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| journal or publication title | Society for Social Management Systems Internet Journal                        |
| volume                       | 7   |
| year                         | 2011-09   |
| URL                          | <a href="http://hdl.handle.net/10173/807">http://hdl.handle.net/10173/807</a> |

# A STUDY ON THE CONSTRUCTION MANAGEMENT EDUCATION PROGRAM BASED ON A UNIVERSITY COOPERATION FOR UNDERGRADUATE STUDENTS

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**Abstract:** To set up the proper education program of the construction and project management at universities for creating reliable and capable engineers is now become the most essential matter in the developing countries. In developed countries, on the other hand, the construction and project management education is needed to reconstruct for the purpose of improving and maintaining the accountabilities for the public and taxpayers. A group of faculties in Asian universities specialized in the construction management had established International Construction Management Forum (ICMFA) in Asia in November 2008. The paper discusses the education activities related to the construction management for university students carrying out through universities cooperation under the ICMFA framework.

**Keywords:** Construction management, project management, engineering education.

## 1. Introduction

Nowadays countries in Asia are very aggressive to execute infrastructure development projects. However, there are many cases that projects get delay and cost overrun caused by not only pure technical problems but also lack of management. The people handling construction project know that there are no projects have any problems. In other words the people involving in a project must work together for solving problems. Nevertheless it is commonly see that the project owner, the contractor and the consultant engineer do not like to work together for fighting for the problems but fighting each other. The main reason of it might be people do not like to take risks because they do not have sufficient skill and knowledge of risk management and project management. The problem is that the people do not have enough and sufficient opportunity to study the construction and project management. To set up the proper education program of the construction and project management at universities is now become the most essential matter in developing countries. In developed countries, on the other hand, the construction and project management education program is now required to reconstruct for the purpose of improving and maintaining the accountabilities for the taxpayers and also expanding the international activities.

## 2. The main Concept of the Education Programs

### 2.1. Need to Confirm the Main Object of Civil Engineering

The question must be asked - what is the main object of civil engineering and the civil engineer? One answer could be that the main object of civil engineering is to contribute to the creation of infrastructure required for promoting the welfare of the public. Indeed a civil engineer may define infrastructure as facilities necessary for the public welfare and development of the country. Many civil engineers will agree with his answer. However, that answer raises the further question of – what is ‘public welfare’. One answer could be that public welfare is the satisfying the human necessities for physical, economic, cultural and environmental requirement. This answer takes into account the physical aspects of human desires as the physical evidence of the civil engineers effort is perhaps only the physical systems necessary for the public life, like potable water supply systems, sewages, electricity supply, gas supply, communication, garbage treatment, etc.,

On the other hand civil engineers also contribute to the development of the country by creating the physical presence of social institutions like schools, hospitals, roads, railways, river banks, irrigation networks, harbors, air ports, bridges and dams. All of these have a social dimension as well. Infrastructure developments must be planned and implemented with sustainability of societies as one

of the priorities. Not only construction but maintaining, controlling, managing, recovering, demolishing and final abandonment must all be considered in the design and construction. The planning and implementation must go in parallel with social systems and the natural environment. It is therefore clear that infrastructure must be carried with out not only with engineering mind but social “science” as well.

## 2.2. The New Concept of Infrastructures

The basic concept of infrastructure is shown on Figure 1. Society comprises many complementary and interrelated activities such as economic, political, cultural, living things, natural activities. Society is also changed by developments in these activities. All the activities interact with each other in what might be called a ‘Social Support Base’. This Social Support Base comprises two elements, one is an artificial supporting system and the other is non-artificial supporting system.

The artificial supporting system consists of “Soft infrastructure”, and “Hard infrastructure”. The Non-artificial supporting system relates to “Natural infrastructures”. When sustainable development is referred to it is necessary to recognize that the natural infrastructure element is an essential element. For most of man’s history humans have been solely dependent on the natural infrastructure. This analysis proposes that society can be considered as being supported the Social Supporting Base which comprises three kinds of the above described infrastructure. The important thing to understand is that these three kinds of infrastructures ought not be planned, built and operated separately in isolation. They must be planned with a consciousness of co-relativity. For example, when a care facility is to be built and operated, it is essential to study the social systems like insurance, security, medical care and related function plus a thorough consideration of the natural infrastructure (environment).

Environment specialists argue that the natural environment is the most important and ought to be considered first. However, this view fails to

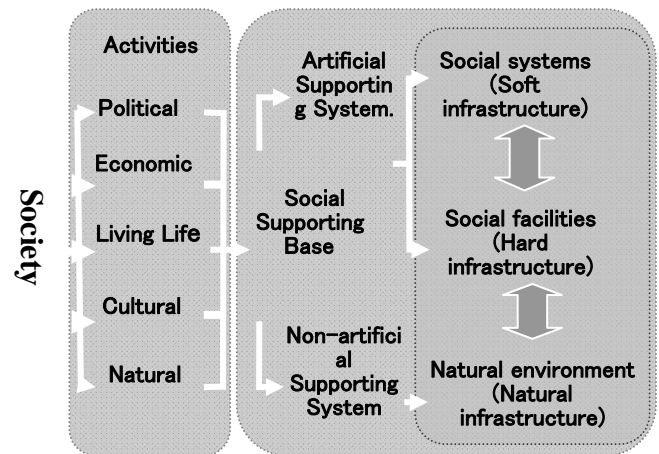


Fig.1. Social Activities Supporting Structure

consider the three kinds of infrastructure described above and to work out a realistic and practical solution this is essential. Then realistic and practical solutions can be found.

