

The Material-Process Perspective: Design and Engineering

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Abstract : The development of design and engineering in large construction projects are characterized by an increased degree of flattening out of formal structures, extended use of parallel and integrated processes ('Integrated Concurrent Engineering') and an increased number of expert disciplines. The integration process is based on ongoing collaborations, dialogues, intercommunication and comments on each other's work (iterations). This process based on reciprocal communication between actors and disciplines triggers value creation. However, communication between equals is not in itself sufficient to create effective decision making. The complexity of the process and time pressure contribute to an increased risk of a deficit of decisions and loss of process control. The paper refers to a study that aims at developing a resilient decision-making system that does not come in conflict with communication processes based on equality between the disciplines in the process. The study includes the construction of a hospital, following the phases design, engineering and physical building. The Research method is a combination of formative process research, process tracking and phenomenological analyses. The study tracked challenges and problems in the building process to the projection substrates (drawing and models) and further to the organization of the engineering and design phase. A comparative analysis of traditional and new ways of organizing the projecting made it possible to uncover an implicit material order or structure in the process. This uncovering implied a development of a material process perspective. According to this perspective the complexity of the process is rooted in material-functional differentiation. This differentiation presupposes a structuring material (the skeleton of the building) that coordinates the other types of material. Each expert discipline's competence is related to one or a set of materials. The architect, consulting engineer construction etc. have their competencies related to structuring material, and inherent in this; coordination competence. When dialogues between the disciplines concerning the coordination between them do not result in agreement, the disciplines with responsibility for the structuring material decide the interface issues. Based on these premises, this paper develops a self-organized expert-driven interdisciplinary decision-making system.

Keywords : collaboration, complexity, design, engineering, materiality

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