

# Development of Human Resources in Science and Technology – Experience from the United States and Application in Vietnam

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**Abstract:** In the modern society, human resource is the most vital source for the development of every nation, race or ethnicity because only qualified people can properly manage other sources. Therefore, many countries in the world have implemented policies to enhance domestic human resource and attract high-quality workers from other countries. In order to help the economy of a country integrate with international organizations, it is essential to mention the important role of science and technology work forces. The training and developing high quality human resource has become a top mission in many countries and the United States (US) has become the leading country in the field.

**Keywords:** Human resources, science and technology work forces, experience, United States.

## 1. The current state in training high quality human resource in the US

The US is a large country, surrounded by Canada, the Atlantic Ocean, Mexico and the Pacific Ocean. It is constituted of 50 states with a total area of 9.629.047 km<sup>2</sup>. “The US is the largest country in the world and it is also a country with the most advanced science and technology. In 2012, the population of the US was 314.07 million. In 2011, the human development index (HDI) was 15.094 billion USD and the GDP per capita in the same year

was 48.386 USD” [1]. The natural resources and socioeconomic conditions were the positive factors to assist the US enter international organizations.

The rivalry between countries in the 21<sup>st</sup> century will be the battle of a national synthetic power in the field of advanced science and technology.

To achieve that result, the US had to go through 200 years of development with the materialism and a driven force of: “Human resource is the center of all development”. The US has brought out multiple strategies to develop human resource in science and technology while participating in international organizations. Its achievement in the field of

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science and technology and human resource training has become a lesson for Vietnam and many other countries in the world.

### *1.1. Allocation of expenditure for education and training in America*

The US is a country with a modern education system, especially in higher education, considered as the most effective in the world [2]. The US also takes the lead in high quality science and technology human resource. The famous educationist Gunnar Myrdal once said: "Throughout the long history of America, education has always been the hope to improve each character and each society" [3]. Most historians agree that the advancement in economy, politics, science and culture of the US were achieved in a short period of time thanks to the development of education.

With a long term strategy, the expenditure for higher education in the US all came from different sources, such as companies, state organizations, non-governmental organizations, religious organizations, sponsors, and so on. In order to fully develop equality in education, the US has deliberately removed the barrier of expenses so that all students can go to school. "According to the GDP rate, the education budget in America has soared continuously: 5.3% of the GDP in 1960, 7% of the GDP in 1991, and currently it is approximately 7.5% of the GDP, which is a much higher amount of education budget in comparison with other developed countries [4]. The budget above is used for building schools, supplying modern devices and training educators. The affluent budget has given schools the ability to build modern infrastructure, train educators, and also create student support funds.

As to human resource development, the US cultivates a creative environment, encourages talented individuals, fosters and attracts these people in many fields. World War II has left the US, the only country in the world, with opportunities to attract a large number of human resources, resulting from that, a lot of

scientists from other countries have migrated to the US. This reality clearly answered the question why the US has the huge number of top scientists in many disciplines.

### *1.2. Success in university education*

In the US, generalizing high school education is initiated in a way that says all citizens must be educated to create a society of freedom, and level improvement and self-proficiency. In the US, the education system is compulsory and free until the age of 16 or 18. Each state has its own schools, called "public school", and the "Federal Office of Education" will be in charge of the whole country. The system contains:

- Nursery schools or kindergartens for children from the age of 2 to 6.
- Primary schools with 6 or 8 years from the age of 6 to 12 or 14.
- High schools with 4 years of junior high school and 4 years of senior high school, from the age of 12 to 18.
- Colleges and universities.

According to published statistics "The US has around 80.000 primary schools and 32.000 high schools. The rate between students and teachers is 20 for primary schools and 5 for high schools, which is actually a very encouraging rate, compared to South Korea, a country with a developed education system, where the rates are only at 36 and 30" [4].

The scale of university education and professional high schools has escalated quickly, bringing the US to the period of mass university education. Many countries and international organizations have accepted that the US has the best university education in the world. American education has many prominent qualities: the training quality reaches a high level in which creativity is encouraged, training program is close to reality and constantly being updated, modern technology is used in training, researching and training is closely attached to each other.

As a country with a highly developed education, practicality, and a system of the best universities in the world, along with the “Red Carpet” policy which welcomes international students, the number of foreign students in the US is continuously rising and topping the chart. According to the US Open Doors report from the Institute of International Education (IIE): “In the school year of 1954-1955, the number of international students in the US was 34.000. After that, the academic year of 2003 to 2004 had more than 572.000 students. For the academic year of 2006-2007, there were 583.000 students studying and researching in America”.

