

# AN ORGANIZATION BASED INFORMATION ARCHITECTURE TO SUPPORT UPPER LEVEL CONSTRUCTION ORGANIZATION DECISIONS

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## Abstract

*This paper presents an Organization Based Information Architecture (OBIA). This architecture has been developed to support the upper level decision making processes of construction organizations. The information in the OBIA is separated into five main categories: organization, commitment, process, environment, and facility. These categories were identified through expert interviews and case study evaluation. The main categories of information provide an information structure which supports strategic level decisions within a construction organization such as project risk assessment, selection of future projects and strategic planning functions. These decisions require information which is not well defined by project specific information structures developed in previous research efforts.*

## 1 INTRODUCTION

This study looks at the information needed for nonprogrammed, strategic decisions made by construction executives. Nonprogrammed decisions were defined by Simon (1960) as novel, unstructured, and consequential with no cut-and-dried method for handling the decision. Strategic decisions simply refer to important decisions within an organization (Mintzberg et al. 1976). Examples of strategic decisions made within construction organizations are market selection, project evaluation, and personnel selection. These decisions require a vast amount of information and are usually performed in an intuitive, experience based manner. It is important that the executives involved in making strategic decisions within an organization have the information needed to effectively make these decisions.

A majority of the previous information modeling efforts in the construction industry have a project based focus on providing a facility. These models are generally developed to facilitate the implementation of computers throughout the lifecycle of a project. The information architecture presented in this paper has a different objective. It identifies critical information needed for strategic decision making within a construction company and provides a structure for this information.

## 2 BACKGROUND

Many information models focus on a common model to represent the physical facility (product) being constructed. These product models provide a common representation of a building for the integration of computer systems.

Other information modeling efforts have focused on project based information models to develop more integrated project management computer applications.



Such modeling efforts include the Process Based Information Architecture (Sanvido 1990) and the Integrated Reference Model for Architecture, Engineering and Construction (Luiten et al. 1993). These models are oriented around the basic unit of a construction product or construction process.

The model presented in this paper identifies the information needed by the people within a construction organization to properly manage the organization. This includes the information needed to effectively manage both specific projects and the organization as a whole.

### 3 METHODOLOGY

The methodology used to develop the Organization Based Information Architecture (OBIA) provides the context of the model. It was developed by identifying the information needed to effectively evaluate potential construction projects which a construction organization could pursue. The project evaluation decision (some previous research has referred to this decision as the "Bid/No Bid" decision) is a strategic level decision which focuses on a wide variety of information related to the proposed facility, the organizations involved with the project, the environment surrounding the project, the processes which must be performed for the project, and the proposed contract(s). Due to the variety of information and the complex nature of the project evaluation decision, social science research techniques were used throughout this study, including interviews, content analysis, and case study evaluation techniques.

To determine the information which was needed to make a strategic decision, e.g., the project evaluation decision, it was necessary to consult the experts who make these decisions. Ten interviews with project evaluation experts from large United States construction companies identified the information which they considered when performing the project evaluation decision. Details and examples of the information were requested throughout the interview process. Each interview was analyzed by developing content analysis diagrams identifying the information which they discussed. A small example of the type of content analysis developed is shown in Figure 1.

