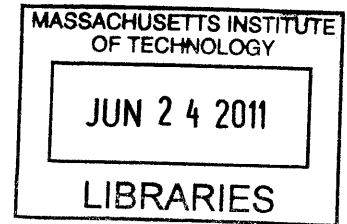


# Construction Management and its Application to the Delivery of the Lamar Towers in Saudi Arabia

By

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B.S Civil Engineering  
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# **CONSTRUCTION MANAGEMENT AND ITS APPLICATION TO THE DELIVERY OF THE LAMAR TOWERS IN SAUDI ARABIA**

By

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## **ABSTRACT**

Construction Management (CM) is becoming the delivery method of choice for constructing complicated projects. Previously, the most common method to employ was the General Contracting method, where the contractor and designer were two independent entities and the project was awarded based on a competitive bid and a lump-sum price. Research has shown that a Construction Manager not only understands the professional knowledge required for a project but also bridges the gap between the contractor and designer and promotes cooperation between the two. This delivery method can decrease the project duration, provide flexibility, value engineering and decrease the total cost of the project while satisfying the owner's needs. Therefore, it is key to examine the different types of Construction Management (Agency CM or CM At-Risk) as well as to understand the role that a Construction Manager plays in this delivery method.

The application of Construction Management in the construction of the Lamar Towers in Jeddah, Saudi Arabia is also examined to exemplify the benefits that the method is providing. The interaction between the different parties and issues that the teams have to face on a daily basis are studied in this thesis. A risk/reward analysis is also presented. Finally, suggestions are brought forward to improve the different aspects of this specific delivery method.

Thesis Supervisor: Jerome J. Connor

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# TABLE OF CONTENTS

ABSTRACT.....	2
ACKNOWLEDGMENTS.....	3
LIST OF FIGURES.....	6
1 Introduction.....	7
1.1 Description.....	7
1.2 Objectives of Thesis.....	8
2 Background Information on Construction Management.....	10
2.1 History.....	10
2.2 Construction Risk.....	11
2.3 General Contracting Versus Construction Management.....	12
2.3.1 Traditional General Contracting Delivery Method.....	12
2.3.2 Construction Management Delivery Method.....	14
2.4 Types Of Construction Management Methods.....	16
2.4.1 Agency Construction Manager.....	16
2.4.2 Construction Manager At-Risk.....	18
2.5 Types of Contracts.....	19
2.5.1 Lump Sum Contract.....	19
2.5.2 Cost Plus Contract.....	20
2.5.3 Guaranteed Maximum Price.....	21
2.5.4 Comparison between the Three Contract Types.....	22
2.6 Construction Manager Selection Method.....	23
2.7 Construction Manager Duties.....	25
2.7.1 Conceptual Phase.....	25

2.7.2	Program Planning Phase .....	26
2.7.3	Design Phase.....	27
2.7.4	Construction Phase .....	29
2.7.5	Close-Out And Start-Up Phase .....	30
2.8	Potential Drawbacks of Using CM Delivery Methods.....	31
3	Case Study: Lamar Towers in Jeddah, Saudi Arabia .....	34
3.1	History, Economy, Population and Culture of Saudi Arabia .....	34
3.2	Project Overview .....	37
3.3	Project Drivers.....	39
3.4	Owner Drivers.....	43
3.5	Delivery Method.....	45
3.5.1	Original Contract: Agency CM with Main Contractor.....	45
3.5.2	Current Contract: Agency CM with Multiple Primes.....	49
3.6	Bid Process .....	52
3.6.1	Original Contract.....	52
3.7	Current Contract.....	55
3.8	Analysis .....	56
3.8.1	Results .....	56
3.8.2	Suggestions .....	62
4	Conclusion.....	67
	References.....	68
	Personal Interviews.....	69

## **LIST OF FIGURES**

Figure 1: General Contractor Delivery Method [8].....	13
Figure 2: Construction Management Delivery Method [8].....	15
Figure 3: Building Sequence Comparison [3].....	16
Figure 4: Cost (in thousands of dollars) vs. Price for all three methods [1] .....	23
Figure 5: Saudi Arabia's Oil Production, Consumption and Exports [15] .....	35
Figure 6: Economic Activity [16].....	36
Figure 7: Towers Renderings [17] .....	38
Figure 8: Mixed-use Programming Diagram .....	40
Figure 9: Original Organizational Chart.....	46
Figure 10: Sales/Marketing Center.....	48
Figure 11: Revised/Current Organizational Chart.....	50
Figure 12: Proposed Organizational Chart.....	66

# 1 INTRODUCTION

## 1.1 DESCRIPTION

Today, construction accounts for nearly 10% of the national gross product of the United States and as much as 20% for developing countries such as Saudi Arabia. Construction has a great impact on the economy and it is imperative to improve efficiencies in this process in order to maximize large cost savings [12].

“Construction is a service – not a product” said John D. Macomber in his paper: *You can Manage Construction Risks* [1]. Construction is a complex process that is mainly comprised of contracts. It is characterized by the relationships that teams foster within themselves. It is because of this reason it is believed that the customer is buying a service rather than a product.

Each construction project is unique and no two projects are ever exactly the same. Construction is a highly intricate process and it can only be successfully managed by professionals in the field (ie. architects and engineers). It is an expensive process that many companies and individuals go through in order to complete a project. It is the biggest source of debt for these individuals and it requires extensive financing over a long period of time. Moreover, delays or issues with construction are the most debilitating problems owners can face over the course of the project [1]. Due to the high risk that is innate to construction, owners collaborate with professionals to lessen the burden of the risks.

When selecting a delivery method for a particular project, many factors influence the owner’s decision. First, there is the schedule issue: does the owner want the different

phases, such as design and construction, to overlap or not? Second, the project complexity issue: is the constructor's input important during the design phase? Third, the changes matter: is there potential for many changes to come after the start of construction? Fourth, the quality definition and verification matter: will the designer take control or quality control and quality assurance and inspect the work? Fifth, the owner's in-house capabilities: is the owner experiences enough with the construction process and does the owner have the appropriate skills to do so? Sixth, the experience with the desired method matter: has the owner used this specific delivery method before? Finally, the timing/availability of funding issue: who is funding the design and construction and is the funding available at all times [5]? Therefore, hiring a Construction Manager can help mitigating the risk as well as providing the professional knowledge that is needed to deal with the construction process.

## **1.2 OBJECTIVES OF THESIS**

The main objective of this report is to develop a framework and understand the benefits that Construction Management brings forth. This Thesis also deals with the application of the Construction Management delivery method in the Kingdom of Saudi Arabia and more specifically to the construction of the Lamar Towers in Jeddah. The key is to understand the complexity of the risk that the construction process generates and to mitigate it using a Construction Manager. A detailed description of the different types of Construction Management is brought forward and compared to the traditional General Contracting method.



It is also key for any owner to understand the different types of contracts that he/she could use when hiring a CM. Thus, an extensive study of the different types of contracts is presented as well as a thorough discussion of the most beneficial steps to follow when hiring a CM. Moreover, a checklist of the role that a CM has to offer during the different project steps is offered.

As mentioned earlier, the case study that this thesis deals with is focused around investigating the implications that the Construction Management delivery method has on the project progress. The project, owner and market drivers are analyzed first. Then, the interactions and the effects that different players have on the construction process are analyzed. A risk/reward analysis is also presented and finally suggestions are brought forward to enhance this method and eliminate all of its' deficiencies.

## **2 BACKGROUND INFORMATION ON CONSTRUCTION MANAGEMENT**

### **2.1 HISTORY**

It is recognized that Tishman Realty & Construction Co. pioneered Construction Management as a professional service during the 1960 [3]. At that time, the construction process was getting more and more complex as projects were getting more technically involved and growing in size. It was very hard for owners to manage all the teams that are present on site including the architects, engineers, consultants, contractors, subcontractors and so on. Owners needed a professional also known as a Construction Manager who has the experience to deal with coordinating and directing all aspects regarding entire project cycle.

The Construction Management delivery method was first used in December 1965 during the construction of the 100-story John Hancock Center in Chicago and later, in the 1967 construction of the 110-story twin towers of New York's World Trade Center. These projects demonstrated, unquestionably, that Construction Management was able to deal with the demands of large-scale and complex projects [3]. Since that time, the method has been constantly improved and refined as new technologies have emerged.

On September 3, 1968 the Federal Government conducted a study to evaluate the construction procedures utilized in the public construction sector. The main purpose of this study was to find the best delivery method to reduce the construction times and cost. The results came two years later and showed that projects in the public sector took twice as long as a similar project in the private sector. Thus, in order to resolve this inefficiency, the

Federal Government adopted the CM method as a viable method that can be used in the public sector. Later in 1975, the three main associations of architects, contractors and engineers issued a statement that recognized and defined the importance of Construction Management. The AIA (American Institute of Architects) issued the first Owner-CM agreements that same year. Finally, the Construction Management Association of America (CMAA) was inaugurated in Denver, CO in 1982 [4]. Today, both the AIA and CMAA agreements are used when Owner-CM contracts are signed.

## **2.2 CONSTRUCTION RISK**

There are seven steps in assessing and allocating the construction risk. These steps are: understanding the types and phases of risks, assessing the risks of a particular construction project, matching risks with in-house capabilities and building a construction team, defining a building strategy, picking the right type of contract, choosing the builder and finally monitoring construction [1].

Moreover, risks can be generally divided into three categories: financial risk that deals with the budget, time related risk that deals with the consequences if the construction is delayed, and finally design-related risk that deals with the degree to which the design satisfies the client's needs. All these risks can be addressed appropriately during the preconstruction and construction phase.

The preconstruction phase is the most critical because it focuses on programming the project. The risks in this phase are small, as changes can be implemented easily because construction has not yet started. During the construction phase, the risks move from

planning to supervision [1]. In fact, now the team has to follow the requirements set in the planning phase. The major aspect is to manage construction risk.