In accordance with the result of rating and listing the best universities in the world, “The US has 88/200 top universities which takes up 44%. In 2000, The US has around 3.600 universities and colleges with more than 10 million students. Also, the rate of people at the age of attending universities, colleges, vocational schools has increased rapidly: from 56% in 1970 to 76% at the beginning of the 1990s and 78% currently”.

What makes the originality of American education system is the diversity in quality. It ranges from high schools which have been upgraded to universities to the best universities in the world. It cannot be controlled in the same management that the ministry of education from other countries conducts. The diversity seems to be infinite, anything can be taught. A high school student who wasn't ranked high in the past can still attend the most prestigious university in America if his IQ is high. The weak performance in the past is not a standard to consider, the fault can come from schools, not the students. It is an education system that appreciates individual value through the whole process of development. With that conception, American universities have selected a large number of students with talents and trained them to become more efficient.

Most of the developed industrial countries have applied the American university education

model and training program. “In Asia, many high quality universities such as Nanyang Technological University (NTU), National University of Singapore (NUS), Chulalongkorn University (Thailand), Seoul National University, Korea University, Yonsei University, Tsinghua University (China) all apply American university programs in their academic system [5]. All the Asian universities listed above use the same manuals from Harvard, MIT, Stanford, University of California, Berkeley, and so on.

In order to correctly comprehend the content of American university manual, university professors use English and not focusing too much on compiling the manual. If the majority of students need references, the university will begin to compile. The translation from English to other languages is actually not encouraged in these universities because most of the students in these universities can speak English fluently. By applying these university education models and American university programs, Asian countries have rapidly created skillful human resource, which is good at science and technology, has improved management skills and developed the main industrial fields. More importantly, it helps shorten the industrialization time and enhance the rival ability nowadays.

Companies are also concentrating on developing human resource and training labor. “In 2002, the expenditure for training labors in companies is 210 billion USD. It increases to 600 million USD in 2005 and more than 800 million USD in 2000 and now it reaches to 1.000 billion USD” [4].

## **2. American experience in university education to meet the demand for human resource development**

*2.1. Collecting sources to train talented individuals in leading areas, especially focusing on science and technology human resource*

In 2001, the US applied a program in training talented individuals for Science and Technology (called the “BEST” program: Building Engineering and Science Talent) in several reputable universities. The objective of this program is to widen the scale of Science and Technology labor force, through attracting the young and talented individuals to science and technology to replace the former generations. This program advocacy is to focus mainly on training American born citizens. In 2003, many prestigious universities designed and applied 124 curriculums in training Science and Technology, classified as priority training according to the BEST program. Even though the financial support from the government to these university talent programs is not major, the financial source can be distributed “generously” to truly talented students. In the US, Science and Technology human resource training can receive a large support from investment in Science and Technology infrastructure and R&D activities. Investing for Science and Technology in the US is standing at 2.8% of the GDP, taking up 44% in science and technology gross expenditure in OECD countries. This figure ranked first in the world.

National Research Foundation has made positive effects on university research, especially on training young and talented groups. Therefore, each year around 3000 patents are given to universities in America. Training Science and Technology personnel is mainly conducted on collaborating effectively in research activities. For 127 universities in the US, 78% of the total bachelor degrees were given in 2000 and 87% of the total master degrees in science and technology. According to the BEST plan, universities must take the main responsibilities in training young and talented human resource.

The method of training human resources in the US changes constantly. Applying modern technology in teaching and research is compulsory for professors in universities; especially information technology is widely

applied. In 2003, one third of the classes which followed BEST had their own website. The talent training method emphasizes on mathematical tools and Inter-disciplinary Studies. Students get used to applying tools and processing multi-dimensional data when taking part in science subjects. The budget for scientific research of students rises constantly. In 2001, 67% of students getting financial support for research from the federal budget, mostly focusing on basic sciences. Therefore, many outstanding pieces of research have been made by talented young student [6].

## 2.2. *Well practicing of education management*

The two effects that made the trademark of American education nowadays are the scale (effects on law) and diversity (culture). The federal constitution allows local communities to properly control the administration in public schools by letting the community takes charge of making policies and teaching plans for the schools.

School managers who are voted by the communities must fulfill all the needs from the local and their concern for education. All schools and universities have their own self-managing groups, associations or steering committees and all are independent on drafting standards, accepting students and facilitating their own requests for graduation. The main result for this unique situation is the diversity and flexibility in the post-graduate and graduate university system of the whole country. Each year, hundreds of research papers, which strictly undergo the peer-reviewed process, are published. Each school has their own research and education evaluation department. The inspection and evaluation get stricter by each stage. The public debate on quality, contents and educational goal takes place widely across America.

## 2.3. *American education system always initiates specific goals*

Basically, American education strives for an equal education opportunity, despite social class, or race/ethnicity. Cultural effects on American education are also important but harder to define. The generally high educational level is always considered indispensable in American education system.