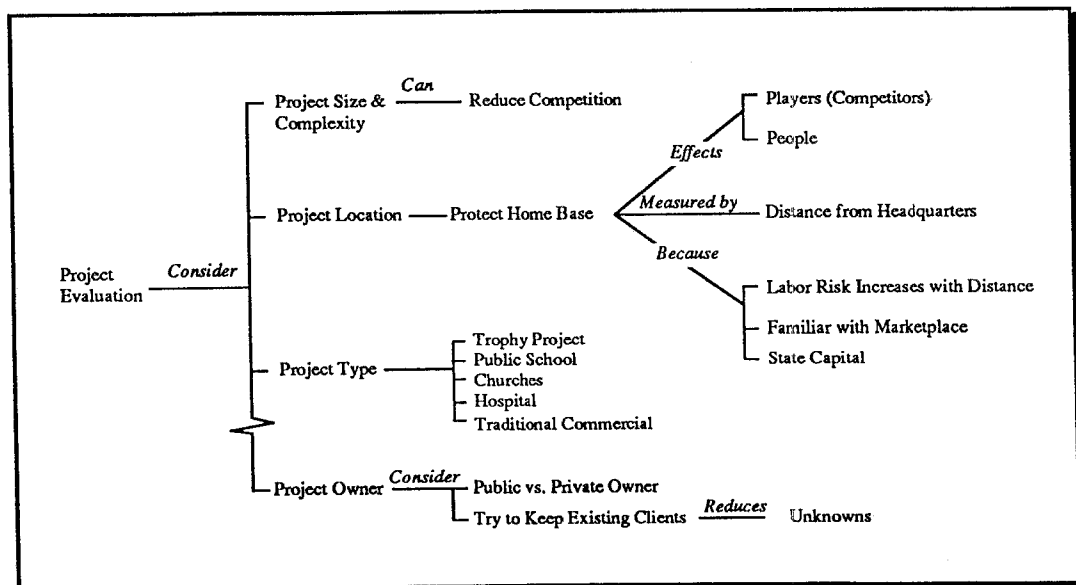


Figure 1: Partial Content Analysis for One Interview

The model was developed through a combination and categorization of the various topics discussed throughout the ten interviews. When necessary, categories were reorganized and renamed to provide a consistent information model. The model is represented as an IDEF1X model which is hierarchical and easy to understand. Additional details were added to the OBIA from literature in the area of the 'Bid/No Bid' decision and management literature.

The OBIA was evaluated through ten specific project evaluation case studies. Each case has a potential project which was being evaluated by a specific construction company. This allowed for the adequacy and comprehensiveness of the OBIA for the project evaluation decision, but it is believed that the OBIA also contains information needed for other strategic decision.

## 4 ORGANIZATION BASED INFORMATION ARCHITECTURE

The Organization Based Information Architecture (OBIA) is an information structure developed to contain the information needed by executives within a construction organization to effectively perform the strategic decisions regarding the organization. The OBIA is organized into five main categories of information. These categories are organization, commitment, process, environment, and product. Figure 2 shows the main categories and the relationships between these main categories. Each of these categories is described in more detail in the following sections.

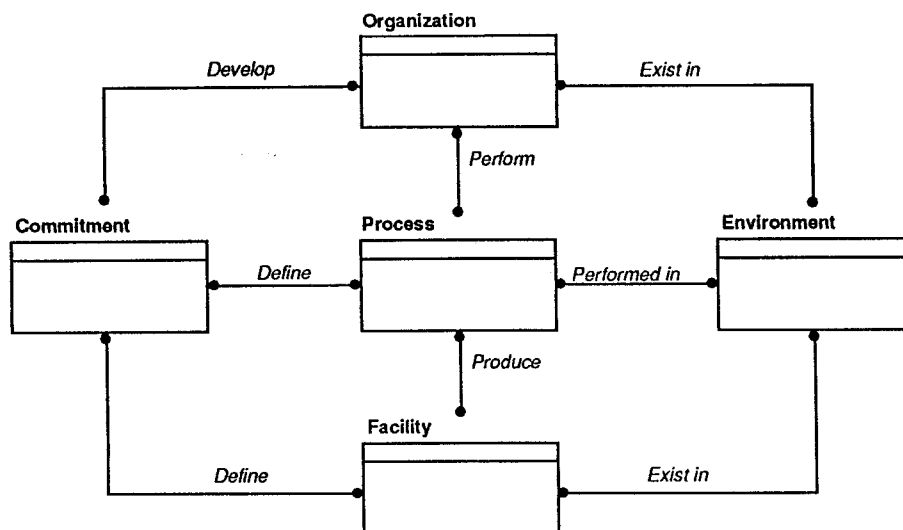


Figure 2: The Organization Based Information Architecture Level 0

### 4.1 ORGANIZATION

Organizations are “social entities that are goal-directed, deliberately structured, activity systems with an identifiable boundary” (Aldrich 1979, pp. 4-6). Each organization has goals and controls resources.

An organizational goal is “a desired state of affairs that the organization attempts to reach” (Etzioni 1964, p. 6). Several different types of organizational goals were identified throughout this research. These goal types are: financial, market scope, resource, productivity, and organizational development.

Organizations also have resources. The organizational resources are defined as people and items which organizations use, whether tangible or intangible, to perform processes. The different types of resources identified through this research are: financial, human (including management and labor), knowledge, relationship, image, physical (including infrastructure, equipment / tools, and materials), and time.

It is important to realize that an organization can be a portion of a company, an entire company, or a group of companies. For example, one particular company could perform a specified set of processes for a facility under a contract. In this scenario, the company would be considered an organization. In another arrangement, a company may form a joint venture with another company to perform processes for a facility under a single contract. In this scenario, the joint venture companies would be considered a single organization from the project viewpoint. But, if you were considering the contract between the joint venture partners, then each of the companies would be considered an organization. Therefore, it is important to determine the perspective being analyzed and define the organizations from this perspective.

