

THE CRUCIAL ROLE OF “CMa” IN PRECONSTRUCTION PHASES: KNOWLEDGE AND SKILL REQUIREMENT

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Construction Management is one of a significant project delivery system in search for the project success. One of the two types of this system is “Construction Management as Advisor” which involves a professional entity called Construction Manager as Advisor (CMa) which advises the Owner from the initial decisions to the completion of the construction. There has been a growing movement towards the project success factors in the past number of decades. However conducting research on project success factors related to the preconstruction phase is not as common. The aim of this paper is to review the crucial role of CMa in the preconstruction phase and identify the knowledge and skill requirements. By doing so, this study also aims to be a reference to the owners in selecting or hiring a CMa which can be a person or an organization. Since construction management delivery system is relatively a new method in Turkey. In order to define knowledge and skill requirements; the services to be given by a CMa in American Institute of Architects contract documents are analyzed by one by. The research findings showed that 22 different services have to be given by CMa in the preconstruction phase. The skill and knowledge requirements of those services are discussed and identified accordingly.

Keywords: Project success, Pre-construction, Construction management, Building defects.

1 INTRODUCTION

The focus of construction industry for project success in construction industry is mostly on the construction process itself. However a building project is a cascade of phases starting with the decision of owner and the conception of the project of which outcome will be an input for the next phase. Moreover most of the decisions are given before the construction starts in preconstruction phases. Since those decisions given will have high impacts on the construction process and the building itself as an end product, this study aims to explore the advantages of a CMa to improve the preconstruction phases. Sommerville (2007) examined more than a thousand design deficiencies and reached a conclusion that the reasons of them are; poorly prepared technical details and misconsidered specific requirements. Also it is mentioned that if the design team put a clear image for both the contractors and the occupants, problems would be less. According to the study of Reddy and Andrew (2005), the design and the construction of a building is actually an integrated system, however construction professionals are

mostly not take into consider the strong relationship. At the construction process, one of a main reason of delays and cost increases is rework. According to Sommerville (2007), ambiguity causes the delays. Additionally ambiguity rises because of incomplete, uncertain and conflicting type of information which is produced at the preconstruction phases. Preconstruction phases consist of four different stages; Project Conception, Design, Construction Documents and Bidding. Design involves Schematic Design and Design Development (PRM 2005). According to PRM (2005), the Project conception activities which are the responsibility of the owner are feasibility study, programming, site analysis and site selection. Meanwhile the owner is required to produce program, budget and schedule of the Project properly. As an investor and not an expert in building construction, owner will need to coordinate and manage different proffesionals or consultants to provide those activities and documents which are required to include complete, certain and clear information. On the other hand all those first information such as budget, schedule, programming will be the determinants of the quality of the design of the building after all. Additionally, the ability of decisions given in the early stages to influence costs of building project's is higher as seen on the Figure 1. The conception has the highest influence on the cost which will be a performance measurment for the construction and success level for the building.

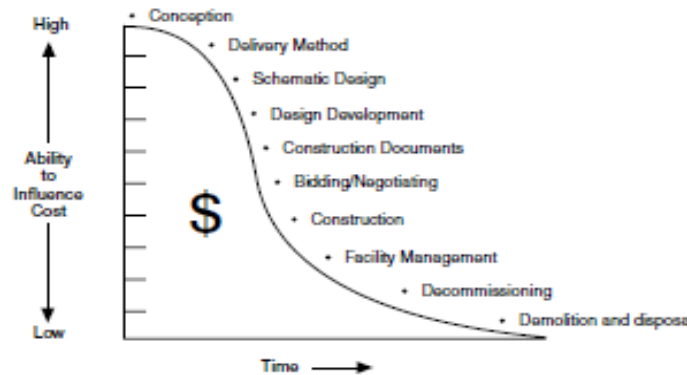


Figure 1. Ability of decisions to influence costs at different stages (PRM 2005).

2 CONSTRUCTION MANAGER AS ADVISOR

Construction management is the process of professional management applied to a construction project from conception to completion for controlling project time, cost, and extent (PRM 2005). One type of the Construction Management Project delivery system is the Construction Manager as Advisor (CMa). Without having any financial risk, the CMa's role is to advise the owner throughout the phases of the building project starting from the initial decisions. When an owner implements a project using a CMa, it allows the owner to make use of advice that is unaffected by any potential conflict of interest (PRM 2005). One of the primary advantages of CMa is utilizing the CMa's construction expertise during the Pre-Construction Phases to advise on design constructability, scheduling, cost and budget control, contract and bid document preparation, and other (CMMA 2015). Therefore in this study, by focusing on the

availability of a CMA in preconstruction phases, it is going to be discussed that how crucial is the preconstruction services of a CMA for the success of the building.