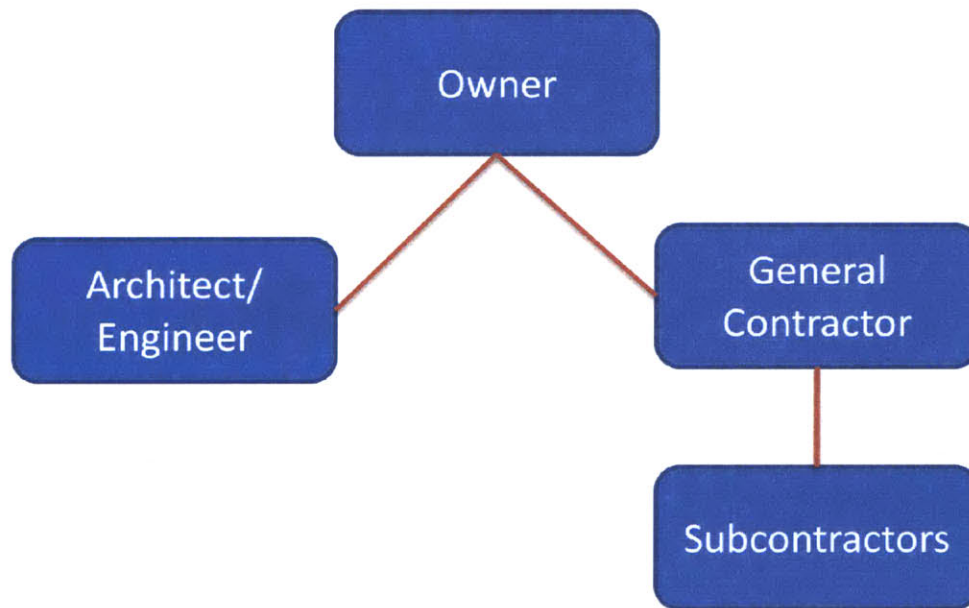
Every construction project has particular risks that are particular to it. In fact, every project is unique because they deal with specific site location and financing strategy. Once the risk is identified, it is important to match the risk with the capabilities of the current team. In this phase, it is very important to match the best team for a specific job, and those teams have to be managed by an important player. Depending on the owner's involvement and knowledge in the construction of the project, he/she may choose to do it him/herself, but in many cases, it is better to hire a Construction Manager to do the supervision. Once the different teams are chosen, a building strategy can be put in place, depending on the risk involved. Typically, high risk jobs can be mitigated by using a strategy that promotes cooperation, while low risk jobs are better dealt with price competition.

## **2.3 GENERAL CONTRACTING VERSUS CONSTRUCTION MANAGEMENT**

### ***2.3.1 TRADITIONAL GENERAL CONTRACTING DELIVERY METHOD***

In the traditional General Contractor delivery method, the main components that provide the service are the general contractor and the architect/engineer. It usually follows a Design-Bid-Build process. Here, the Design and Construction process are under separate contracts. When using this delivery method, the final selection is done according to the lowest total construction cost [5]. The contractor has a main role of undertaking the construction, directing, and coordinating the work of many subcontractors, vendors and workers. Thus, the GC usually has a "vendor" relationship with the owner [10]. The

architect/engineer is mainly responsible for designing the project, as well as providing all the construction documents and supervising the contractor's work to check if it is being performed according to specifications. The A/E has a "fiduciary" relationship with the owner because the owner entrusts the A/E to act on behalf of him/her [10]. In this method, the owner has complete control over the design [12] and the two entities are managed by the owner. Figure 1 is an organizational diagram of the traditional General Contracting delivery method. The lines on the graph are representative of contracts being signed between the entities that are linked.



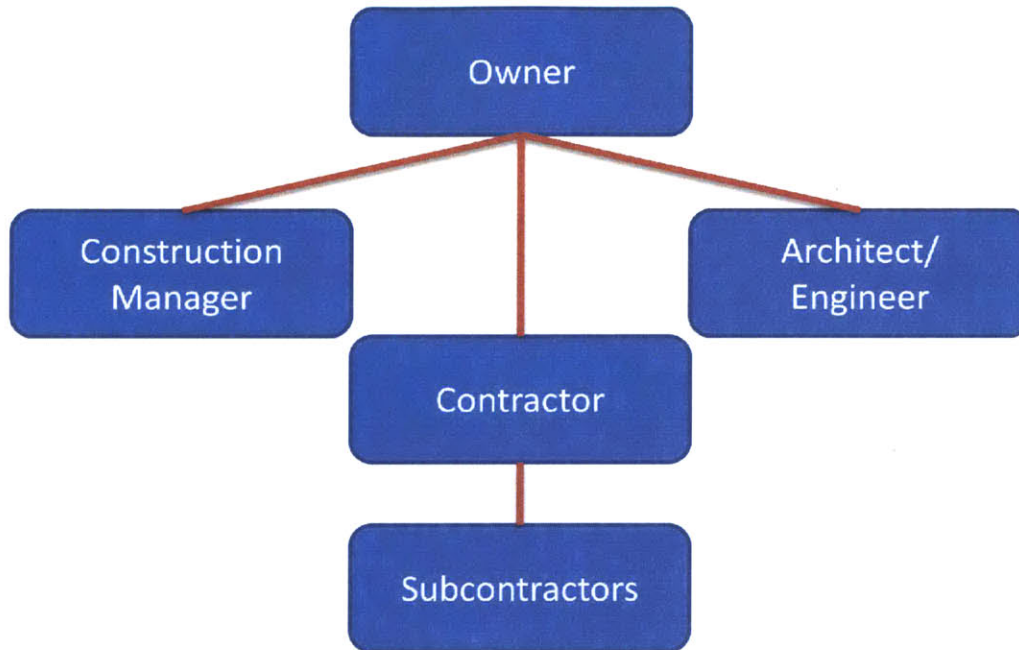
**Figure 1: General Contractor Delivery Method [8]**

On one hand, the main advantages for the owner are that the owner can select from a wide range of design professionals, and the designer has a fiduciary relationship to that owner. Also, the contract is awarded when the design is completed. The owner receives a final price and knows the cost from the beginning of construction process [2].

On the other hand, there are two main disadvantages when selecting such a method. First, during the design phase, the owner has no adequate construction expertise present and so there are no means by which to evaluate the cost implications of the architect's design. In many instances, the design may be extremely complicated from a construction point of view. Yet less complicated and less expensive techniques could be available that yield a similar result [3]. Moreover, during the construction phase the owner has no control on cost or changes because he/she has no direct control over the subcontractors who typically do 80% of the work. In fact, the general contractor has his/her contract signed with the subcontractors, making it harder on the owner to interact or manage them. The changes that are not part of the contract can be billed at higher prices and the added expenses are hard for the owner to mitigate [2].

### ***2.3.2 CONSTRUCTION MANAGEMENT DELIVERY METHOD***

The main goal behind using the CM delivery method is that the Construction Manager operates at all times as the owner's agent and manager in all aspects of the building process. The Owner has a new player along with the Architect/Engineer that will help supervise the building process [3]. The rest of the players involved are unchanged; there is still a contractor and his/her subcontractors. Figure 2, is an organizational diagram of the Construction Management Delivery Method [8].



**Figure 2: Construction Management Delivery Method [8]**

The main advantages of this method are that it allows for fast-tracking and gives more flexibility for changes during construction, without paying a premium [10]. Fast-tracking means that construction can start before the design is completed, resulting in time and cost savings. The CM provides preconstruction services such as value engineering and constructability analysis to improve the project. It also promotes teamwork between the designer and contractor by reducing adversarial relationships and provides incentives for the contractor to save the owner money [12]. Figure 3, shows the building sequence comparison between a GC and a CM and highlights the advantages of using a CM. Yet, the disadvantages of this method are that the price is normally not known early on and the CM plays the most important role in the success or failure of the project. If he/she is not competent enough, like providing a poor bid packaging or inadequate managing then the project can be very costly [2].

## General Contractor Approach

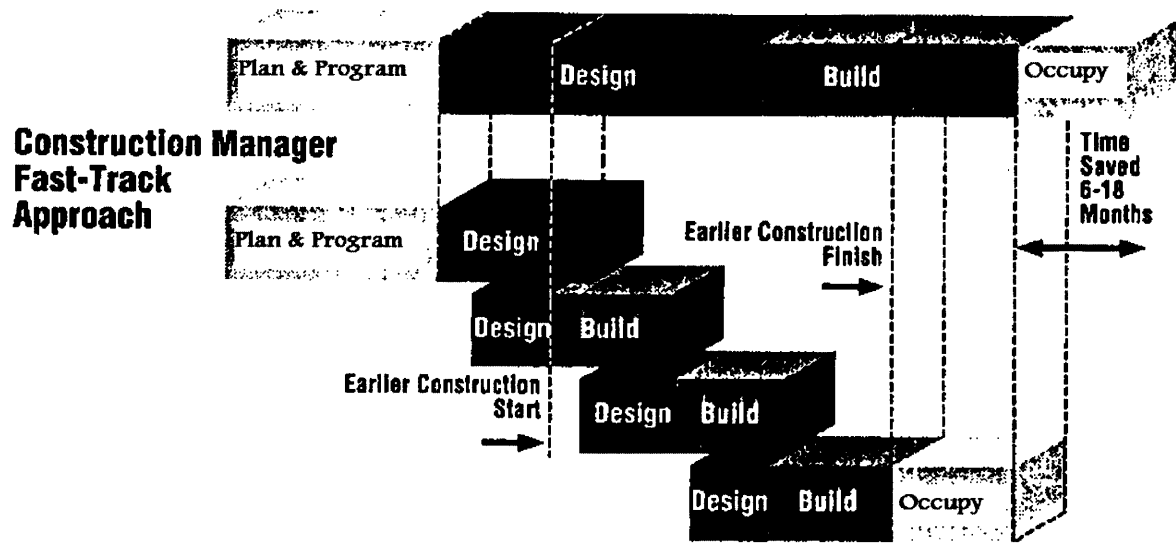


Figure 3: Building Sequence Comparison [3]

## 2.4 TYPES OF CONSTRUCTION MANAGEMENT METHODS

### 2.4.1 AGENCY CONSTRUCTION MANAGER

The first type of Construction Management is Agency CM. In this type of delivery method, the Construction Manager plays an important role as a consultant and advisor for the owner. The Construction Manager is not contractually responsible to physically build the project. Rather, the agent is responsible for providing the management services necessary to proceed with construction. An Agency CM can be added to multiple delivery systems. For instance, the CM can manage a Designer and General Contractor under a Design-Bid-Build system [2]. Here, the CM can interview the Designer and prepare the bid packages for a GC to bid on. This method also works with Design-Build where the CM may interview the Designer and monitor the design and construction [5]. Agency CM is not usually limited to a specific type of project but it is more frequently used on large and



complex projects to supplement the owner's in-house capabilities with professional expertise.