#### 4.2 COMMITMENT

The second main category of information contained in the OBIA is commitments. Commitments are agreements between organizations and changes to those agreements which define the exchange of a scope of services, products, and/or compensation within a defined time. They can be either legally binding through a contract, or they can simply be agreements made between organizations with no legal implication. The distinction between contractual and non-contractual commitments has an impact on the methods used to resolve conflicts arriving from nonadherence to the commitment. The different subelements which impact a commitment include: scope, compensation, time, legal issues, and selection criteria (see Figure 3). It is important to note that these categories related to a commitment contain only the factors which were found through this research to have an impact on the project evaluation decision. This is not a complete categorization of factors which are contained within commitments.

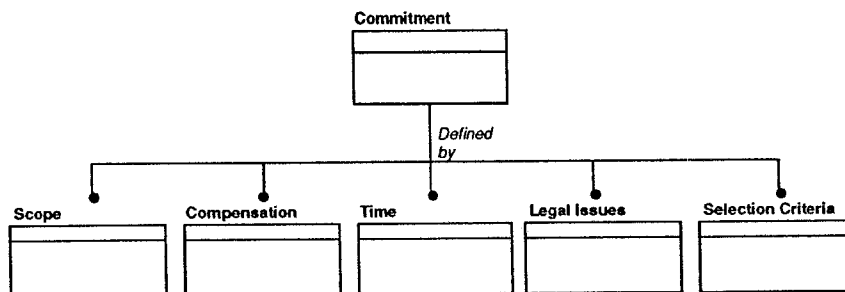


Figure 3: Commitment Information Categories

#### 4.3 PROCESS

The third category of information in the OBIA is process information. Construction organizations perform processes to manage business operations and to provide facilities. A breakdown of the various processes performed by construction organizations is given in Figure 4.

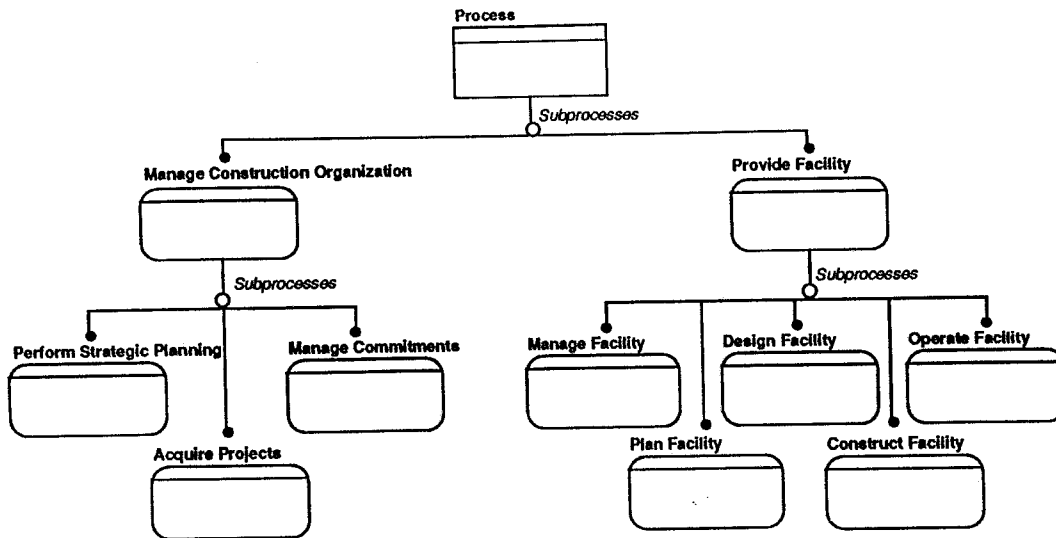


Figure 4: Processes Performed by Construction Organizations

The two main process types performed by construction businesses are organization management processes and facility processes. Organization management processes include such items as strategic planning, acquiring projects, and managing commitments. These processes are critical to the ongoing survival of the construction organization, but provide no value added to a particular construction project. The facility processes are those processes performed which contribute directly to the provision of a facility. These processes have been identified in the Integrated Building Process Model (IBPM) by Sanvido et al. (1990).

#### 4.4 ENVIRONMENT

An environment is defined as all the conditions and circumstances surrounding and affecting a process, facility or organization within a geographic location. Environments affect the methods which are used to perform facility processes and the risks and opportunities involved in performing business in a specific geographic location. The environment is divided into the following six types: physical, political, legal, economic, cultural, and resource (see Figure 5). A further definition of each of these categories is contained in Messner (1994).

