds of personnel has become the mainstream of the world wide continuing education.

2.2 Content of continuing engineering education.

The content of continuing engineering education mainly consists of three parts. The first part is engineers' preservice education, which refers to education and working practice received after graduation but before becoming an eligible engineer, including new technological knowledge and the latest technological achievements which are never been learned by engineering technical personnel. The second part is engineers' in-service education, which refers to continuing education received for being more equal to work, for continuously developing and renewing knowledge, and for enhancing ability and level, including knowledge additionally learned for meeting requirements of engineering technical personnel or knowledge learned for transforming to management work. The third part is post transformation education, which refers to continuing education received for being equal to new post and for exercising new working function. Therefore, continuing engineering education includes necessary study received for professional knowledge renewal, management knowledge development, post transformation and the like.

3. Current situation of China's continuing engineering education

In 1960s, continuing engineering education greatly promoted economical development of the Occident, and enhanced comprehensive national strength and international competitive strength of the Occident. In 1979, Professor Hongxian Zhang form Tsinghua University introduced the concept of continuing engineering education into China, with an education object of engineering technical personnel who begin to work after graduation from universities. With the continuous increase of social requirements to continuing engineering education, General Office of the Central Committee and General Office of the State Council jointly issued rules related to continuing engineering education in 1981 for the first time, and State Scientific and Technological Commission organized and established the "China Association for Continuing Engineering Education (CACEE)" in 1984, which set tasks of continuing engineering education and decided that enterprises, universities and scientific research institutes were important bases for developing post-university education. Then, Ministry of Personnel issued "Interim Pro-

gram for National Professional Technical Personnel Continuing Education" and "Planning Outline for National Professional Technical Personnel Continuing Education 2003-2005", and in September of 2005 the Ministry of Personnel issued "Implementing Scheme for Professional Technical Personnel Knowledge Renewal Project ("653 Project")" (National Ministry of Personnel <2005> No.73). With the formal start-up of "653 Project", the work aiming at enhancing building of a professionally technical contingent and promoting continuing education of professional technical personnel were developed around the whole country, thereby making the work of continuing education increasingly legalized and standardized. In the report at the 17th Party Congress, Secretary-general Jintao Hu emphasized on "developing distance education and continuing education, building a learning society of national learning and life long learning", from which we can see that the party and the state pay great attention to continuing education.

In recent years, China's continuing engineering education has been quite developed. Firstly, educational scale has been continuously enlarged. According to incomplete statistics, the professional technical personnel receiving continuing engineering education allover the country since from 2006 are over 80,000,000, and there were even millions of personnel receiving the WTO basic knowledge continuing education organized by the Ministry of Personnel. Secondly, continuing education work for high level professional technical personnel has quite great development. Since from the recent five years, all levels of personnel offices have organized over 6,000 professional technical personnel advanced courses, and nearly 400,000 high level personnel have participated the advanced study and training. Thirdly, the function of continuing engineering education for serving social economy has been continuously enhanced. Since the work of continuing engineering education has been incessantly developed, the quality of the whole professional technical personnel contingent is enhanced, which quickens building of China's professional personnel contingent and makes great contribution to economical development.

Although continuing engineering education has got a certain achievement, it is not nearly enough for meeting requirements from the strategy implementation of reinvigorating China through human resource development to the engineering technology professional personnel contingent building. At present, China's continuing engineering education is mostly developed with scattered ways, with low socialization and marketization degree. The content of continuing education is not closely related to progressive technological post need. The training methods are single, lack of flexibility and innovation. Since people have not deeply understood continuing engineering education and have overmuch utilitarian thought, continuing education usually is taken as a platform for raising salary, promotion and self improvement, which had a serious influence on quality of personnel training.

4. The future development tendency of continuing engineering education in knowledge society.

Nowadays, science and technology are rapidly developed, and knowledge renewal continuously speeds up, which has more and more requirements for quantity and quality of talents. It has become an irreversible trend that build a learning society, and realize life long education and life long learning. Knowledge society puts forward higher requirements for continuing engineering education.

4.1 Compound and crossed course arrangement.

The present engineering construction projects require engineering technical personnel to master engineering construction management knowledge, to have well foreign language ability, to master international common practice, and to have more comprehensive knowledge system of management, finance, marketing and the like. During arranging courses for continuing engineering education, people need to know that the single kind of engineering courses is not nearly enough for meeting requirements of learners, and it has become an inevitable trend that natural science and social science are crossed and infiltrate into each other to form a new subject system. The technological innovation, technical reconstruction engineering engaged by the engineering technology and management personnel of enterprises and public institutions, and management of almost all technologies and techniques as well as engineering are all unable to do without theoretical support and knowledge background of multiple subjects.

4.2 Internationalized educational content.

Scientific and technological development requires people to continuously renew knowledge, which promotes the development of continuing engineering education aimed at knowledge renewal. In knowledge society, though China's continuing engineering education has been developed for a short time, it must insist on internationalization, and quicken up to foster professional technical personnel who have the characteristic of internationalization and can meet requirements of China's scientific development and building.

4.3 Modernized training methods.

Continuing engineering education should meet in-service learning requirements of engineering technology and engineering management personnel, should emphasize on developing non campus boundary virtual learning environment, and should establish a general-purpose network support system varying with each individual whenever and wherever possible. Continuing engineering education further needs to use a way of distance to develop training projects like authenticating examinations in financial field, including actuary and accountant training, real estate and estate management, small and medium-sized cities planning and the like. Distance teaching means undoubtedly will greatly enhance efficiency and benefit of continuing engineering education.

History of world civilization shows that continuous development of education promotes ceaseless renewal of knowledge, and incessant innovation of knowledge leads to continuous innovation of science and technology, thereby promoting continual progress of human society. The essence of science is innovation, and the task of continuing engineering education internationalization is also innovation. Innovation is the soul of national progress as well as a forever motive force for a country's development. The enhancement of knowledge innovation ability and technical innovation ability of talents is largely decided by education. Obviously, we should make great effort to quicken up the internationalization progress of China's continuing engineering education, thereby introducing China to the world and making China step onto the world arena.

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