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## Conclusions to Theme B Engineering and Construction Management

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### 1. SUBJECT

The owner or client who is undertaking a project is interested in getting the best overall result. This is not a simple task to-day regarding all the factors that should be taken into account and the many disciplines and relationships involved in a construction project.

Project management is the way to manage undertakings that are limited in scope and time as an entire task. Complex situations can be simplified and better controlled by defining projects and by managing them professionally. Project directives containing the essential information about the whole project in a short document and project handbooks as a more extensive documentation help to find and to maintain a common policy.

Since the first presentations on a similar topic at the IABSE Congress in Vienna (1), engineering and construction project management became a more and more consistent science, and a necessity for competitiveness in many market-places of the world. At the Vancouver Congress, contributions about the application of management principles to very prominent projects from Japan, South America, China, Canada, South-East Asia, and the Near East were described.

Quite large projects telling the lessons of single projects that involve large risks and benefits were selected. However, project management is applicable to a much wider range of projects. There are lots of medium- and large-scale construction projects, and even in a large project, there are many subprojects. Indeed, each consultant, contractor, supplier, and subcontractor manages a project of his own.

### 2. SYSTEMATIC PROJECT MANAGEMENT

The problems of project management are to define and to reach the project objectives, to know the actual status at all times, and to know the ways and means to achieve the next intermediate targets. This means to maintain the control in the following theoretically known areas during all phases of the project cycle:

- the operations that should be performed in the constructed facility when in operation, and their best possible benefit-cost-ratio as the general project objective
- the technical concept, dimensions, and quality of the constructed facility and all its subsystems and components
- the time schedules on several levels and in all important disciplines, with an economical resource usage
- the cost accounts on several levels and in all important disciplines, as related to the life-cycle costs and benefits of the facility
- the positions of the project organization and their work tasks, skills, motivations, responsibilities and rewards as well as the procedures of communication in this organization
- the environment of the project and its possible changes during the project cycle and during the constructed facility's life cycle.

The technical system can be considered as the basic reference system for all these areas of control (2).



Both the theoretical and the phenomenological approaches are worthwhile for investigation. The theory tries to generally answer the questions of the future. However, it is important to observe as well the up-coming needs, problems and opportunities of the future, the kind of relevant questions arising, and the type of projects that will have to be managed most frequently.

### 3. KNOWLEDGE PRESENTED

Each participant of the congress and each reader of the preliminary (3) and this final report may put his emphasis on different methods and experiences presented on that occasion. Here, a few points are summarized from a personal point of view.

The view into a longer-range future shows the potential of renovation projects and especially the great potential of new construction projects in the urban areas of developing countries. - When organizing a project, not only the functions of the consultants and contractors, but also the tasks and responsibilities of the owner and the operations planning should be considered. It would be interesting to know the criteria for an optimal allocation of tasks to the parties involved. - Quality management is a sometimes underestimated part of project management. Project time scheduling, cost planning and control, and project organization need a general technical background, if a real coordination shall be provided. - Construction projects can be designed and realized with an astonishing speed to-day. The large differences of duration for similar projects could be an indication of deviating objectives or construction technologies. - Thinking in terms of systems is considered as an essential basis of project management. Both the break-down of the entire system to subsystems and components fulfilling defined work tasks, as well as the communication and material flows taking place within the systems are open to discussion. - Large and complex projects can be controlled, but the corresponding management effort is quite often underestimated. Project management should reduce the risk of the organization undertaking the project which can be done by reducing the probability of occurrence and by reducing the amount of the possible damage.

### 4. PROBLEMS FOR THE FUTURE

Engineering and construction management is quite a young discipline. Although several reliable conceptual models could be found in the past two decades, many parts of the field are not yet explored deep enough to be ready for detailed explanation, computer programming, and instruction.

Professional project management is more and more widely used, but many fields are still open for beneficial application and improvement. Decades of teaching, exchange of experience and research activities will be necessary for this achievement on all levels.

The theoretical connections between the management science and the engineering and construction sciences are not yet well enough established, although the progress made in the last decade is remarkable. Indeed, project management is very close to construction practice, at least as close as corporate or product management.

It took many decades and an enormous scientific effort to find an accepted terminology in structural analysis. A similar statement will probably hold for each project management area.

### REFERENCES

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- (3) IABSE Congress, Vancouver, 1984, Preliminary Report, pp. 13-24