3 PRE-CONSTRUCTION PHASES SERVICES OF CMA

The pre-construction services to be given by a CMA are listed as brief descriptions below as Table 1, by the light of C132 2009, the standard contract document of American Institute of Architects (AIA), between CMA and the Owner. Required knowledge areas are noted for each service (Table 1).

Table 1. Knowledge area requirements for CMA pre-construction services.

No	CMA Pre-construction Services (AIA C132,2009)	Required Knowledge Area
3.2.1	<i>to Review the program furnished by the Owner.</i>	PROGRAMMING
3.2.2	<i>to Provide a preliminary evaluation of the Owner's program, schedule and construction budget requirements, each in terms of the other.</i>	PROGRAMMING COST&BUDGET CONT.
3.2.3	<i>to Prepare a written Construction Management Plan</i>	COORDINATION
3.2.4	<i>to Prepare preliminary estimates of the Cost of the Work or the cost of program requirements.</i>	COST& BUDGET CONT.
3.2.5	<i>to Review design documents during their development and advise on proposed site use &improvements, selection of materials,& building systems&equipment. Provide recommendations on constructability, availability of materials&labor, sequencing for phased construction,</i>	DESIGN REVIEW SITE EVALUATION
3.2.6	<i>to Prepare and periodically update Project schedule</i>	SCHEDULING
3.2.7	<i>to Prepare and update estimates of the Cost of the Work of increasing detail&refinement.</i>	COST& BUDGET CONT.
3.2.8	<i>to Make recommendations whenever determines that design details adversely affect constructability, cost or schedules.</i>	DESIGN REVIEW
3.2.9	<i>to Provide recommendations and information regarding the assignment of responsibilities for temporary Project facilities and equipment, materials and services.</i>	CONSTRUCTABILITY REVIEW
3.2.10	<i>to Provide recommendations&info regarding the responsibilities for safety programs among the Contractors.</i>	CONSTRUCTABILITY REVIEW
3.2.11	<i>to Provide recommendations on the division of the Project into individual Contracts for the construction of various categories of Work</i>	CONSTRUCTABILITY REVIEW
3.2.12	<i>to Update the Project schedule to include the components of the Work, including phasing of construction, etc.</i>	SCHEDULING
3.2.13	<i>to Expedite and coordinate, the ordering and delivery of materials</i>	SCHEDULING
3.2.14	<i>to Assist the Owner in selecting, retaining and coordinating the Professional services of surveyors, special consultants, testing laboratories</i>	CONSTRUCTABILITY REVIEW
3.2.15	<i>to Provide an analysis of the types&quantities of labor required for the Project&review the availability of labor.</i>	CONSTRUCTABILITY REVIEW
3.2.16	<i>to Assist the Owner in obtaining information regarding applicable requirements for equal employment opportunity programs&other programs</i>	LEGALITIES
3.2.17	<i>to Update and submit the latest estimate of the Cost of the Work and the Project schedule, after the approval of the Drawings and Specifications,</i>	COST&BUDGET CONT.
3.2.18	<i>to Submit the list of prospective bidders.</i>	BIDDING
3.2.19	<i>to Develop bidders' interest in the Project and establish bidding schedules. to Issue bidding documents to bidders and conduct pre-bid conferences</i>	BIDDING CONSTRUCTABILITY R.
3.2.20	<i>to Receive bids, prepare bid analyses&make recommendations</i>	BIDDING
3.2.21	<i>to Assist the Owner in preparing Construction Contracts and advise on the acceptability of Subcontractors and material suppliers.</i>	CONSTRUCTABILITY REVIEW
3.2.22	<i>to Assist in obtaining building permits and special permits.</i>	LEGALITIES

4 KNOWLEDGE AND SKILL REQUIREMENTS OF CMa IN RELATION TO THE PRE-CONSTRUCTION PHASES

It is defined in this study that there are twelve knowledge areas related to the pre-construction phases, which will be explained in detail and discussed in the following sections.