The key element in this method is that the Agency CM is a firm that is paid a fee to supply a management service. Using this type of contract, the owner, not the Construction Manager, is the one signing the contracts with other players. Thus, the Agency CM cannot be held accountable for actual construction damages such as delays or cost increases. Instead, the Agency CM is responsible for providing the management according to industry norms. In this regard, the CM is held accountable for providing the appropriate services and may be liable for negligence [2].

As mentioned earlier, the Agency CM is the owner's representative. Therefore, the owner must select the company based on the CM's experience and capabilities, which fit with the type of project that is going to be built. The agent works best when he/she is given the authority to make timely decisions and hold the other teams accountable for any delays or cost overruns. Owners are found employing this method when they find themselves limited with their in-house capabilities.

However, it is the least effective method when owners keep decision making for themselves and do not delegate with the CM [5]. In fact, if the CM has little authority during the design and construction phase, then the owner has hired an Agency that has little or no effect on the project and acts like a messenger between the owner and the rest of the team members. At this point, the CM has an administrative role instead of the intended leadership role. On the other extreme, if the CM has too much power, they can complicate the process which can cause delays and cost overruns [5].

The Agency Construction Manager provides coordination, administration and management within a defined scope. The CM is involved throughout the different phases of a project and deals with the rest of the team members to satisfy the requirements issued by the owner. Most importantly, the CM does not take on the performance risk and is not accountable if the project is delayed for additional costs. However, if an Agency CM does not perform the job as he/she is asked to, the negligence can affect the project. For instance, if the CM is not performing the inspection in a timely manner, they will be delaying the job and that delay translates into a higher cost to the owner. Thus, when choosing an Agency CM, the owner must consider this fundamental aspect [5].

As mentioned earlier, the Agency CM is hired for his/her services for a return fee. If many companies are competing for a CM job and all have relatively equal credentials, it is the difference in fee which will make one get the job over the other. This fee is usually based on the salary of the Agency CM employees. The fee should equal the sum of overhead plus profit plus reimbursable items. Other options can be based on a fixed fee, percentage fee or hourly fee. The fee is also usually divided into two phases. First, the preconstruction phase fee has to do with the preconstruction services that the CM provides. It is usually a lump-sum basis and less often based on an hourly fee. Secondly, the construction fee incorporates the salaries of the CM's employees and other costs, related to the Construction Manager being on the site [5].

#### **2.4.2 CONSTRUCTION MANAGER AT-RISK**

Construction Management At-Risk (CM At-Risk) is a relatively new project delivery method that combines the skills of two different entities: the Agency Construction Manager

and the traditional general contractor. It originated from the fact that owners did not feel that they were getting the best deal out of hiring two different types of firms on the project. They wanted a hybrid team that incorporated both kinds of firms. In this method, the owner has mainly two contracts: one with the CM At-Risk and one with the designer. The constructor, also CM At-Risk, is brought on early and provides critical preconstruction services, holds trade contracts, takes responsibilities for the performance of the work, and guarantees the construction costs and schedule [5]. The CM also serves as a contractor, assuming the risk for performance, and can do the job either by his/her own manpower or by hiring specialty subcontractors. One of the main advantages of using this method, is that it always allows for “fast-tracking” projects because the construction phase can begin before the completion of the design phase, hence, speeding up the entire process [2].

The fact that the CM is brought in early not only helps with preconstruction services, but also aids with defining a guaranteed maximum price (GMP), as well as completion commitments and many other services needed by the client. Therefore, this new system makes the entire construction of the project more predictable for both the owner and contractor.

## **2.5 TYPES OF CONTRACTS**

### ***2.5.1 LUMP SUM CONTRACT***

After setting the strategy that the owner wants to follow, is it important to choose the right type of contract. There are three main types of contracts that are usually employed. The lump-sum contract is the most widely used type of contract. First, architects

and engineers complete the entire design of the project and produce the required bidding documents, as well as specifications. Then, the project is put out for bidding. At this point, many contractors are invited to bid by estimating the total cost that they would need to build it. After taking into consideration profits, overhead and contingencies, they then bid it for a fixed price. Once the bidding is completed, the owner opens all the bids and the lowest bid receives the job. The contractor takes on all the risk and assumes responsibility if the price surpasses the given limit. However, that usually pushes the contractor to take shortcuts because every dollar saved is profit for the contractor. This type of contract is truly a “zero-sum game” [1], every dollar the contractor gets is taken from the owner and vice-versa.

It might seem that using a lump-sum contract for high-risk jobs is a good idea as the builder assumes all the risk and the owner is risk free, but quite the opposite is true. In fact, if the cost goes up unexpectedly after the bid is accepted, the contractor is going to have a hard time keeping up and will eventually start losing money. At that point, he/she will lose dedication to the project. Moreover, by transmitting the risk to the contractor, the owner loses the decision-making power and might receive a structure that does not necessarily satisfy his/her needs.

### ***2.5.2 COST PLUS CONTRACT***

This contract is also known as a time-and-material contract. It is a type of contract that lawyers and mechanics use. The main idea behind this contract is that the contractor gets paid for the actual cost of the work no matter what it is, plus a percentage fee or fixed fee. Here, the risk is completely taken by the owner. The advantage of such a contract is

that the owner is positive that the work is going to be performed in a correct manner because there are not any incentives for the contractor to use any shortcuts.

The disadvantage is that there is no cap on the cost for the project; as long as the builder is working on the project, he/she gets paid by the owner at the end of the month. Despite the risk disadvantage, there are some situations where it is beneficial for the owner to choose such a contract. For instance, it is a good method if quality is more important than the financials, or when time is very limited and immense overtime is needed. It is also useful when construction documents are not ready for the contractor to bid, or even when the owner has enough construction expertise and has the time required to spend and supervise the work performed [1].

### ***2.5.3 GUARANTEED MAXIMUM PRICE***

This method is used mainly for large construction sites and is typically a hybrid between lump-sum and cost plus. It is this contract that is the most popular when a CM is hired. It is also the best method when high-risk projects are being built, as risk is divided more equally between the owner and the builder. The owner and contractor agree on a maximum price. The owner then assumes all the risk as long as the cost is below the GMP, and once the cost surpasses it, the risk is transferred to the contractor or CM At-Risk. Just like a cost plus agreement, the owner benefits when direct costs are less than expected, but if they surmount it, it is the contractor that absorbs the overruns, like in a lump-sum agreement [1].

Thus, this type of contract uses the best aspects of all contracts and gives the owner some savings in case the cost is below the guaranteed maximum price. In many cases, the GMP is higher than a lump sum because the contractor's profit has a threshold. In many instances, if the cost comes lower than the GMP, the savings are shared between the owner and the builder according to the contract. The most common ratios are 70/30 (70% of the savings go to the owner and 30% go to the contractor). Thus, this prompts the contractor to work as a team and provide a good performance because he/she is rewarded for it in the end.

#### ***2.5.4 COMPARISON BETWEEN THE THREE CONTRACT TYPES***

Figure 4 shows the price in relation to the actual construction cost in lump-sum, cost plus (time-and-materials) and guaranteed maximum price contracts [1]. As this figure shows, the results can differ depending on the final cost of the construction and on the entity that takes on the risk. For instance, in the lump-Sum the contractor takes on the risk and depending on the final outcome, he/she can either earn a substantial amount of money or lose a lot as well. In the time-and-material contract, the owner takes the risk and the contractor is paid the same, regardless of the outcome. Finally, for the GMP, if the contractor is under the GMP, he/she gets paid an equal amount but once he/she is over it, he/she loses all profit and that is why the GMP is usually higher than the lump-sum contract.

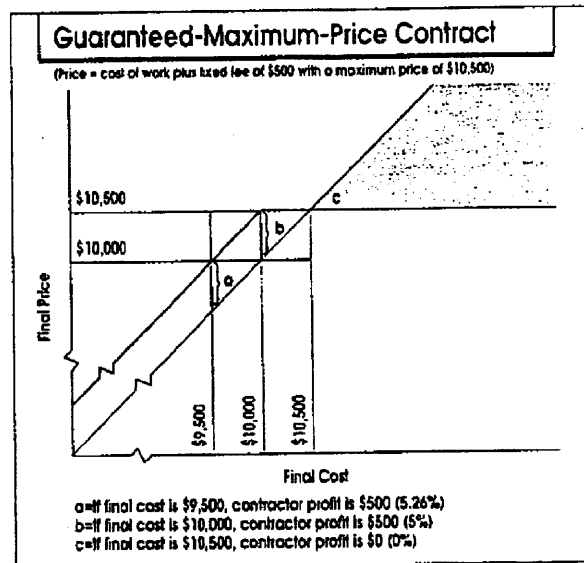
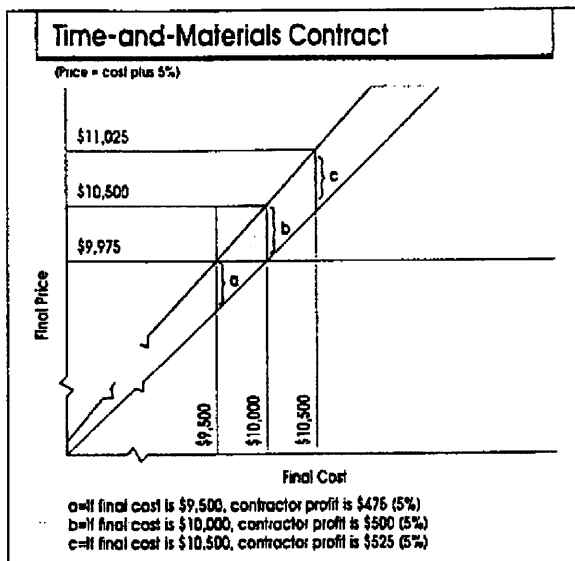
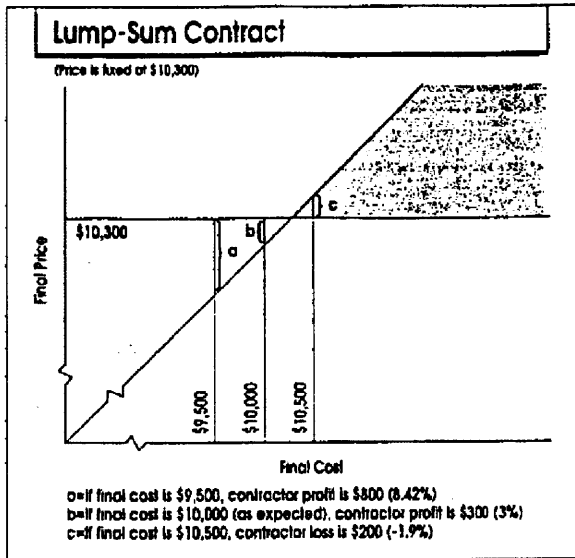


Figure 4: Cost (in thousands of dollars) vs. Price for all three methods [1]

## 2.6 CONSTRUCTION MANAGER SELECTION METHOD

Now, more than ever, it is worth the investment to hire a professional Construction Manager to take control of a project. The CM can help coordinate the efforts of various teams involved in the construction process so that the projects can be completed on time and on budget [7]. It is important that the owner understands the project's parameters and

has to choose a CM that has the experience needed to run the project [8]. When selecting a delivery method, factors such as fast-tracking, owner's control, risk allocation, construction claims and cost growth are of high importance [11].