American education has a tradition to serve the purpose of uniting people with each other, which is the “Americanize goal.” Schools in the US have served the purpose of uniting hundreds of cultural groups, languages, religions and socio-political backgrounds that represent millions of immigrants.

Education helps improve society – reducing disparities in social background, race or ethnicity, which is accepted by many people nowadays. The majority of public and private schools are enthusiastic on supporting this “democratic diversity” and manifest it in selecting their students.

The major goal for education is a way of “making yourself better” or “rising above the world”, which is a basic part of the American dream. Millions of people migrate to the US with a hope of having a better life with a better education for themselves and more importantly, for their children. The starting point – despite the last goal being money, fame, power or simply, knowledge – often starts from the doorsteps of a university.

#### *2.4. Dignifying the responsibility of educators*

The most common type of evaluation is through the assessment forms from students. The requirements for educators are being able to convey and ensure the knowledge output as well as student’s assessment.

The dignifying of educator’s responsibility is determined by:

- Every educator has the right to take part in the initial training process and activities to improve specialty. Through that, educators will be equipped with knowledge and essential skills

to teach a diverse “population” of students with different social, educational, and health needs.

- Establish cooperation, whenever possible, between local educational office, high quality educational institute, student’s parents, labor force, and business community with local job associations, to provide and support educators’ specialty development programs.

#### *2.5. Education system is always accredited*

Because of its diversity and flexibility, along with the outstanding precedence of Science and Technology, the American education system is considered to have a high accreditation rate. In the US, state licensed is based on meeting three requirements for establishing schools according to each state, such as material facilities, security, deposit, tax, and so on. Accreditation is concerned with academic quality. Being established does not mean that it has been accredited. Therefore, the US has an apparent differentiation between accredited universities and degree coming from diploma mills.

In the US, there are two offices that recognize accrediting agencies, which are Department of Education (USDE) and CHEA. Among them, USDE is a government office and CHEA is an independent office that is certified by government and accrediting agencies. Up to 2010, these two offices have created database for schools after high school (around 60% are universities), accredited with 7.000 schools and 18.000 training programs [7].

Throughout 200 years of development, the American education system has come a long way. The system has trained a large number of students at advanced level, who covered 40% of the national labor force. In reality, the US is one of those countries that have the highest number of the world’s top scientists. Such high quality human resource has brought the US to a superior position.

### **3. Applying American experience in training and developing human resource in Vietnam**

The American training and educating programs can be applied to Vietnam by this order:

#### *3.1. Arranging selection of Vietnamese talented students to study in talent training program*

In America, talented students are selected through multiple examinations and classification of IQ index, EQ (emotion index), and CQ (creativity index). The competing rate to study in reputable universities with talent training program is high. Due to the fact that after completing their degrees or training, students can quickly find jobs with high income in big companies. The current method in selecting talented student in Vietnam is not suitable. Thus, Vietnam can adopt some recruitment methods from American universities, for example, using the assessment standard of ETS (Talent Discovery and Selection), to select candidate for the talent training programs.

#### *3.2. Selecting several programs which have been successfully applied in many Asian countries and can possibly be conducted in Vietnam*

Harvard, MIT, Chicago, Stanford's programs are examples. As for business and administration talent training program, it is suitable to apply the program from Harvard (for further information about the Harvard Business School and Kennedy School training program, visit [www.hbs.edu/about/case.html](http://www.hbs.edu/about/case.html)). For mathematics, science and technology training programs, BEST ideas and goals can be ideal (for further information, visit [www.bestworkforce.com](http://www.bestworkforce.com)).

#### *3.3. Focusing on training educators*

Not many people can teach such programs in Vietnam, due to the weaknesses in inadequate knowledge, incapable of using

second language such as English, and former teaching methods. There are two approaches and assignments of these programs in Vietnam: firstly, invite American professors to come and teach in Vietnam; secondly, choose young and qualified trainees to visit the US to learn, acquire, and implement the training model. These approaches can be done at the Vietnam National University, Hanoi. The result can be evaluated to enhance the human resource training in several potential universities in Vietnam.

To provide students with reference, the Ministry of Education and Training needs to provide financial support to translate essential documents into Vietnamese. It is certain that the money used for translating and publishing those documents is not as much as hiring Vietnamese authors to compile the manuals. The benefit firstly goes to the government since additional money can be saved for education. The second benefit is that students can receive benefits from translation of scientific documents. Because some manuals compiled by Vietnamese authors are too simple, the important content for developing analytical abilities is usually cut, and some matters are not presented accurately based on the authors' subjective ideas.

#### *3.4. Changing teaching method*

Teaching method is one of the essential keys in the educational process. The exploration, instruction, encouragement of new ideas, exchange and public debate are considered as important phases in the educational process. To apply technologies in classroom, universities need to invest in modern devices, and link university training with other research institutes and industries to produce more valuable scientific findings.

