

Full Length Research Paper

Analysing the use of construction management (CM) at risk to suggest a suitable contractual structure for developing countries

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Accepted 10 September, 2012

Paying attention to the science of management, generally, and especially to the knowledge of Project management and leadership, is absolutely necessary in national development programs in every country. Like other fields of industrial development, the progresses of the systems of project management have been considerable. In common traditional systems, there were no kind of some services like scheduling, constructability studies, value management studies, and researches on the ways of reducing the direct costs of the project and as a result, problems like high costs, low quality and no unacceptable delays, were happening frequently. Definition of construction management agency reduced many problems, but having no responsibility and taking no kind of risk against the client caused this type of management to be unusable. So, the construction management at risk (CMR) was defined. In different countries, there are many titles for the construction managers, but all of them have two agents and the risk element in common. Also in Iran, in addition to the clients, there has been defined an official title named Management contracting, or the fourth factor in the national executive and technical system. Having little knowledge about the essential reasons of CMA and CMR definition, with the fundamental goals of these types of managements, and perhaps, the right method of transition, from the three-factor system, to the four-factor one, many of Iranian management contractors only use some limited aspects of the construction management. This research, generally, tried to define management groups of civil projects and study their differences and similarities, according to the common international standards, and then looked through the characteristics of the management contracting in the Iranian executive and technical system to find the difficulties and problems which the management contractor are dealing with, and finally, evaluated the ideas of the experts of these fields (like the construction management companies, and those contractors with such former experiences) through a survey. Applicable suggestions to use the CMR in Iranian contexts, to improve the qualitative status of the projects, and to reduce the imperfections and delays, are the expected results of this research.

Key words: Project delivery system, management, construction management.

INTRODUCTION

Construction management

In the last thirty years, there have emerged a winning of right for public agencies in the USA to apply a method of construction contracting which lets the construction manager be involved early in or prior to the design

process. Many professional construction managers are leery of this change of role and resist being placed "At-Risk".

Construction management (CM) is one of the three major categories of project delivery systems in common use for building construction projects, the other two being

the traditional Design-Bid-Build and the Design-Build systems. Construction management includes its two most common forms (construction management as agent and construction management as contractor). In the first one, owner enters into multiple trade contracts with the trade contractors and suppliers and in the next one, construction manager enters into multiple trade contracts with the contractors and suppliers while CM gives a GMP to guarantee the project's price (Construction management, 2001).

CM is defined as a discipline and a management system created to promote the successful execution of project for owners (Dorsey, 1997). All forms and variations of CM contracts have the second, third or fourth contractual relationship added to the root relationship agency CM, between a construction manager and an owner (Dorsey, 1997; Construction Management Association of America [CMAA], 1999; Haltenhoff, 1999). This research is based on four important institutions publishing the references documents and contracts forms [Associated General Contractors (AGC), American Institute of Architects (AIA), Construction Management Association of America (CMAA), Joint Committee on Taxation (JCT)].

RESEARCH METHODOLOGY

Some methods have been used for data collection in this study. First of all, a thorough literature examination, typically including documents published by AGC, AIA, CMAA, JCT was implemented in order to reach an indepth understandings about similarities and differences between types of CM, responsibilities and payments (Construction Management Association of America [CMAA], 1999; CMAA, 1993a, 1988b; JCT Joint Contracts Tribunal, 1987; AGC 565, 1991; AIA, 1991; CMAA, 1988b, 1993b, c; AIA, 1992a). Secondly, we searched about CM and other types of managing methods which were employed in Iran. The author conducted interviews with contractors in Iran to obtain the popularity of managing methods (Emam, 2009). At the end, we prepared a questionnaire to achieve the amount of acceptance of CM in Iran. Community statistics in the questionnaire consisted of contractors and construction managers. Questionnaire was adopted as an appropriate method to evaluate viewpoints of companies for each group.

TWO TYPES OF CONSTRUCTION MANAGEMENT (CM) CONTRACTS

If the delivery you are referring to is the delivery of design and construction services, CM "Not At-Risk" is not a project delivery method, instead, CM "Not At-Risk" is a project management (versus "delivery") method, a method of managing design and construction services (Construction Management- "Management" vs. "Delivery")

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Abbreviations: **CMA**, Construction management agency; **CMR**, construction management at risk; **GMP**, guaranteed maximum price; **GC**, general contractor.