As mentioned earlier, when selecting a general contractor, owners tend to go with a design-bid-build scheme and the contractor is chosen strictly based on the lowest cost. However, it is not the case when choosing a Construction Manager. On the one hand, the Agency CM is hired based on their qualifications and experience and are paid a fee that can either be fixed or a percentage of total cost [8]. In fact, since they do not take on the performance risk, the fee can be fixed since they will get paid regularly for their services.

On the other hand, the CM At-Risk is hired through a cost plus or GMP contract [11]. In fact, since the CM is selected early in the design process he/she can only be hired based on qualifications. Moreover, the earlier the CM At-Risk is selected, the more value engineering he/she can bring to the project. Also, the owner may choose to select specialty trade contractors early in the process to bring more value engineering and understand the cost and schedule implications of the design. The ultimate goal in both methods is to have the most economical design and system that meets the client's needs [5].

If the CM At-Risk is going to be paid using a cost plus contract, the CM has to have an "open-book" approach so that the owner can supervise the project costs. This type of contract is used when the owner and CM have a high level of trust or when the project has a high-risk, so that the actual cost cannot be accurately estimated. If the CM is chosen based on a GMP, the CM is paid using one of two methods. The first, and preferred one, is a "schedule of values" basis that consists of monthly payments that the CM receives at the



end of the month. These payments are linked to the percentage of work achieved to the most current date. The other is a “backed up billing” basis that requires all the subcontractors to provide the CM a detailed list of the works achieved. The CM prepares the invoices and submits them. This method not only be extremely time consuming but can also create delays [5].

## **2.7 CONSTRUCTION MANAGER DUTIES**

The Construction Manager has a key role in the project process. He/she determines whether or not the construction process is going to be a success or a failure. Depending on the project phase, the professional Construction Manager has different tasks. There are five main different phases: the conceptual phase, the program planning phase, the design phase, the construction phase, and the close-out and start-up phase [6].

### **2.7.1 CONCEPTUAL PHASE**

In the first phase, the Construction Manager is responsible for developing the conceptual estimates. By using the schematic drawings, the CM develops the budgets and provides a cost comparison between different concepts. The CM should also understand the cost and time trade-off consequences for alternative designs including basic labor crafts cost estimates [6].

Moreover, the CM develops conceptual schedules. This ranges from listing all project requirements, such as long-lead-time procurements, design durations and construction activity durations. The CM has to also understand the owner’s time requirements and other limiting constraints in order to prepare a network analysis schedule of all project activities,

and superimpose the resource requirements on conceptual schedule activities. The CM has to also be able to simulate the total project time under varying conditions [6].

Finally, the CM provides input to the program risk analysis. This includes providing a project sensitivity analysis and using previous knowledge about other projects in order to identify future problems and provide the appropriate solutions. Once a problem is identified, the CM estimates its impact on the project time and cost and has to be able to simulate it under different conditions [6].

### ***2.7.2 PROGRAM PLANNING PHASE***

In the second phase, the CM provides a constructability analysis. The CM should be familiar with the construction methods that can be used according to the particular geographic location. The CM also identifies the potential major construction problems. This means that the CM should identify the high-risk activities and run an analysis on them. During that phase, the CM also has to develop project resource requirements: labors, materials, equipment and funds availability, and evaluate different alternative sources for key resources [9]. Depending on the site location, the CM should identify the inventory that is available near the site. This means understanding the construction methods used in that area as well as determining the availability of suppliers and subcontractors to generate a methodology on how the project should be planned and marketed [6].

Moreover, the CM assists in the development of capital budgets. This means that he/she should provide a checklist for capital cost including, but not limited to, land costs, road-transportations costs, utility costs, site development costs, building costs,

construction finance costs and design costs. The CM should also assist in developing cash flow projections and provide a schedule of the project spending and cash availability. Moreover, the CM develops parametric estimates and cost budgets by breaking down conceptual packages into the basic program of work packages and cost estimate. At this phase, the CM must update the preliminary schedule created in the conceptual phase by developing and detailing a time-oriented bar chart. At this stage, activities must be added to the work breakdown structures [6].

The CM also develops a preliminary project control system by evaluating the capabilities required for performance and identifying measurement criteria for evaluating the performance. There must be a strong link between the planning and project control system [9]. The system should be compatible with the systems that other teams are using. The CM must also develop a preliminary project management information system. In many cases, the CM is responsible for safety on the site, thus he/she must develop a project safety program that follows the Occupational Safety and Health Act (OSHA). Furthermore, the CM must assist in the development of the insurance program by evaluating different alternatives. Finally, the CM must administer the electronic data processing (EDP) services [6].

### ***2.7.3 DESIGN PHASE***

In the third phase, the Construction Manager is responsible for the overall project planning. This means that the CM must understand the owner's real needs and assist in finding the proper project location according to zoning requirements. The CM must advise on the type of structure that should be built (high rise or low rise, steel or concrete), assist

in choosing the right Architect/Engineer and organize the project team [9]. The CM has to help in developing the project life cycle costs that should be determined by a life-cycle analysis and should evaluate the cost trade-offs. Moreover, during the design phase the CM has a critical role of providing value engineering to the project [6].

Furthermore, the CM must qualify potential project bidders by evaluating their capabilities, previous performances, experience, recommendations, financial stability, legal constraints, safety records and quality assurance program [9]. Once the prequalified contractors have been identified, the CM must finalize all the bonding requirements in order to permit them to submit a competitive bid for bid packages. The CM must also procure the long-lead-time items that have been identified earlier so that the material arrives when needed so that it does not affect the schedule. The CM in conjunction with the designer should also finalize the bid work packages. The packages include number of contracts and give a preliminary scope of each contract [6].

In addition, the CM needs to finalize the project schedules by issuing a complete bar-chart for the project. The CM has to develop reporting and monitoring procedures so that the actual progress can be compared to the planned progress at all times [9]. The CM is also responsible for drafting the final physical layout of the construction areas by locating all construction buildings and all the necessary access paths. The CM must define the areas necessary for material lay-down, subassembly and staging. The CM must also give the location of all general facilities. The Construction Manager has to compare the project control systems and management information systems. The CM has a task of assisting the owner in obtaining all required permits and licenses, assuming that the contractors are

compliant with the permits and owner commitments. Finally, the CM must provide his/her input and review all the contract documents. This means that the CM must review all the plans, specifications, and prepare contract special conditions to reflect field conditions, schedule and contracting interfaces [6].

#### **2.7.4 CONSTRUCTION PHASE**

In the fourth phase, the CM must develop and administer an area transportation system. This includes the transportation within the site and outside it. The CM must also study the project is access and hauling requirements, and define critical loads, sizes and traffic flows. The CM has to be positive that the project is compliant with the equal employment opportunity (EEO) program. More importantly, the CM must enforce the project safety program that includes preparing the appropriate items that are needed, as well as providing safety personnel onsite at all times. The CM needs to run periodic safety meetings to correct actions and present awards to ensure good safety initiatives are being implemented. The CM has to coordinate labors relations to ensure that no issues between laborers will rise onsite. The CM receives and evaluates bids to ensure that they are adequate and award prime contracts to bid winners with the owner's approval [6].

Furthermore, the Construction Manager should manage and perform general conditions tasks such as constructing offices, sanitary facilities, roads, warehouses etc... The CM implements time and cost control systems by determining the number of personnel needed on and off site, estimating cash flow expenditures, establishing schedules for project with start dates for subcontractors, establishing purchasing system and establishing a method of reviewing and processing change orders. It is also the CM's

responsibility to manage daily construction activities [9]. This includes monitoring contractors' construction schedule, recording inspection and test data, maintaining job files, recording as-built data, preparing progress report, reviewing change orders, attending meetings and managing and supervising quality assurance. The CM must also administer prime contracts, meaning that he/she should conduct meetings to check on progress, coordinate between all teams, secure approvals, coordinate all shop drawings, manage the EEO program, coordinate job safety, manage cost control, monitor cash flow, evaluate, document and process claims and maintain labor's relations [6].

Moreover, the CM has to receive, review and approve contractor's requests for progress payments by validating the percentage of work completed and then recommending approval to designer and/or owner. The CM must also supervise contract changes and claims by validating change estimates when claims are filled and recommend their approval to the owner. The CM also assists the owner in negotiating changes. The CM is also responsible for quality assurance and inspection to make sure everything is going according to plan and to specifications [6].

#### ***2.7.5 CLOSE-OUT AND START-UP PHASE***

In the final project phase, the CM is responsible for the project close-out. This means that he/she should conduct frequent inspections during finishing stages, establish dates for equipment testing, acceptance periods and warranty dates [9]. He/she should also obtain from contractors the guarantees, operations manuals and instructions, keying schedule, maintenance stock spare parts, completed record-drawings, bonds for the roofing

maintenance, certificates of inspections and acceptance by local agencies and release of liens.