#### *3.5. Supplying facilities for universities*

To advance the training quality and promote training linked to scientific research and application, the government needs to prioritize

and provide facilities, such as modern devices, for the prominent universities. It is essential to upgrade universities to research centers at the national level by adopting models from developed countries around the world. There is no Nobel Science prize winner who did not take part in any big project nor did not go to laboratories and not own any modern technical devices for research purposes. Academic freedom and tolerance are the two basic conditions for creativity and innovation.

### *3.6. Promoting collaborations between university and industry*

Currently, university training programs are diverging from the industrial skill requirements. Therefore, it is necessary to promote the collaboration and association between universities and enterprises. By doing so, the university can provide training and prepare high quality individuals for the development process, and at the same time, university can receive funding from the enterprise. These funds can be helpful in renovating training programs, support research activities, and commercialize research products. In South Korea, China and Japan, the relationship between universities and industries are very close. Especially, some universities have switched to the enterprise university module like the MIT in the US, and the NUS in Singapore. In addition, enlarging university operation means that universities must have self-control abilities.

### *3.7. Building model of ensuring educational quality in Vietnam*

Education accreditation is new field in Vietnam. Systematically, it started when the training accreditation office from the University Department at The Ministry of Education and Training was established in January 2002. Since then, it is extended for every academic level and different training level since 2003 after the Examination and Accreditation Office was established. Accreditation was strengthened since December 2004 when the temporary

regulations on university accreditation were enforced. Accreditation continued to be reinforced and developed along the promulgation of other processes. However, the knowledge of managers and educators, particularly, and the society, generally, on accreditation are very limited. Many people are still misunderstanding of this concept.

Nowadays, the Ministry of Education and Training is deploying the education quality accreditation following the American model that is used by many countries in the world. The American accreditation model is a process evaluated by an organization independent of the educational office to examine and approve quality of education programs and institutes.

### *3.8. Strengthening the educational collaboration between Vietnam and the US*

Throughout these years, the Ministry of Education and Training and education managers have focused on networking and developing exchange programs with prestigious universities and institutes in the world. Especially, during recent visits, many Vietnamese and American politicians have mentioned the concern about national education achievement. Many forums and seminars on education were held by the two countries in Washington D.C and Houston.

Some of the specific results of the education association from the visit of Prime Minister Nguyen Tan Dung, are the agreement contract signing to establish the education specialty group between the Vietnam Ministry of Education and Training and the US Ministry of Foreign Affairs. This contract is the agreement to boost educational collaboration between the two governments. According to the record of international students from the Institute of International Education (IIE) in 2007, for the first time in the US, Vietnam was ranked in the “top 20” countries with the most number of international students and the highest increase: “the number of Vietnamese students studying in

American universities have increased from 4.597 to 6.036 students” [7].

#### 4. Conclusion

Training talented individuals and developing human resources in Science and Technology during our process of industrialization and modernization is an urgent need. Nowadays, not only Vietnam National University, Hanoi but also other universities have conducted talented bachelor training and high quality bachelor degree. In reality, Vietnam have gone through a lot of activities that is considered movements but in the end, successful movements are limited but failed ones are many.

As a result, education management agencies need to have an assessment to get experience before conducting it on a larger scale. Training and using high quality human resource must start from students’ and employers’ needs, and it is insufficient to respond only to trainers’ needs. Training and education is successful only when the needs for training high quality human resources meet with the requirements of the socioeconomic development process. The American experience in training human resource in the field of Science and Technology

has provided applicable lessons for Vietnam’s industrialization and modernization process.

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## Phát triển nguồn nhân lực khoa học và công nghệ - Kinh nghiệm từ Mỹ và Ứng dụng ở Việt Nam

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**Tóm tắt:** Trong xã hội hiện đại, nguồn nhân lực là nguồn lực thiết yếu nhất cho sự phát triển của mỗi quốc gia bởi đây chính là yếu tố quyết định để quản lý tốt các nguồn lực khác. Do đó, nhiều quốc gia trên thế giới đã thực hiện các chính sách để tăng cường nguồn nhân lực trong nước và thu hút



nguồn lao động chất lượng cao từ nước ngoài. Để giúp cho nền kinh tế của một đất nước hội nhập với các tổ chức quốc tế thì việc chú trọng phát triển lực lượng lao động khoa học và công nghệ đóng một vai trò vô cùng to lớn. Việc đào tạo và phát triển nguồn nhân lực chất lượng cao đã trở thành một nhiệm vụ hàng đầu ở nhiều quốc gia và Hoa Kỳ (Mỹ) là một quốc gia đi đầu trong lĩnh vực này.

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