Clarifying CM vs. CM At-Risk By Michael Kenig, Holder Construction).

Construction management (CM) in USA

CM is defined as a discipline and management system created to promote the successful execution for owners. The primary consideration is whether the construction manager performs an administrative role acting primarily as an agent to an owner or takes on responsibilities of a constructor, perhaps working for a GMP. So, CM can be divided into tow parts: CMA and CM at Risk (CMAA, 2002). Construction manager provides professional services to the owner; the CM organizes the effort, develops the management plan, monitors the participants' progress against the plan and identifies actions to be taken in the event of deviance from the plan. CM also provides expert advice in support of the owner's decisions in the implementation of the project. The CM can be a firm, a team of firms, or an individual (CMAA, 2002).

Agency CM (construction management for fee)

In "agency construction management", the CM assumes the position of professional advisor or extension of staff to the owner. The owner lets most of the contracts, and certain cost and performance risk is placed on the contractors. In these cases, the CM is in a position to offer advice unencumbered by any interests other than those of the owner and the project (CMAA, 2002). The owner shall enter into a separate contract with one or more contractors for the construction of the project (CMAA, 1993a).

Construction management (CM) at risk (CM/general contractor)

Construction management at risk services is provided by a person, corporation, or entity that provides construction management services for a project throughout the pre-construction and construction phases. These services may include preparation and coordination of bid packages, scheduling, cost control, value engineering, evaluation, other pre-construction services and construction administration. CM is a licensed general contractor and guarantees the cost of projects (GMP). A CM holds all subcontracts and bears risks on time, cost and workmanship quality. CM may or may not self-perform some work tasks (Dorsey, 1997). A "CM/GC" is essentially the same as a CM "At-Risk" (Construction Management- "Management" vs. "Delivery" Clarifying CM vs. CM At-Risk by Michael Kenig, Holder Construction). The construction manager has the right to perform works tasks by his own forces and to award seprate contracts or allow utility owners to perform some works tasks (CMAA, 1988b). The key difference between these two forms is that the CM at risk is in fact a distinct delivery method due to its responsibility for construction performance. Agency construction management on the other hand, is a distinct set of services that can be applied to any delivery method (CMAA, 2002).

Construction management (CM) in UK

Basically, there are the two types of CM contracting systems in the England: the construction management contracting-CMC and management contracting-MC (CIRIA, 1983; Willis et al., 1994). The first series of these type contracts publish was published in 1987 - JCT87 management contract (JCT Joint Contracts Tribunal, 1987).

Construction management contracting (CMC)

In CMC, an owner (client) assumes the contractual position of a

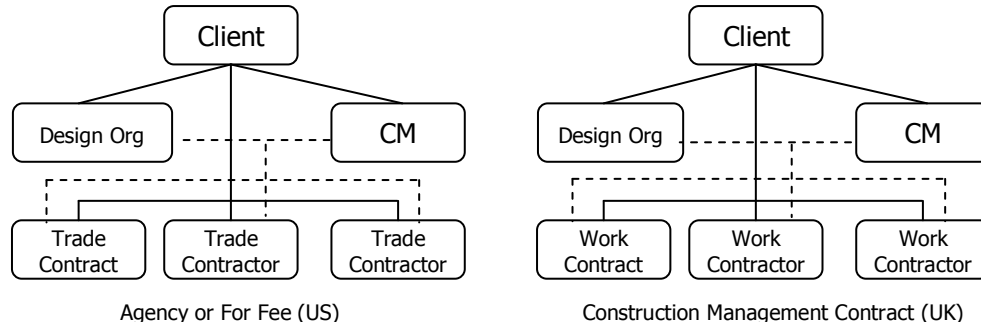


Figure 1. Contractual arrangement in CM consulting.