4.1 Architectural Programming

It is the starting point and if the program has deficiencies, design defects will be inevitable. Through the availability of a CMa at the very beginning of the project, the needs of owner will be converted into architectural space requirements, which will be the start of high quality design. In order to give architectural programming service or to consult the owner CMa has to have knowledge of architectural design and space standards in addition to cultural and community context, legal issues, cost and construction methods. Basically, architectural programming requires investigative and information gathering skills, analytical skills in addition to strong communication and management skills.

4.2 Design Review

Design review will be only affective if it is done at the preconstruction phases by considering the architectural program, functional requirements, legalities, site restrictions and construction methods. Without having any experience of building design, to make a design review is not quite possible. Skills related to understanding of architectural and MEP drawings in addition to the ability to use the related computer aided design softwares such as Autocad are required.

4.3 Site Evaluation

The size of the site, its anticipated use, and the programming requirements will have a major effect on the scope of work for site analysis services. Having knowledge on climate, topography, soils, and natural features, site utility distribution systems, evaluating site access, understanding of building siting considerations, ability to analyze multiple factors objectively and also ability to work with related or specialty disciplines are needed (Fasla 2015). Additionally, knowledge of feasibility reviews, ability to use related softwares, investigative and analytical skills are required.

4.4 Legalities

Knowledge related to the local building law, codes and regulations is required to make design and constructability reviews. Any design not considering the legalities would fail since the building permits will depend on to be allign with the local authorities. Knowlegde of code compliance reviews in addition to communication skills and anticipating the possible future requirements are required for a CMa to be a proper guidance.

4.5 Scheduling

Scheduling of preconstruction phases require design process knowledge. Since estimating the times of approvals from the legislative authorities after the submittals is also critical, the knowledge of legalities is required for CMA. Milestones, key dates and submittals timings would affect the start of construction and the completion of the building. One of an important skill required is risk analysis, making assumptions and foreseen the alternatives to set the milestones.

4.6 Constructability Review

Constructability Review is the process of evaluating the construction documents for clarity, consistency, completeness and ease of construction to achieve overall project objectives (PRM 2005). Constructibility seeks to eliminate non-productive work on site, make the production process simpler and provide the opportunity for more efficient site management and safer working (Emmit and Groese 2014). The knowledge of construction means, methods, process and systems are required for an efficient constructability review. Without knowing the labor availability to be used for a specific type of a detailing, it is not possible to incorporate that detail into the design. One of an important required skill is ability to anticipate the design details which will possibly cause problems during construction or in the building as an end product.

4.7 Cost and Budget Control

Making cost estimates at different stages of preconstruction phase requires to use specific information related to each stage. Such as making a cost estimate in the conception stage is different than to make in construction documents stage. Especially the very early stages are difficult since the need of much more assumption without having concrete decisions. Knowledge required are making cost estimates and budgeting especially for the preconstruction stages. Analytic skills are required.

4.8 Bidding

The most critical part of the process is to prepare bidding documents which will give the same understanding to all parties. Unless it can cause disputes at the time of construction of that work item which would mean delay and additional cost. Knowledge of building construction is required. CMA requires to have detailed thinking skills and the ability to foresee the possible misunderstandable or unclear explanations for the work item. Also, CMA has to have the knowledge of related softwares to control the process and while evaluating the contractors.

4.9 Management and Coordination

Specifically for the preconstruction phases, the estimates for cost and time will be involved in the construction management plan while the uncertainties are at a high level. Coordination skills by organizing effective meetings, on time communications for conflicts, flexible way of thinking are required.

5 CONCLUSIONS

For the success of building project the main advantage of CMA system is the availability of a building construction expert who has the ability to manage and coordinate. Preconstruction phases involve decisions of which results will be visible at the time of construction or even after the construction.

In the preconstruction phases CMA's key role requires wide knowledge especially on design, constructability, cost management, programming and contract documents. While advising the Owner, CMA's communication, coordination, organization and management skills will affect the preconstruction process critically. Moreover those skills will influence the construction directly by giving the proper decisions and implementing them in all related documents .

Having onsite experience on design and construction is an asset for a CMA in order to manage, coordinate or advise properly not only management skills or technical skills are needed but also at some level of experience is required.

Preconstruction phases requires to associate fluid opinions with the construction process and the building at the end. CMA, have to have responsive actions during the evolvement of architectural design.

As a conclusion, for a succesful construction process and a successful building at the end, pre-construction services of a CMA requires knowledge on "architectural programming", "design review", "site evaluation", "legalities", "scheduling", "constructability review", "cost & budget control", "bidding" and "management & coordination" in addition to strong communication, analytical thinking and investigative skills.

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