Session Report:

MANAGEMENT III
MANAGEMENT TECHNOLOGY OF THE FUTURE

Session Chair: Noel Raufaste (ASCE, USA)
Session Secretary: Tadaaki Nakamuta (Shimizu Corporation, Japan)

Mr. Noel Raufaste

Mr. Tadaaki Nakamuta

Alternative Method of Construction for Public Work in U.S.A.
by Professor Saeed Daniali
Public Works Management of the Future
by Dr. Tsuneo Uesaka and Mr. Akira Fujimoto
N-Dimensional CONstruction Management Information System (NDCON)–An Approach of Integrating Construction System in FIAPP
by Dr. Fletcher Griffis, Mr. Eric Hsiao-Hua Chang, Dr. Symeon Christodoulou and Miss Michele Fei

Prof. Saeed Daniali

Mr. Akira Fujimoto

Dr. Symeon Christodoulou

1. SUMMARY

This summary highlights key technologies and issues from the three manuscripts comprising this session on Management Technology of the Future. The presenters discussed the need for improved construction management procedures and procurement systems. Their recommendations range from going back to studying the basics of implementing good management and procurement systems to exploiting electronic commerce that seamlessly integrates design and construction data to serve as a decision tool in the design and construction of facilities. We heard about processes for the owner and related decisionmakers to performed simulation and visualization of to-be-built projects so they may better understand the construction process, to anticipate problems, and to correct design and constructions practices as needed.

Construction projects have specific objectives and there are many unforeseen problems that negatively impact timely completion. While technologies, institutional arrangements, and processes will differ, the management of such projects has much in common with the management of similar types of projects in other specialty or technology domains such as aerospace, automotive, and ship building. Construction management is the skill of directing and coordinating human and material resources throughout the life of a construction project by using good management techniques to achieve predetermined objectives of scope, cost, time, quality, and participant satisfaction. The uncertainty in undertaking a construction project comes from many sources and often involve many participants in the construction project all whom will never work together again as a construction team. Needed are decisionmaking assessment tools that help owners select the best contractors based on technical skills, experience, and price; monitor construction in real-time and simulate, with a high degree of accuracy, the status of construction in the future for use as a decisionmaking tool to anticipate problems; and create databases of the as built construction for later reference to identify location of elements and systems.

To meet this challenge, three speakers presented prototypes of contracting method and management system in the near future. Their common aims are based on:

1. eliminating inefficient contracting methods and procurement systems,
2. creating management systems protocols that are based on universally accepted procedures for use by the end-users and owners,
3. harmonizing information and construction process procedures for more efficient construction management processes.

These three papers show a direction and processes for the future.

2. PRESENTATION HIGHLIGHTS

Mr. Fujimoto, Public Works Research Institute (PWRI)[1], addressed three characteristics of construction management system in Japan-- Ceiling Price System and Owners' Cost Estimation, Designated Competitive Bidding System, and Lump Sum Cost. He also explained PWRI's research on construction management in terms of Project Management tools, Value Engineering, Evaluation of Infrastructure Development, Consensus Building and Cost Estimation Rationalization.

[1] The Public Works Research Institute is part of Japan's Ministry of Land, Infrastructure, and Transport serving as a government research laboratory performing research and development on a wide variety of fundamental and applied technologies that improve design and construction technologies in areas of procurement methods for government funded construction and contractor evaluation procedures, to national land management and development, to global environment and the improvement of construction and production systems, to developing mitigation methods against natural hazards, to design practices for transportation systems, and other infrastructure technologies.

Mr. Fujimoto addressed the need to develop a uniform system for procurement and contractor evaluation. He spoke to the development of processes to achieve consensus in construction decisionmaking, and an education program and project management tools that provide owners with methods to better measure construction quality and assess potential environmental consequences, to anticipate increases in project costs and changes to construction schedules, and other factors. These tools are needed following the 1993 Japan general contractor scandals where the public lost confidence in public funded construction. These tools will help open construction to organizations beyond Japan. The Japan Diet in 1994 revised its biding and contracting procedures for public works projects based on recommendations from the Council on Construction Contracting following the 1993 scandals.