The CM must also remove all temporary facilities and execute "Certificate of Substantial Completion". The CM must make a list of uncompleted work and ensure that the contractor does the correction before issuing the final payment. Then, he/she must prepare the final project report and do the final project accounting [9]. Finally, the CM must validate all systems, do some testing and start-up. All systems should be working and the CM must supervise the transfer of the operations from contractors to the owner's personnel [6].

## **2.8 POTENTIAL DRAWBACKS OF USING CM DELIVERY METHODS**

When using the CM At-Risk method, there might be an incentive for the CM to act like a general contractor because of the cost guarantee that has to be issued. When choosing a CM At-Risk, the owner must disregard the fee that the CM wants because it is only a small part of the final gross margin to the Construction Manager, unlike Agency CM. In fact, in many situations, the "fee" that is quoted can be misleading to the owners because the actual cost can be much higher than that simple fee [13].

The owner has to understand that most CM At-Risk companies were general contractors in the past and that could present some disadvantages. The existence of a cost guarantee may influence the field staff to ignore an issue that would increase the total cost of the project. Another negative side is that the personnel that are present have usually an extensive experience in lump-sum bidding, and they often can relate to subcontractors

rather than to the owner [13]. For instance, if the bid packages come above what the CM had agreed upon, the CM is motivated to change to scope of work in order to bring it back to an acceptable price or he/she will have to come up with the difference him/herself. Moreover, since the CM is responsible for a product that another company, such as a manufacturer or a subcontractor supplied, he/she is billed in case there are defects with the product. Also, accidents can be costly and sometimes exceed the insurance limits [13].

Thus, this will make the CM At-Risk give higher prices than General Contracting does. For instance, the CM will use larger contingencies on the cost he/she gives, and will become more selective on subcontractors and requires them to issue bonds that an Agency CM will not ask for. Also, the CM At-Risk should be more aggressive on change orders and finds him/herself on the other side from the owner, unlike Agency CM. It is very important to be careful when doing that because it would provoke the owner. The CM At-Risk might also bill to allow positive cash flow because he/she is the one paying the bills to the subcontractors and manufacturers, which would not happen if an Agency CM was hired. The CM At-Risk is also responsible for delays that could occur out of his/her hands and so it is very important to point it out as soon as it happens but he/she is indirectly criticizing the imperfections in the owner's personnel [13].

CMs and architects both provide administration functions and it is imperative to allocate tasks between them to optimize efficiency and, at the same time insuring that all aspects are addressed properly. In order to do so, the owner must ensure that no portions are overlapped between the two teams because that would result in cost increases for the scope given. It would also create disputes between the two teams because of a lack of clear



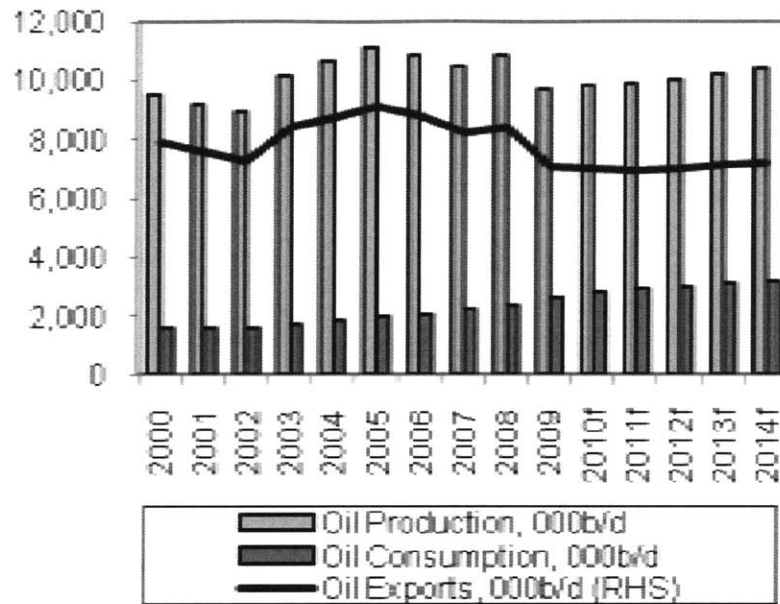
instructions to the contractor. On the other hand, this can allow for gaps in the coverage of important tasks creating issues when the problem generated from the gaps come up. This can result in delays that would increase project costs. Finally, the allocation of duties must be proper so that no tasks get assigned to the wrong parties [7]. Reordering those duties might be costly and once again result in project delays and cost overruns. The best way to deal with those problems is to use the AIA or CMAA contract documents.

When the owner hires an Agency CM that is working for a fee, the owner has to deal with some disadvantages. Since, the CM is paid on a hourly basis, he/she may be tempted to work more hours than needed in order to maximize the fee. It is also very important to monitor the CM's effort versus results to make sure that the time that the CM is putting in is actually benefiting the project. If the Agency CM's performance is poor, the owner must litigate against him/her to collect any damages that occurred [14].

### **3 CASE STUDY: LAMAR TOWERS IN JEDDAH, SAUDI ARABIA**

#### **3.1 HISTORY, ECONOMY, POPULATION AND CULTURE OF SAUDI ARABIA**

Within the past six years, the Kingdom of Saudi Arabia (KSA) implemented changes to reform the country. The changes were launched under the new rule of King Abdullah bin Abdul-Aziz. In an attempt to compete with the neighboring United Arab Emirates, to improve its infrastructure, to stimulate economic growth, and to attract foreign investors, the Kingdom decided to repeal the height restrictions it had implemented in the major Saudi Cities, like Jeddah, which is the second largest city in the country. In fact, before those reforms were made the height restriction on buildings was limited to fifteen stories. By removing limitations and promoting expenditure, the value of the land doubled and in some places even tripled in less than a year after the new amendment was established. The government is also encouraging private investment, increasing its capital spending, and is committed to making the necessary reforms to place the country in the top ten of the World Bank's annual Doing Business rankings.



*f = forecast. Source: Historical data: BP Statistical Review of World Energy, June 2010. Forecasts, BMI.*

**Figure 5: Saudi Arabia's Oil Production, Consumption and Exports [15]**

Saudi Arabia is a wealthy country whose oil dependent economy has positioned it as one of the richest countries in the world. It has the world's largest oil reserves and is the world largest oil exporter (see Figure 5). Oil accounts for more than 90% of exports and nearly 75% of government revenues, facilitating the creation of a welfare state. The revenues from the Oil Export are expected to exceed 200 Billion dollars in 2011. The rest of the exportation comes from the heavy industry that distributes oil to the Middle East and North Africa. Thus, the world dependency on oil has allowed Saudi to increase its wealth rapidly [15].

	2006	2007	2008	2009	2010e	2011f	2012f	2013f
Nominal GDP, SARbn [1]	1,335.6	1,442.6	1,781.6	1,384.4	1,454.8	1,551.0	1,663.2	1,778.4
Nominal GDP, US\$bn [1]	356.6	385.2	475.7	369.7	388.5	414.2	444.1	474.9
Real GDP growth, % chg y-o-y [1]	3.2	2.0	4.1	0.4	3.8	3.9	3.7	3.5
GDP per capita, US\$ [1]	15,061	15,945	19,303	14,601	14,947	15,618	16,422	17,225
Population, mn [2]	23.7	24.2	24.6	25.3	26.0	26.5	27.0	27.6
Unemployment, % of labour force, eop [1]	6.3	5.6	5.0	5.4	6.0	7.0	7.0	7.0

*Notes: e BMI estimates. f BMI forecasts. Sources: 1 SAMA, BMI Forecasts. 2 World Bank/BMI calculation/BMI.*

### Figure 6: Economic Activity [16]

Saudi Arabia benefits from a high population growth rate along with its rapid wealth increase. It is characterized by a 2% yearly population increase, compared to only 0.9% percent in the United States of America (figure 6). Even though the construction sector has been growing, the real estate sector is still suffering from a shortage of housing units and the demand will continue to increase with the rapid population growth.

Although the economic downturn in 2009 slowed down the country, it did not greatly affect the construction sector. Currently, Saudi Arabia is in the process of recovery which is accelerated by oil exportation. The economic index of the country is increasing as well. The Nominal GDP increased by 13% within the past two years, soaring from \$369.7B in 2009 to \$414.2B in 2011. The GDP per Capita increased by \$1000 within the past years (see figure 6). Moreover, the extreme wealth of the Saudi government enables it to be a welfare state and thus taxes are virtually nonexistent (only a 2.5% income tax and 0% sales

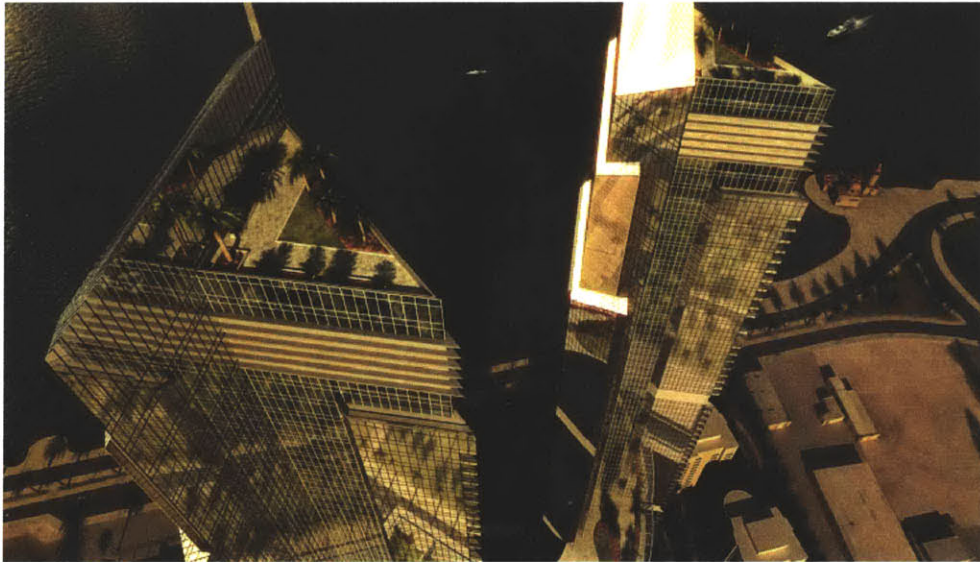
tax). This translates to having cheaper items in the Saudi Arabian market. For instance, the price of a bottle of Pepsi (or Coca Cola) is only 1SR (equal to ~\$0.27) compared to \$1.49 in the USA. Also, the Saudi society does not drink alcohol or go out to bars to socialize as it is all illegal. The society also does not travel much and would rather stay in Saudi because of the culture differences. All those factors result in an accumulation of high savings (25% on average). The high savings enable the society to spend mainly on luxuries, cars and housing [16].