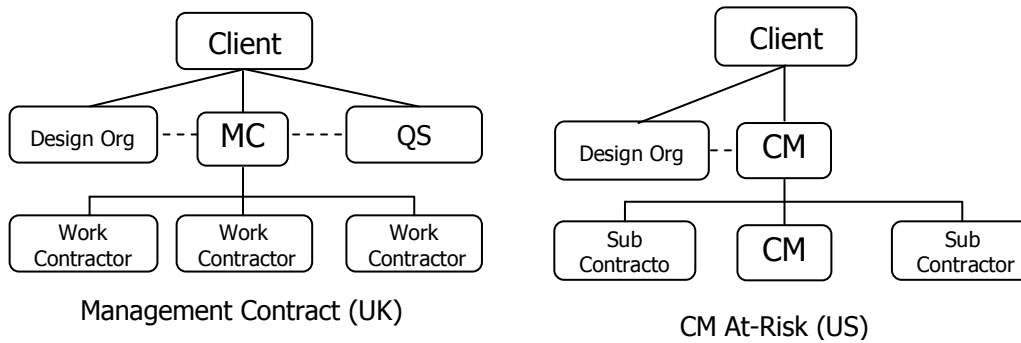


Figure 2. Contractual arrangement in CM contracting.

main contractor and engages directly, works contractors to carry out construction works as subcontractors. The conventional allocation of risks remains unchanged. This is similar to CMA in the USA (CIRIA, 1983).

Management contracting (MC)

In MC, an owner first appoints first a professional team that prepares project drawings, specifications and bills of quantities which broadly describe the scope of a project. The head of a team is usually an architect. The owner also appoints a management contractor at the early date who is a project planner, manager and organiser (JCT Joint Contracts Tribunal, 1987). The management contractor (MC) does not carry out any construction work. Instead, it assists the employer in putting together work packages for tender and then enters into, and manages the work contracts. The procedure is thus a two-stage one. Owner pays MC a fee, together with the “prime cost” of the building work. This system of procurement should not be confused with construction management, where the employer engages trade contractors directly (www.jctcontracts.com/contracts). This type is an outsourcing approach with incomplete risk transition and has a nature between approach and system (Emam, 2009).

Comparison of CM contracting systems in the USA and UK

In the USA and the UK, CM consulting includes the national forms of agency CM and construction management contracting (CMC), respectively. In turn, CM contracting includes the national forms of CM-at-risk, and management contracting (MC), respectively (Specialist Task Organizations Procurement Approach for

Re-engineering Construction Project Processes, 2007) (Figures 1 and 2).

This two-form classification seems to be consistent with some national constructing systems. Frequently, the same basic similarities and differences are to be found around seven key theoretical themes, that is definitions, contractual links and arrangements, information links, contractual risks, project responsibilities, the roles of CM firms and the types of organizations that are engaged in CM tasks in product development and construction phases (Specialist Task Organizations Procurement Approach for Re-engineering Construction Project Processes, 2007).

CONSTRUCTION MANAGER’S RESPONSIBILITIES

A construction manager acts as a consultant in the preconstruction phase and as the equivalent of a general contractor during the construction phase. A construction manager holds all subcontracts and bears risks on time, cost and workmanship quality. A construction manager provides preconstruction services as an agent, holds subcontracts and provides a GMP and a fixed contract period. A construction manager may or may not self-perform some work tasks (Dorsey, 1997).

Pre-construction phase’s responsibilities in pre-construction phase

Construction manager’s responsibilities in pre-construction phase in both types CMA and CMR are similar to one another. The responsibilities in pre-construction phase are based on AGC 565 (AGC 565, 1991; AIA, 1991):

1. Preliminary evaluation;
2. Consultation;
3. Preliminary project schedule;
4. Phased construction;
5. Preliminary cost estimates;
6. Subcontractors and suppliers's selection;
7. Long-lead time items;
8. Fast tracking.

CMAA (1993c) document No A-4 includes the standard form of the agreement between the owner and the professional design team. It highlights the relationship of the project parties with regard to design, basic services to be provided by design professionals in all project phases, additional services, the owner's responsibilities and the compensation and payments for design professionals' services. The article 4.15.1 of CMAA (1988b) document attests to the fact that the contractor should forward all communications to the construction manager. Article 3.1.1 enjoys the contractor to provide safe facilities for the owner's access.

The overall project risk of price, quality, performance and contract duration are placed on the construction manager who may offer the option with the GMP and the fixed contract period. The construction phase commences when the owner accepts the GMP proposal and issues a notice to the construction manager to proceed (Specialist Task Organizations Procurement Approach for Re-engineering Construction Project Processes, 2007). In the USA, the article 2.1 of CMAA (1993b) document No. A-3, states that the construction manager shall administer the contract and act as the owner's principal agent in all matters. The owner hires the CM firm about at the same time with the A/E.