Dr. Symeon Christodoulou, et. al., Polytechnic University, New York discussed the Fully Integrated and Automated Project Process (FIAPP) that aims to improve seamless and automated information integration and construction quality control by using 4-dimensional visualization techniques for time sequencing. A new compound information system, based on the FIAPP concept, is the N (multi-) Dimension CONstruction Management Information System (NDCON). NDCON CIS Integration is based on drawings, specifications, and other documents that provide the information simultaneously. The NDCON System Architecture, based on Database Management Systems, responds to data changes automatically and rearranges data for optimum performance of output. NDCON Construction Process visualizes the complete process of construction by using 4D visualization techniques (3D CAD Model + time) and links other essential elements (project design, cost estimation, scheduling, procurement, accounting) within one networked system. In this global environment, data are modified and continuously updated throughout the construction process. Dr. Christodoulou presented a case study to demonstrate his research.

Professor Saeed Daniali, University of Washington, Seattle discussed a competitive negotiated contracting method based on the contractor's technical merits and procurement know-how for office building construction. The Design-Bid-Build for tender method for public works can restrict procurement method and tendering process and lead to additional cost, undesirable delays and low quality construction.

Professor Daniali spoke to a procedure used by the U.S. General Services Administration, Public Building Services[2], known as the competitive negotiated contracting method. He noted this procedure results in a higher quality of construction at less cost. Professor Daniali said, today owners are reconsidering the traditional processes and are giving greater emphasis to selecting contractors based on: 1. their technical merit; 2. using uniform procurement and management methods; 3. information clearinghouses for public works projects, procurement, and for certification of information; and 4. projecting the facility's construction process into the future to anticipate possible problems. He said, the process encourages greater communication between the owner and the designer, contractor, contractor teams, trades, and labor. Dr. Daniali stresses this method works to control cost, guarantee high quality construction and eliminate risk of litigation. This method requires that owners have several well-trained employees and an established construction committee to comprehensively review the variety of documents. Alternatively, the owner would need to hire a construction management consultant firm to oversee the entire activities.

3. **CONCLUSION**

[2] The Public Buildings Service of the General Services Administration, provides the work environment for over one million Federal employees nationwide. PBS serves as a builder, developer, lessor and manager of federally owned and leased properties. It provide a full range of real estate services: real estate brokerage, property management, construction and repairs, security services, property disposal and overall portfolio management.

During the Session, we discussed a competitive negotiated contracting method based on the contractor's technical merits and procurement know-how for office building construction. We heard about the advantages of using new and powerful computer software to more reliably perform project management. Such software provides the owner with an effective decisionmaking tool. Common keywords between three speakers are "Transparency", "Efficiency", and "Competitiveness" from the viewpoint of the end-user's satisfaction. In order to realize these methods and systems, the authors noted that technical cooperation with other related industries and guest worker/researcher exchanges are essential. We need to discuss the compatibility of these different processes and systems and engage in collaborations as we learn from each other.

Professor Daniali discussed a new contract procurement method used by one U.S. Federal Government Agency based on the owner's thorough evaluation of contractors evaluated technical merits and best bid based on construction schedule, staffing and expertise, quality performance measures, and on information captured from comprehensive oral interviews. Mr. Fujimoto reminded us of the need for uniform contractor evaluation and procurement procedures to assure continual high quality construction projects. Dr. Christodoulou and his three co-authors provided an important new decisionmaking tool to simulate construction in a multi-dimensional matrix. It provides a customized synthesis of cost estimation, scheduling, procurement, and accounting construction management system that visualize the construction process.

These three presenters offered new opportunities to advance construction management practices. If these processes are to succeed, greater communication is required between the owners and contractors. The speakers have encourages us to improve construction management practices through an active global exchange of the latest technologies and through routine discussions at the owner/designer/contractor level as a way to effect high quality global management decisionmaking tools.

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