

## **Berkeley-Stanford CE-M Workshop    Research Issues**

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### **Toolbox for construction planning**

#### **Introduction**

Architecture, Engineering and Construction organisations need to meet with more client demands in shorter project duration's, at lower costs and to a higher quality. While operating in a highly competitive environment, the complexity of design and construction processes management of data and decision making increases. In achieving the desired productivity, quality, and cost reduction, information technology will play a vital role in the future. This paper focuses on the contractor's process of construction planning. The vision and research issues are based on insights, gained during my graduation project and a period of practical training at building-sites.

#### **Construction Planning**

The result of construction planning is a "Construction Plan" the total of plans for various construction aspects. Plans are made for planning, transport, equipment, site layout, logistics, safety, labour, costs, dimension control etc. In today's practice construction knowledge is retained in the mind of process designers and the output of construction planning is a set of "incoherent" documents, schedule's and diagrams. Additionally the construction planning is monodisciplinary. Generating alternative plans, maintaining and replanning is time-consuming and difficult. To design construction plans, knowledge, overview and communication is needed. The most difficult task for construction planners is to oversee all the relationships between construction aspects, to recognise and control all relevant information and to found decision to be made. In my vision future technologies will support contractors and partners during the construction planning process.

#### **Vision**

Intelligent Tools will assist process designers to keep overview during the construction planning process. The output of the tools is a coherent construction plan containing overall and detailed plans. Different "views" on the construction plan and product are available and contribute to efficient information handling. Process and product information related to a construction aspect, activity or object can be extracted and relationships, design history and argumentation are indicated.

The language and structure witch describe the construction plan is exchangeable between phases and building partners and construction planning will be organised multidisciplinary. Construction plan "documentation" starts at the product design and plans of different disciplines will be integrated. Process information is represented with several techniques that make interpretation univocal.

During a dynamic and iterative design process various tools interact continuously, will assist in making analyses and decisions while the construction plan evolves. Knowledge-based techniques enable process designers to generate alternative construction plans rapidly. Performances of construction aspects can be forecasted. For example: while designing a "transport-plan" the consequences for planning, costs, degree of occupation, logistics, etc. are indicated. For each project the most important construction aspects are intercepted and an integrated set of applications is configured. Together they become the process designer's "toolbox".

When the construction plan is carried out, tools are added to the "toolbox" witch support planning in detail, controlling resources and monitoring. The design process continues when tools indicate that justification of the construction plan is necessary. After the project is completed, the evolved construction plan and monitored process are analysed and new knowledge is extracted for new planning processes.

## **Research Issues**

Before the “Toolbox for construction planning” as envisaged is created, the following issues should be addressed:

**Structure:** Development of a structure in which each unique construction plan can be stored, plans for several construction aspects and script for building parts be extracted.

**“Language”:** Development of a computer-interpretable language describing construction process information so processes can be integrated.

**Organisation:** Development of methods and procedures that enable collaborative engineering.

**Tools:** Development of tools that support an iterative, dynamic and multidisciplinary design processes.

**Knowledge:** Capture and apply construction-planning knowledge that enables tools to contribute to a coherent construction plan.

**Performance:** Process Development methods to indicate performances of several construction aspects.

**Representation:** Development of representation techniques that enable efficient communication about all construction aspects.

**Note:**

The issues can be related to research currently carried out at several institutes. I would refer to CIFE's collaborative 4D-CAD research, as well to all institutes that work on supportive tools and methods. Working for a construction group, I want to draw attention to gap between theory and practice. At HBG a broad research program called “Half Time” is carried out in association with TNO Building and Construction Research. To achieve the objective to reduce processes to half time, various innovative technologies are selected, developed and integrally implemented in all group companies. I notice that implementation of a technology like 3D CAD, long “adopted” at research institutes, encounter difficulties. Related developments still need time and effort before operational. Research on “IST - SOLL” transformations is desirable to keep up with theory.

## **Personal background & motivation**

In November 98 I started working for the technology department at HBG, a European construction group. My task is to contribute to developments related to 3D/4D-CAD technologies, to monitor developments and to make innovations known.

At the Technical University of Eindhoven I graduated at the departments of Construction Engineering & Management and Design Systems. At the departments a concept for a “Construction Plan” is in development. I graduated on the development of a crane planning DSS, in the context of an IT supported construction planning process.

My interest in IT development in AEC industry rests on the accelerating developments and its prospective huge influences. Construction information technologies face a big challenge.