In AIA (1991) A121/CMc-AGC document 565 and AIA (1992c) document B801/Cma, the construction manager shall review design documents during their development and advice advise on the proposed site use and improvement, the selection of materials, the building systems and equipemnt and the project delivery method (AGC 565, 1991; AIA, 1991; CMAA, 1993b).

According to the Article 1.3 of the document No GMP-1 (CMAA, 1988a), "the owner will require the construction manager to contract directly with such contractors as may be necessary for the construction or supply of the project". The clauses 1.2 and 1.4 state the relationships of owner and architect, construction manager and other participants, respectively. An owner in a consultation with a construction manager contracts separately with design professionals while the construction manager must endeavour to maintain a working relationship with design professionals. In addition, the dual agent/independent contractor status of a construction manager creates a potential for a conflict of interest during feasibility and design phases. However, such dual services can be eliminated through separate contracts for each service (CMAA, 1988b).

Construction phase's responsibilities in construction phase

Construction phase includes:

1. Construction manager shall schedule and conduct meetings at which the owner, architect, Construction manager and appropriate subcontractors and discuss the status of the work;
2. The Construction manager shall provide monthly written reports to the owner and architect on progress of the entire work;
3. The Construction manager shall develop a system of cost control for the work;
4. The Construction manager is responsible for unsafe materials;
5. CM Construction manager shall not be required to provide professional services (AGC 565, 1991; AIA, 1991). The construction manager advises on the division of the project into individual works contracts for various categories of work including

the method to be used for selecting contractors and awarding contracts. The construction phases commence with the awards of the initial construction contracts or purchase orders. The construction manager provides administrative, management and related services to co-ordinate scheduled activities and the responsibilities of the contractors with each other and with those of the construction manager, the owner and the architect. It is stated in the article 4 of AIA (1992a) document A201/CMa that the construction manager administers the works contracts in co-operation with the architect.

For instance, the Article 3.2.5 of CMAA (1993c) document No A-4 states that the construction manager and the design professionals shall maintain a close liaison and have the frequent interchange of information and documentation to achieve compliance with the project and the construction budget. The construction manager furnishes to the owner and the architect a list of the subcontractors, including the suppliers of materials and equipment. The construction manager must recommend to the owner and the architect a schedule for procurement of long-lead time items that constitute part of the work required for meeting the project schedule.

RISK IN CONSTRUCTION MANAGEMENT (CM)

The construction industry is statistically one of the most hazardous industries in many countries. Formal identification of hazards in the workplace is one of the foundations of successful safety management (Marta et al., 2010). There are twelve areas in the CM body of knowledge such as project, budget, contract, decision, information, material/equipment, quality, resource, risk, safety, and schedule and value management. Some areas are highly specific and technical (for example, scheduling and value management). Others tend to be obscure and more general (for example, decision management). In every construction project, the primary risk categories include cost and time over-runs, quality deficiencies and business interruptions that result from project-related disputes (Haltenhoff, 1999). In the CMAA (1999) documents, the basic functions that is, cost, time, quality, project/contract and safety management are addressed as the integral components of the CM process. Herein, risk management is analysed only in three exemplary areas that is, cost management, time management and project management, based on the CMAA standard forms of agreements (Specialist Task Organizations Procurement Approach for Re-engineering Construction Project Processes, 2007). Managing risk means minimizing, controlling, and sharing risks, and not merely passing them off onto another party. The methods of managing risks are retention, transfer, mitigation, and prevention of risks or any combination thereof (Nabil and Saied, 2001).

GUARANTEED MAXIMUM PRICE

When the drawings and specifications are sufficiently completed, the construction manager shall propose a guaranteed maximum price, which shall be the sum of the estimated cost of the work and the construction manager's fee (AGC 565, 1991; AIA, 1991). GMP is a type of contract work that is more suitable when the design is based on conventional means. However, the scope of work is not clear for fixed-price bidding at the time of contract award (Daniel et al., 2011). Contingencies are essential to address the usual cost growth that occurs during the further development of drawings and specifications. Contingency also covers the growth of construction stage cost growth, which is properly reimbursable as the cost of the work but not as the basis for change orders (Dorsey, 1997). The maximum price includes the actual cost of the work, a construction manager's fee and contingencies. In principle, owners do not reimburse construction managers for exceeding guaranteed prices.