## 3. The movement to set up the construction and project management education program

Since year 1997, Kochi University of Technology is carrying out the education programs of the construction and project management in the undergraduate school and graduate school. In year 2004, KUT started the advanced course of the construction and project management in the graduate school for the students from industries as the professional continuing education program.

The basic philosophy of the programs created and carried by KUT construction management laboratory is to concern the construction and project management with the mind of internationalization. Based on these kinds of understanding and experiences, KUT has been continuing activities to improve and maintain the education programs. In year 2006, KUT and Nippon Koei a consultant firm in Japan was asked by JICA; Japan International Cooperation Agency to execute a project to create a prototype of the graduate school level education program of the contract administration based on project management technique. JICA also asked KUT group to execute its seminars in Tokyo and Asian Institute of Technology in Bangkok.



Contract Administration Course in AIT Bangkok



The first Contract Administration Course in Vietnam

In February 2007, the seminar implemented in AIT Bangkok accepted 23 participants from 11 countries and shown the expected outcome.

After that JICA and KUT has been continuing every year the contract administration seminars receiving trainees who are mostly the staff of governmental organizations and university faculties from Asian countries at KUT campus in Kochi Prefecture in Japan.

JICA and KUT are also continuing the seminar in Asian countries such as Sri Lank, Vietnam, Mongolia, Cambodia, Indonesia and India. KUT also created a prototype of graduate school level education program of the construction and project management and continuing activities to support universities in Asian for setting up the construction and project management course. The management course in the civil engineering department of Mongolian University of Science and Technology worked with KUT to customize the prototype program and started 18 hours lecture course in 2008. Institute of Technology of Cambodia took same way and started 42 hours lecture course in 2009. The Chart No.1 is showing the structures and contents of the program executed in Institute of Technology of Cambodia.

**Chart No.1 the program in Institute of Technology of Cambodia.**

|                | Monday                                     | Tuesday                               | Wednesday                                  | Thursday  | Friday                                      | Saturday   |
|----------------|--|---------------------------------------|--|---|---|--|
| 8:00<br>8:55   | 1.Introduction to CM education             | 8. Quality management in construction | 15. FIDIC Conditions of contract 1         | 22. Advance technology for productivity improvement | 29. Scheduling Practice 4 (MS Project 2007) | 36. Integration of engineering and economic design for urban development |
| 9:10<br>10:05  | 2. Introduction to CM education            | 9. Safety Control                     | 16. FIDIC Conditions of contract-2         | 23. Basic knowledge of schedule & cost control      | 30. scheduling practice 5 (MS Project 2007) | 37. Integration of engineering and economic design for urban development |
| 10:10<br>11:05 | 3.International Construction management    | 10. Engineers ethics                  | 17. Procurement management in construction | 24. Construction Scheduling                         | 31. Cost control                            | 38. Integration of engineering and economic design for urban development |
| 13:00<br>13:55 | 4. International Construction management   | 11. Risk Management in construction   | 28. Procurement management in construction | 25. Scheduling Practice 1 (MS Project 2007)         | 32. Cost control                            | 39. Project site visit Design of real SEZ                                |
| 14:00<br>14:55 | 5. Megaprojects & new const. tech. in Asia | 12. Risk Management in construction   | 19. Claim Application and Evaluation       | 25. Scheduling Practice 2 (MS Project 2007)         | 33. Dispute resolution                      | 40. Project site visit Design of real SEZ                                |
| 15:10<br>16:05 | 6. Quality management in construction      | 13. Basic knowledge of contract adm.  | 20. Claim Application and Evaluation       | 27. Scheduling Practice 3 (MS Project 2007)         | 34. Dispute resolution                      | 41. Project site visit Design of real SEZ                                |
| 16:10<br>17:05 | 7. Discussion and reporting                | 14. Discussion and reporting          | 21. Discussion and reporting               | 28. Discussion and reporting                        | 35. Discussion and reporting                | 42. Project site visit Design of real SEZ                                |

#### 4.2. A way to clearing civil engineers who have wide view

The common understanding of Overseas Development Assistance (ODA) is that it means development assistance from developed countries to developing countries. This may be correct answer, but it is also necessary to understand the context and why developed countries do it. ODA is not just one way and there are more than one way in which developing countries assist developed countries in the transaction. Developed countries like Japan face problems in education and human development in civil engineering and the construction industry. Infrastructure is no longer the main concern of the developed countries. Therefore developed countries do not have many educational and training opportunities in these areas of endeavor. This is not the only problem that they have. There is also the issue of how to keep alive the challenging spirit and the motivation of their young generation. Their infrastructure is complete and associated motivation might be said to be getting low.