As mentioned earlier, Jeddah is the second largest city in Saudi Arabia. It is located on west side of KSA and on the coast along the Red Sea. Even though Saudi Arabia is a wealthy country whose oil dependent economy has positioned it as one of the richest countries in the world, it is facing many environmental problems. In addition, Saudi Arabia is rapidly exhausting its oil wells and will therefore be forced to re-focus its economy on alternative methods of production. Investing in infrastructure and permanent assets will be a key strategy in maintaining Saudi Arabia as a leading economic power. The country is also stable and local contractors are available, even though success and speed of the project depends on market availability of construction supplies.

## **3.2 PROJECT OVERVIEW**

The Lamar Towers (Figure 7) project is one of the most important projects in the country of Saudi Arabia. Indeed, this development is a marquis capital construction undertaking which seeks to take advantage of recently relaxed building standards and a market conducive to real estate investment. Meaning liquid gold in Arabic, the Lamar name was given to the project in order to enhance the appeal of such a real estate destination.

Strategically located in the Al Shatee District on Jeddah Corniche, a road along the Red Sea, in Saudi Arabia, this luxurious project will provide a new dimension to the skyline of Jeddah.



**Figure 7: Towers Renderings [17]**

Currently the 30<sup>th</sup> tallest tower under construction in the world, Tower 1 of the Lamar Towers is only a portion of a massive mixed use development consisting of another tower; the two of which are connected with a spa and business center. Once completed, Lamar Tower 1 will be the tallest building in Jeddah. Currently being marketed to high standard buyers, the condominiums of the Towers offer a wide range of floor plans in order to provide the buyer with the choice of the condominium that best fits his/her expectations. The amenities of the condominiums are personalized and customized as a way to appeal to buyers. The office spaces in Lamar Towers will be sold between \$2100 and \$5333 per square meter, while the price of the residential units is expected to range between \$3200 and \$5067 per square meter. Despite the fact that foreigners are free to

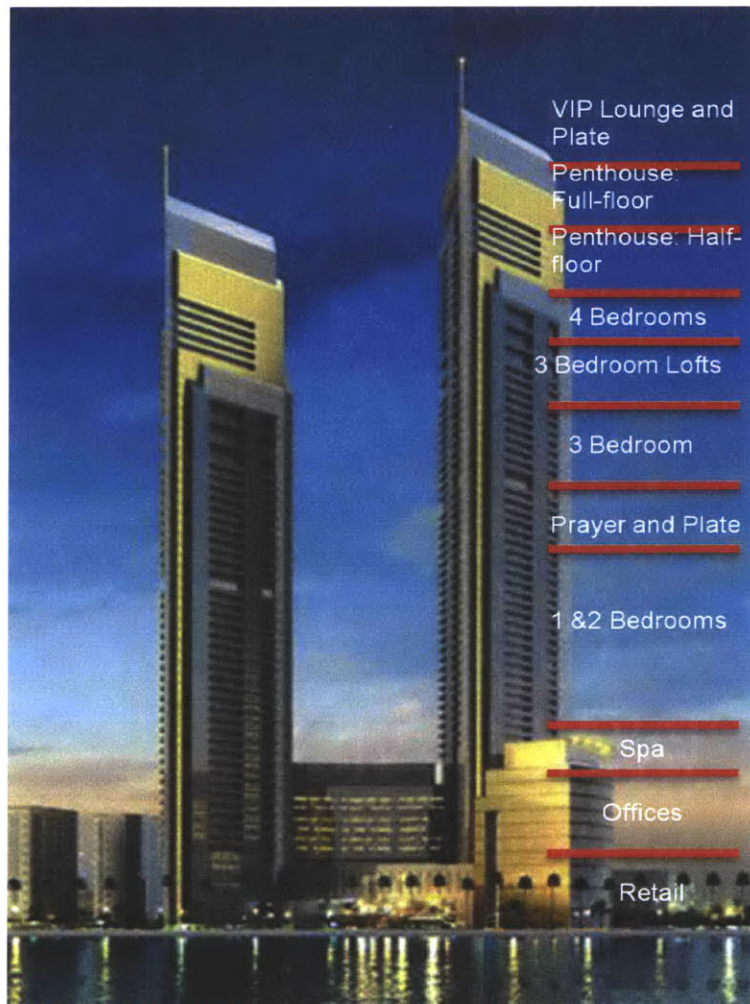
invest in the Saudi Market, about 97% of the buyers in the Lamar Towers project are Saudi Arabians. Finally, with a cost of \$800 million, 65% of the project has been financed by the owner. Some of the project details are listed below:

- Built up area: 413,500 m<sup>2</sup> (4,451,000 ft<sup>2</sup>)
- Gross floor area of Tower 1: 84,000 m<sup>2</sup> (905,000 ft<sup>2</sup>)
- Gross floor area of Tower 2: 68,774 m<sup>2</sup> (740,000 ft<sup>2</sup>)
- Heights
  - Tower 1: 73 floors (322 m) (1056 ft)
  - Tower 2: 69 floors (293m) (961 ft)
- Commercial office building: 13 floors (60 m) (200 ft)
- Cost: Approximately 3B Saudi Riyals (\$800M)
- Owner: Zahran Holding
- Marketer/Developer: Cayan International Co./Assets
- Design Architect: Robert Matthew Johnson Marshall
- Detailed Design Architect: Saudi Diyar Consultants
- Construction Manager: Turner Arabia

### **3.3 PROJECT DRIVERS**

The Lamar Towers project in Jeddah is inherently a unique project, given the intended use and proposed project schedule desired by the owners. The project is intended to be mixed use with on-site parking, retail space, commercial space, a spa, a swimming pool and water features, as well as two towers of luxury condominiums (see Figure 8). For

this reason it is clear through reviewing the project that there are many factors that require a complex and well developed strategy for managing the design and construction of the Lamar Towers. These factors require close control, as the luxury and multi-faceted aspects of the project make it a service type project rather than commodity. Additionally, the project location provided prime real estate on the banks of the Red Sea, further enhancing the luxury and provided an alignment of vision, expectation and potential. It is evident that this matter was successfully analyzed and developed accordingly to create a product which fit the target market, as previously detailed.



**Figure 8: Mixed-use Programming Diagram**



Time was a large factor as the project's cash flow is dependent on occupancy. Since there are many condominium units, presales can provide a certain amount of funding, but as a large portion of the development cannot realize income to begin recouping investments, the date of occupancy is paramount. The contract structure showed that there was a large emphasis on schedule. The contractor had to keep detailed schedules explaining completion dates, track costs, and the manpower expected through the duration of the whole project. The entire process was detailed by the owner who emphasized that significant delays could not be tolerated and required the contractor to consider contingency time into the schedule before bidding on the project.

Another key aspect of the project, which made necessary unique considerations on the part of the owner, was that there was a recognized need for flexibility throughout the construction. Granted that the Lamar Towers is a service type project as stated earlier, it was prudent that there be accommodations made by both the owner and contractor. They needed to update the design in order to maintain the quality and vision proposed, rather than simply uphold bid documents. In line with the time constraints detailed previously, it is obvious in the language used by the owner that such flexibility must be reasonably considered when developing schedules and prices to account for "out of sequence work".

Additionally, the allowance of other package contractors to perform work necessary, and in the best interests of the project as a whole, must be taken as the most important aspect by all parties involved. As seen in Figure 8, the high variance of building program requires the ability to efficiently plan many types of units and different work, making this need for schedule flexibility even more salient and potentially a point of contention as

finishing work and fitting out progresses. Thus, when evaluating price it and schedule it is important to realize that maximum efficiency production runs cannot be ensured.

In addition to flexibility, it was important and clearly evident in examining the Lamar Towers project that Zahran recognized the need for heavy involvement by outside experts in the pre-construction phase. The complexities of running and scheduling a job that includes as many trades and areas of expertise created a situation in which the policies and procedures for managing relationships and work schedules of different parties on site required that well-structured language. This was necessary to present a clear understanding of such complexities to those contractors who would bid on the job. Such an undertaking would require a highly experienced and sophisticated owner who can handle these tasks in a way that does not misrepresent the extent of interdependence of different trades, designers, and owner involvement. For these reasons, it is necessary that experts be consulted for preconstruction services to ensure, from the beginning, that the project will be conducive to a fast-tracked schedule. The schedule will minimize conflict to ensure that the project be completed on time and maintain the luxury vision set forth and on which the reputation and success of the project lies. Thus, a Construction Manager was needed and Turner Arabia was hired.

Although the Lamar Towers project is broad in scope and, as with any residential project undertaking, it never was shown that there were financial constraints that were atypical for a large mixed-use project. Since a big portion of the project includes condominium units, it is possible that capital investment may begin to be recouped during

construction, as discussed previously, and therefore this serves as a benefit for the owners to finance the project efficiently and beneficially.

### **3.4 OWNER DRIVERS**

In examining the contract language used, there may be many inferences made as to the type of owner that Zahran Holding represents. There is a recurring theme of realistic assessment of the owners own capabilities and specialties which may lead one to believe that Zahran was not interested in trying to micromanage the construction process but rather was interested in handing responsibility to experts and focusing on maintaining the vision and prosperity of the project geared towards buyers.

Zahran Holding is a large and diverse organization, owning 15 subsidiary companies and providing services that include: operations and maintenance, healthcare and medical services, environmental services, real estate development and investment and project management, among several other areas of expertise. Given its past experience, it is reasonable to consider Zahran Holding a sophisticated owner who has the capabilities, both financially and personnel-wise, to undertake such a large capital construction project. Having such an owner proved to be important throughout the process as several problems inevitably rose, able to keep the project working even though these problems existed.

However, while Zahran Holding is a specialist in investment, construction and project management, it is evident that there was insufficient expertise and organizational sophistication to manage a project which is so large, unique and complicated. Language throughout contract documents implies that while Zahran requires there to be strong

communication of project schedule and progress, requiring milestone checks and detailed plans of construction, it still delegates control of operations. While the sophistication of Zahran seems contradictory to its lack of involvement in the construction process, it seems responsible given the demanding project drivers.