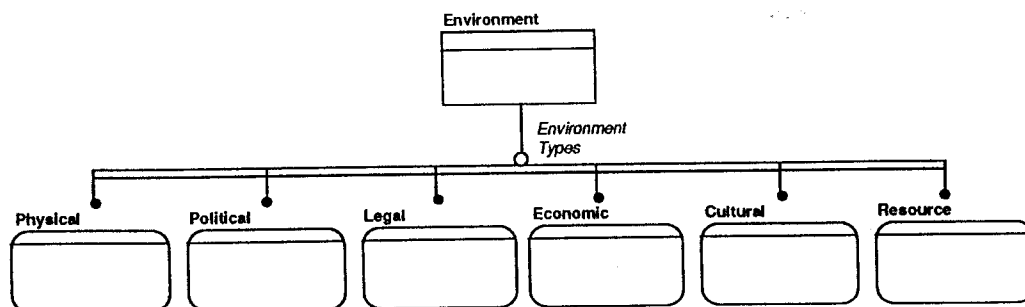


Figure 5: Environment Types

## 4.5 FACILITY

The final category of information in the OBIA is the facility. The facility is the physical product produced through the construction process. A facility has been defined by Sanvido et al. (1990) as “the completed building and site, including all installed equipment.” As discussed earlier, a large amount of research into the specification and categorization of information related to a facility is currently being performed in the pursuit of computer integrated construction. The definition and categorization of the facility product that is used within the OBIA is the same as that used within the Process Based Information Architecture (PBIA) developed by Sanvido (1990). The PBIA defines the facility as having an infrastructure and buildings (see Figure 6). Each of these items is further decomposed into subcategories. Additional information can be found in Sanvido et al. (1992).

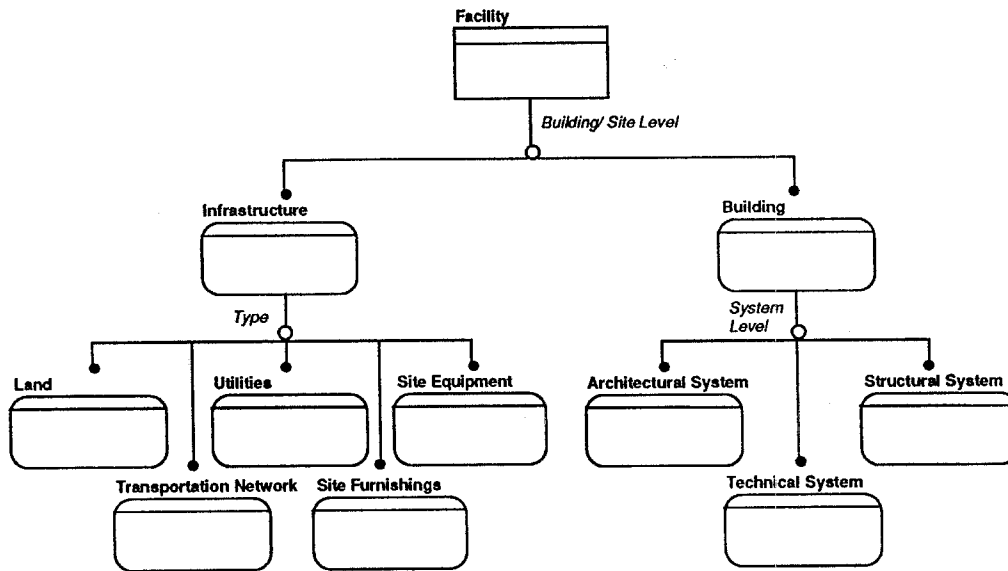


Figure 6: Facility Information Breakdown

## 5 CONCLUSION

The OBIA was developed through an analysis of interviews performed with construction executives. The model was then tested to determine if it contained the information needed to effectively make the decision from a construction company's perspective to pursue or not pursue a particular project. The model was found to contain the definition of information needed to effectively make the project evaluation decisions.

The OBIA was developed through a detailed analysis of a single strategic organizational decision; the project evaluation decision. This decision was selected since it is complex and requires information and knowledge about a great variety of topics. Additional research must be performed to obtain the more specific attributes necessary for other strategic decisions.

Several areas for future research exist. First, a more detailed analysis of other strategic level decisions is needed. Second, a more detailed study of the format and accuracy of information to assist executives is needed. Third, the development of applications for the information structure is needed. To date, the information structure has not been tested through a direct application. This is an important and necessary next step.

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