The scope of works must be defined because scope variations affect the GMP (Specialist Task Organizations Procurement Approach for Re-engineering Construction Project Processes, 2007).

$$\boxed{\text{Cost}} + \boxed{\text{Fee}} + \boxed{\text{Contingencies}} = \boxed{\text{GMP}}$$

PROJECT MANAGEMENT OUT-SOURCING IN IRAN

The history of management out-sourcing in Iran dates back to a few years ago. Based on the author's studies, there is not enough understanding of CM agency and even CMR has not been experienced. There have only been some observed cases of CM agency. Investigating regulation and codes, we conclude that the aim of introducing the services of CM agency, in terms of accepting the risk or not, has not been clarified. Subsequently, there are some ambiguous points in general requisites on CM contracting documents in Iran, which can be summarized as:

1. Owners do not have correct understanding of criteria;
2. There is no balance between wanted responsibilities and delegated authorities,
3. Ambiguity in CM responsibilities;
4. Absence of liable and appropriate regulations about CM services;
5. Deficiency in due finishing CM presence in projects.

Following field research, we prepared a questionnaire to achieve the amount of acceptance of this system in Iran. The selected method is based on two types of CMR, one by GMP and the other one without any assurance such as GMP (similar to MC in UK). Some conclusions were attained.

RESULTS

Community statistics in the questionnaire consisted of contractors and construction managers. The company and its management plans were in the base of actuarial society, according to the list provided for the management plan by the Planning Department and monitoring strategy president (government) proposed, and was randomly selected. Companies were selected randomly and according to the list provided by government. The numbers of companies for each group were 30 and formed a total of 60 companies. Results of the analysis of questionnaires include:

1. If CMR can find its true position and his role is not captivated between some administrative rules, its presence will be effective especially in project's outcome. This depends on the type of cooperation and responsibilities of owner and the construction manager;
2. The main concern in using this system is not being the lack of any accessible specific regulation determining qualifications, ranking, precise description of the services and identifying contracts with a variety of modes, and how to share risk and the contribution of each stakeholder;
3. It appears when owner in Iran infrastructure projects is government, and the culture of the country's main

projects will be led to three-factor, traditional delivery system using CMR services is not provided. In this case, it is not acceptable to use CMR services.

There are some necessities for owners to be able to use CMR services such as:

1. Necessity of complete completing projects on time and detailed planning consideration;
2. Necessity of quality control and having with appropriate documents;
3. Helping owners to confront contractor to defend the rights and the probable contractor claims;
4. Necessity of making coordination among the various stakeholders involved in the project;
5. Skilled manpower for monitoring and controlling the executive;
6. Characterizing owner's belief in the pursuit of the ultimate project's goals;
7. Making current and popular culture using this system, particularly in the areas of oil, gas companies and petrochemical companies;

Obstacles in the path of companies in Iran and developing countries with similar economic conditions are:

1. The company's economic problems;
2. Fluctuating prices and inflation;
3. Uncertainty of about the subcontractors' performance;
4. Uncertainty of about materials and equipment suppliers' performance;
5. Lack of knowledge about regulations related to CMR's services;
6. Social background and lack of confidence in the country;
7. Lack of professional manpower familiar to management;
8. Owner in infrastructure projects is government;
9. Owner's misunderstanding of the amount paid to CMR;
10. Technical and administrative regulations and the circulars that have been set in profit of owners.

Now CMA is used in Iran, using the progressive type is considered to be more effective, that is CMR will have a positive impact on project success.

In some resources, the incorporation of management has been implemented in other types of delivery systems. Therefore, in the incorporation of CMA to Design-Build or EPC, two points remain to be scrutinized:

1. One of the most important CMR's tasks is to create coordination between design and construction phase to transfer constructability to the design. In Design-Build system, factor agent of design is the same one in construction factor agent. As a result of an internal coordination, there is consideration to constructability as well. So if owner utilizes CM, it is ineffective because of

this factor in D-B system;

2. Based on the above facts, CM can run as owner's consultant controlling and monitoring the D-B contractor's works. This is the only task that remains in his plans to manufacture, but this task is also noteworthy because in D-B system, owner has a consultant agent based on FIDIC documents responsible for monitoring. So the presence of two managing factors leads to clashed responsibilities and extra expenditure.

Accession to any system is applicable and true if owner does not have any consultant. It is not considered in Iran and lots of countries. Regardless of which project delivery method is used, it should be a separate discussion from determining which management method you are going to use. A topic for future discussion should be a comparison of modern project management methods and traditional trends applied in developing countries.

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