It is also strongly apparent in examining the Lamar Towers project that Zahran Holding is heavily risk averse. Essentially, no risk is taken by the owner as it is iterated many times to potential bidders that delays in the project, changes in the design, or design errors in the bid documents are solely the responsibility of the contractor and there will be no credits given for any such issues that may arise in the construction process. It is noted that such considerations must be made when proposing price and schedule. The only area of risk which Zahran does assume is the possibility of delay or major project influences due to war.

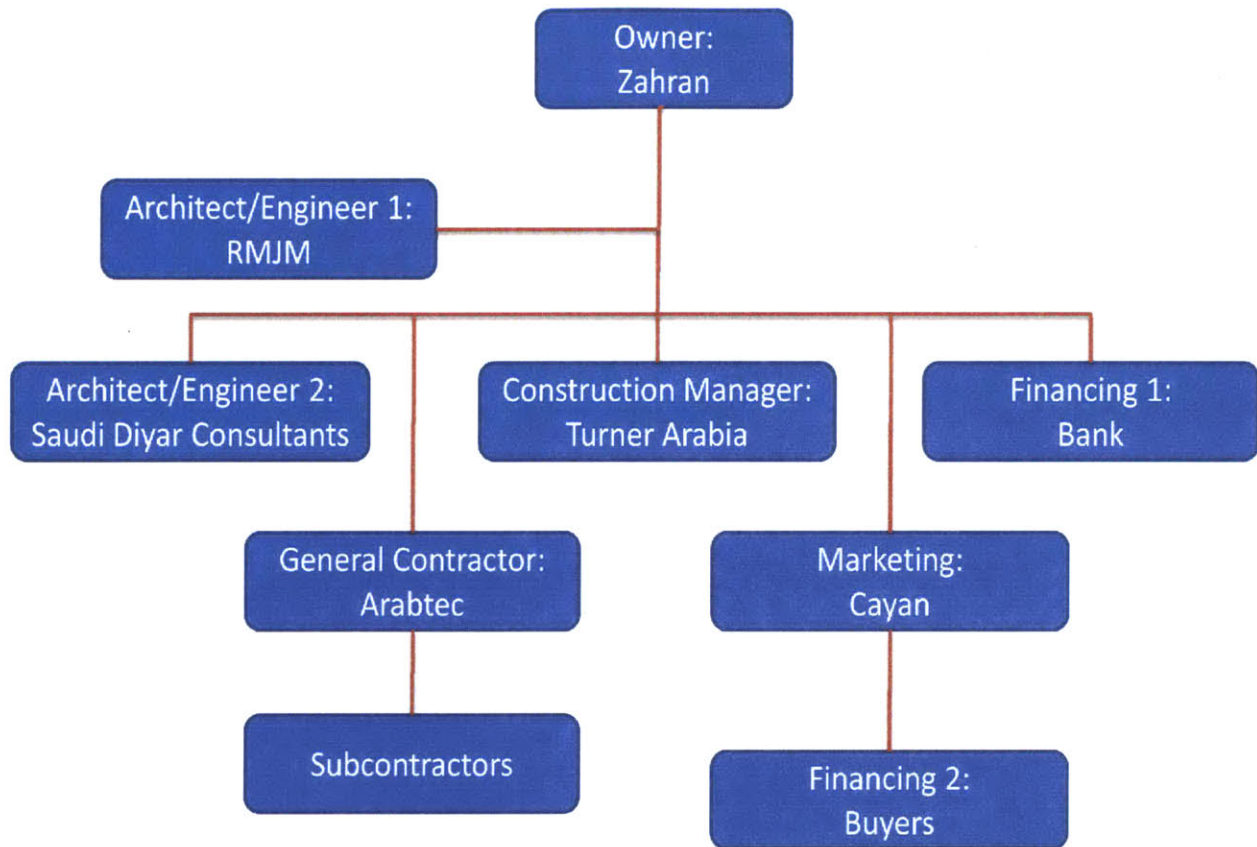
It may be inferred through the language by which this risk is presented to potential contractors that Zahran Holding is attempting to be transparent and attract contractors that understand the nature of the Lamar Towers project. This allocation of risk requires that there be contingency funds allocated by the contractor and inherently concedes that pricing will reflect a premium. However, it is also clearly evident, that Zahran is clearly capable of financing and is therefore willing to pay others to assume the risk which they wish to avoid. This risk aversion is once again apparently contradictory given how diverse and sophisticated Zahran demonstrates to be. They, more than an average owner, have the ability to understand the likelihood of difficulty and delay, as well as the financial strength to assume such risk, rather than pay a premium for it.

One issue which also must be considered when discussing the owner characteristics and that affects the delivery method, as well as involvement by the owner, is that of cultural preference and tradition. It is normal that projects be delivered under design-bid-build methods in Saudi Arabia and this presents a de facto restriction on methods. This became apparent in the delivery method that will be discussed later. Additionally, through contact with the current structural (package 2) contractor, TAROUK, it is apparent that there is a typical expectation of a fiduciary relationship between the owner and contractor. The relationship is more of a reliance on personal than contract language, contradictory to what is accustomed in the United States.

### **3.5 DELIVERY METHOD**

#### ***3.5.1 ORIGINAL CONTRACT: AGENCY CM WITH MAIN CONTRACTOR***

As the history of the Lamar progressed, the delivery method changed. At first, the owner chose an Agency Construction Manager with a General Contractor. They also chose to work with two different Architects/Engineers. The owner also hired a company to develop and market the project. The following is a chart (Figure 9) of the initial delivery method used:



**Figure 9: Original Organizational Chart**

The Owner of Lamar is Zahran Real Estate. The company was founded in 1975 by the Owner and Chairman Cheikh Abdullah Zahran. The company is a stock company specialized in real estate developments in the Kingdom of Saudi Arabia and the surrounding region. It first focused in building maintenance in 1975 but the company diversified into brokerage, investment, stocks, property development, construction and general trading. It operates in many markets specifically the Kingdom, Egypt, Kuwait, Bahrain, UAE, Lebanon and India. In 2006, Zahran decided on building a state of the art skyscraper in the city of Jeddah. They had already bought a big piece of land on the Red Sea water front that they were going to use as the project site.

After negotiating with many international architects, the owner hired Robert Mathew Johnson Marshall (RMJM) as the Architect/Engineer. RMJM is an international architectural firm that is based in the United Kingdom and is known for creating dynamic modern architecture. The agreement between the two parties was for RMJM to create a design according to the owner's needs. The owner was very particular and wanted their building to be mixed use. The designer met their needs and provided them with the design of two residential towers on top of a spa, offices, a commercial center and parking garage as previously discussed. RMJM provided the concept design and drawings up to 50% completion to Zahran. The design mainly included the structural design, MEP design, façade and elevators.

Once the first part of the design was done, Zahran came back to Saudi Arabia where it hired a second architect/engineer, Saudi Diyar Consultants (SDC). SDC finished the details and brought the design to 100%. Included in this detailed design phase, SDC provided the steel and concrete calculations, material take-offs, technical specifications and drawings for the entire project. The company was also appointed to be the onsite engineer that supervises the contractor's work and verifies that the technical part of the project was performed appropriately.

At that same time, the owner hired Cayan as a developer for the project. The main task that Cayan was responsible for was the marketing and advertising of the project to lure new costumers to the building. Their task was crucial because the owner was not able to secure all the required financials from the bank and needed more investment capital. Thus, Cayan created an office next to the site, where full size apartment samples were built

(Figure 10). This building was open to potential buyers who were invited to see the different sizes of the available apartments and office spaces, being able to choose on personal preferences.



**Figure 10: Sales/Marketing Center**

Once the design was completed and the financial investments secured, Zahran appointed Turner Arabia as Agency Construction Manager. Although Zahran had experience with Construction Management, as noted above, they were understaffed and the project was too large and complex for them to handle. Turner had the knowledge and experience that Zahran needed; it is one of the world’s major construction companies and was capable of managing the job. Turner came in, put the bidding documents together, and initiated the bidding process. The owner wanted a General Contractor and the bid was designed as a lump sum breakdown. The breakdown allowed the owner to know the price for the different works: structural, electrical, mechanical, etc. Arabtec won the bid and took over the entire construction process in 2008. Arabtec was established in 1975 and is



famous for its superior execution of real-estate projects. It is a sufficiently large company with 52,000 professional employees and seemed capable of executing the project. One of their signature projects is the seven stars hotel Burg Al-Arab in Dubai, UAE.