Dr. Takeshi Youro, a specialist in brain science says that universities are giving valuable knowledge and information to students but there is no satisfactory outcome. Professors observe that students do not have interest in the subjects they are studying. "Teachers have said this since the time of Aristotle!" Dr. Youro is of the opinion that even though students learn valuable knowledge and information, without the intention to use that knowledge they will never use it to take action. The author has tried to express this in a simple formula:

$$Y = a X$$

$Y$  ; Magnitude of action

$a$  ; Interest coefficient

$X$  ; Education activity = giving knowledge and information

What is needed is to find a way to increase the interest coefficient ;  $a$ . Many faculties know how very difficult this task is. One possible idea is to go back and increase the  $Y$  value. In other words require students to be involved in practical action. This is certainly the reason many people believe that a practical education program – education by doing - is very important. The author takes under graduate students and post graduate students to developing

countries in the vacation every year to let them experience real infrastructure development. Visits have so far been arranged to Cambodia, Thailand, Myanmar, Nepal, Taiwan, Indonesia, Mongolia and Vietnam. There is a double benefit as visiting and local students have the opportunity to discuss and interact. This way of education and human development is very effective. The local universities students have chance to appreciate the shape of infrastructure development in developed countries and can study what is adaptable and what is not acceptable for their own countries.



Discussion meeting between students of Atam Jaya University Indonesia and Kochi University of Technology at Atam Jaya University Yogyakarta Indonesia in September 2010

On 11<sup>th</sup> March 2011, a magnitude 9.0 ( $M_w$ ) earthquake caused by an undersea megathrust, occurred off the north eastern coast of the main Japanese Island of Honshu. The earthquake triggered an extremely destructive series of tidal waves or Tsunamis. The Tsunami was recorded at up to 40.5m above the sea level (as measured in Miyako City in Iwate prefecture) and the Tsunami was recorded traveled 10 kilometers inland in some areas. The Tsunami destroyed houses, factories, buildings,

rail ways, bridges, river embankments and other infrastructure and killed more than 15,000 people. Approximately 5,000 people were still missing at the end of July 2011. In particular, the Tsunami destroyed essential cooling utilities at several nuclear power stations in one location in Fukushima Prefecture. This created potentially catastrophic radioactive contamination.

In June 2011, the authors took civil engineering students from Kochi University of Technology and Ehime University to Ishinomaki City in Miyagi Prefecture (in the area affected by the Tohoku Earthquake) for volunteer activities. Ishinomaki City suffered a great deal of damages from the Tsunami and its inhabitants are still experiencing extremely difficult living conditions.

The volunteer activities had been continued 3days



The volunteer activities by students and faculties in the disaster area in Ishinomaki city

and participating students worked with local people to clean up side ditches and to bring out mud from inside of housings. It was really dirty and tough works. However, the students worked hard without any complains. Though these activities the students had a chance to see the magnitude of the damage and the effect on people's lives in the disaster areas. On returning to the laboratory the students developed their own study themes by themselves. These practical activities are hope will have effect a beneficial effect on the development of construction management education in Asia.

#### **4. Movement for Construction Management Education in ASIA**

In November 2008, a group of faculties of Asian universities which specialize in construction management had a meeting in Taipei and established a forum called the "International Construction Management Forum in Asia" (ICMFA). On the homepage of this forum it states that the mission of ICMFA is "to promote education, research, training and professional development on Construction and Project Management in Asia." The figure 2 shows the member organizations of the ICMFA.

ICMFA will assist member organizations in Asia, which have not yet developed appropriate construction and project management education, to enhance their capacity. It will also establish a center of excellence on construction and project management to undertake research, development and expertise in related fields of learning. The results of research will be fed into organizations and industries for capacity building and efficient infrastructure development and management. ICMFA will provide a platform for academics, researchers, and practitioners to enable sharing of resources and of experiences accumulated by individuals and organizations. ICMFA will facilitate collaborate among different entities such as Universities, Governmental organizations, Non-governmental organizations, the Private sector and Donor agencies.

ICMFA initially will focus on enhancing the capacity of members and other interested organizations from member countries on Contract Administration and developing appropriate education, introducing courses, training curricula on Construction and Project Management. The other areas will be incorporated after integrating the resources from the members and member organizations.



Fig. 2 : Member organizations of the ICMFA

## 7. Conclusions

The new concept of infrastructures mentioned in this paper may create many kinds of ideas and approaches for development of a country and the betterment of its inhabitant's welfare. This concept will also apply for human development and enable civil engineers to realize a holistic approach in infrastructure development and consequently improving the infrastructure development environment. The author believes that ICMFA creates new platform for the improvement of civil engineers' practical activities.

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