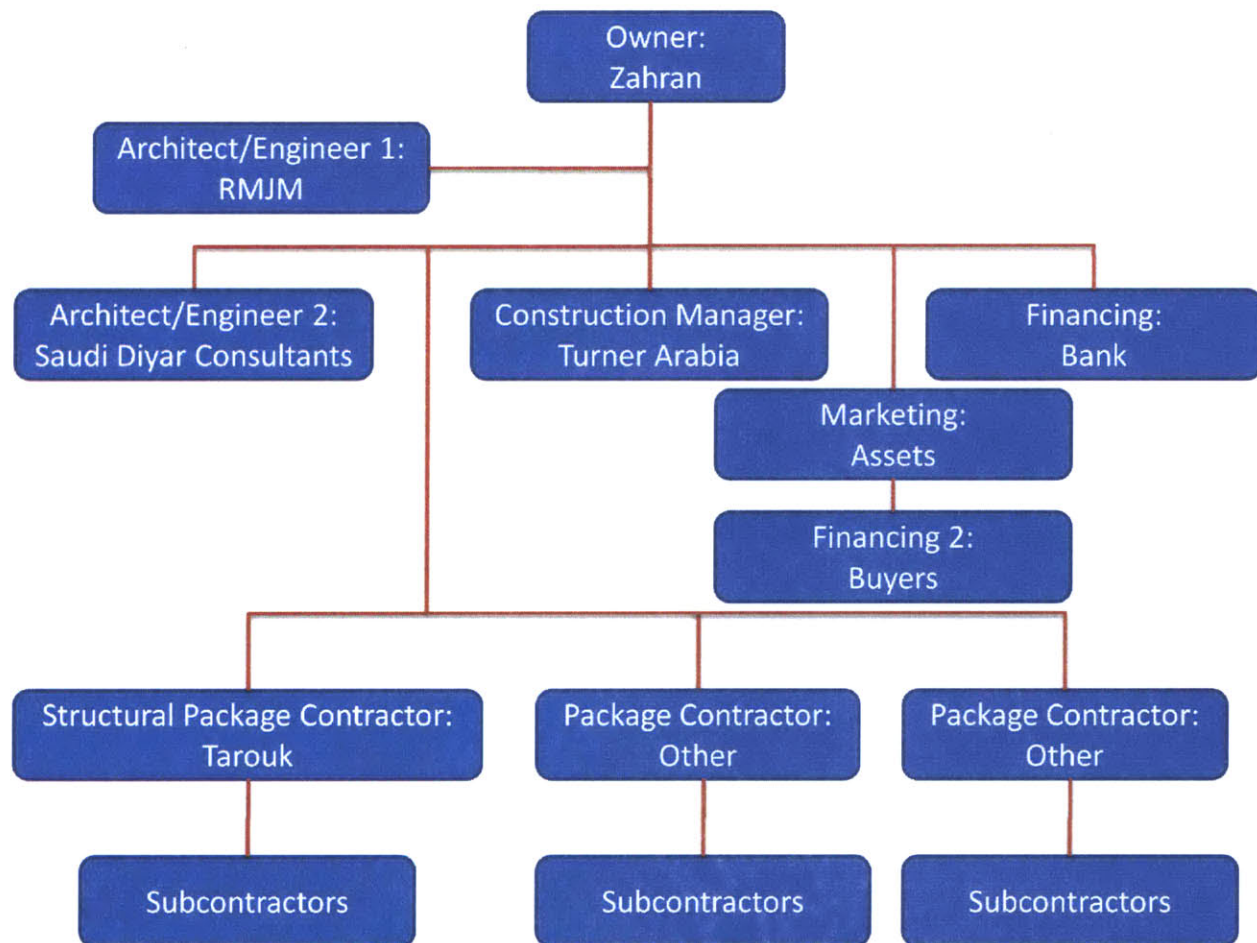
### **3.5.2 CURRENT CONTRACT: AGENCY CM WITH MULTIPLE PRIMES**

After it became necessary for a new contract to be drawn for reasons specified below, the owner decided on using a different strategy. They divided the project into eight specific packages. Those packages are:

- Site Work and Excavations – Already Completed
- Structural - 480M Saudi Riyals (\$128M)
- Mechanical, Electrical and Plumbing systems – 458M Saudi Riyals (\$122M)
- Architecture and Finish trades work – Not Awarded to Date
- Cladding / Curtain Wall systems – 171M Saudi Riyals (\$45.6M)
- Vertical Transportation systems – 80M Saudi Riyals (\$21.3M)
- External works – Not Awarded to Date
- Interior Design works – Not Awarded to Date

All these packages were put out to bid separately. The first package has been constructed before the bidding by the previous general contractor. Package two, which is the biggest, was won by Saudi Lebanese Tarouk Contracting CO. LTD (SLTCC). The third package was awarded to DULB, the fifth to CNYD and the sixth to OTIS. The rest of the packages have yet to be assigned. In fact, the owner decided to redesign the project and change the detailing to fit their needs better, which slowed the current work progress.

Moreover, the owner created their own marketing company; called Assets who was responsible for selling the second tower. It was found that by splitting the entire construction into several packages, the new cost of construction was lower than the original fixed-sum price offered by Arabtec, even though the coordination fee would increase as the risk was now divided amongst more contractors. However, at this point the sales were put on hold as the owner wants to wait till the completion of the project so that he can sell at higher prices. The following is a diagram (Figure 11) of the new delivery method:



**Figure 11: Revised/Current Organizational Chart**

The contract defines the roles and obligations of each major entity involved in the delivery of Lamar. Turner has the authority to act as the owner onsite. Their role is to advise and consult with the owner. Their only limits are that they need specific approval for additional works and the allowance that needs to be issued to the Lump sum Contract in case the additional works are done. Owner's approval is also required for time extension for the contractor, any increase or decrease to Contract Price, and settlement of payment of any claims by or against contractor. The contract also specifies that the CM needs the owner's approval prior to approving any revised contract schedule submitted by contractor and issuing any substantial completion certificate. The CM also reviews and processes all applications for payment by the contractor, including final payment and all variation orders. After reviewing and certifying, the CM submits to the owner so that the payment may be processed. Turner was also responsible for on-site safety and conducted regular meetings to raise awareness.

SDC acts as a consultant on site, but according to contract, they require Turner's approval for any variation order or submittal. In fact, anything which must be reviewed by the owner has to be submitted to the CM from either SDC or TAROUK. Therefore, Turner was acting as the owner's representative. SDC can reject the works that are not compliant with the contract documents and can require additional inspection or testing. However, they cannot take action until they receive a written approval from Turner. SDC is also responsible for checking all of the technical work that is performed by the contractor, and both SDC and Turner can conduct inspections. The contractor's duty is to deliver the project according to contract; he/she has to permit the CM and SDC to conduct their duties at any time. All the shop drawings must be sent to SDC and a copy sent to Turner. SDC has

21 days to review and send forward a decision to the CM. Moreover, the contractor cannot assign a subcontractor without the agreement of the owner and the contractor is responsible for the works performed by his subcontractor. The owner and CM can terminate the subcontractor if they feel that they are failing in their duties.

## **3.6 BID PROCESS**

### ***3.6.1 ORIGINAL CONTRACT***

First, the Agency CM was hired on a fixed fee to provide preconstruction and construction services. Turner Arabia was chosen by the owner as they had the experience and commitment needed to complete the job. As the original delivery method used was a lump sum under a general contractor, the majority of the bid process was relatively standard with the exception that more information was required from the bidding contractor. A lump sum breakdown was required by the owner in which every item, task, and work furnished by the lump sum price contract had to be priced. By choosing the lump-sum contract method, the owner had to set up a bidding process allowing them to pick a contractor fulfilling the specifications in the contract, while ensuring the most reasonable price. A Pre-bid meeting was set up in Turner Arabia office in order to:

- familiarize bidders with project components and aspects
- answer contractor's clarifications
- conduct visit to the site and introduce concerned parties for further site investigation

All questions concerning the bid documents or the project had to be submitted in English and in writing on the Bid Query Sheet no later than two days before the meeting. Contractors received some bid documents on 12<sup>th</sup> January 2008. However, a final bid document was ready for submission during the last week of January 2008. The bids had to be personally delivered to the Construction Manager before the Bid date which was the 16<sup>th</sup> of February 2008. Contractors were discouraged to request bid time extension beyond the 16<sup>th</sup> of February 2008. Nevertheless, if a bidder wanted to file for a time extension, he/she was required to address the Construction Manager in writing no later than 10 days before the date stipulated for delivery of bids. The CM would have to evaluate the request and reply with an agreement or a disagreement. An extension of 3 weeks was granted by the client to the bidders and the bid date revised to 8<sup>th</sup> March 2008.

A key aspect of the bid process was that each bidder had to deposit with their proposal a bid bond in a sum equal to at least five percent (5%) of the proposal amount issued in favor of the owner. The bond had to remain valid for a period of ninety days from the date of submission of the proposals and had to be in the form of an unconditional and irrevocable letter of guarantee from a reputable bank registered in Saudi Arabia. Any proposal submitted without such bond was considered invalid. The bid bond guaranteed that the successful bidder would not retract after being chosen by the owner. Therefore, all the other bid bonds had to be returned to the unsuccessful bidders. The bid bond of the successful bidder was returned after the submission of the required performance bond (irrevocable bank guarantee of an amount of 14 million SR issued by a bank licensed and operating in Kingdom of Saudi Arabia), certificates of insurance and the signature of the contract agreement by the bidder and the owner. Once the Construction Manager approved

the contract, the successful bidder had to submit his/her performance bond within the following seven days and before the signature of the contract. If the bidder did not respect that date of submission, the owner had the right to cancel the letter of acceptance and cash the bid bond.

During the Bidding process, the bidders had the responsibility to ask for all the details required for the “good understanding” of the contract and the high standard achievement of the project. After the signature of the contract, all misunderstandings of the contractor were at his/her charge. For example, the bidders were able to visit the site of the project and were responsible for obtaining all relevant and necessary information to make a lump sum fixed price bid. Moreover, the lump sum bid and any rates and prices quoted by the bidder were fixed for the duration of the contract and were supposed to account for all fluctuations which may occur during the contract. However, contractors were protected from revisions of taxes, custom duties or income taxes 30 days before submission of bids.

Only pre-qualified firms were allowed to submit a bid. Moreover, the owner did not bind themselves to accept the lowest or any bid and did not guarantee to state a reason for the acceptance or rejection of a bid. This allowed Zahran to be discrete in weighing the quality of the bid and perceived the likelihood of success rather than being required to contract based only on price.

The bidding process also allowed the firms to form joint ventures, provided timely notice was given. However, the bids submitted by a joint venture of two or more firms had to be characterized by the nomination of one of the partners to be in charge of the project.

Since the contractor is required to have a Saudi Arabian merchant as a partner or agent according to the contract documents, international contractors were encouraged to enter into joint venture agreement with local contractors.

In addition to the confirming bid, the bidder was requested to submit additional bids including value engineered proposals:

- with an alternative schedule that could be more cost-effective
- alternative cost effective design

The owner was free to accept the bid, or the alternative, with any or all of such alternative materials, specifications or completion periods set out in the alternative. Alternatives were entertained only if they served to decrease the time of completion or the price of the project.

### **3.7 CURRENT CONTRACT**

Similar language from the original contract was used for the new contract. However, while such language showed resemblance, the actual process of selection was entirely different. Since Zahran had the desire to continue construction immediately after litigation ended with Arabtec. They had to choose a contractor whom they believed would be able to construct the project efficiently, without the same problems encountered with Arabtec. The contractor was hired by a negotiation process. Zahran sought out the contractor SLTCC with the belief that they would live up to such expectations. This was in part possible since Zahran had, at this point, developed a strong understanding of the cost of the project. Also, since the new contract method for the whole project was to be lump-sum multiple prime, a

new language was introduced, detailing the allowance of use of subcontractors. This ensured that the work performed would be done by those who Zahran found acceptable and retained the right to refuse subcontractors.

## **3.8 ANALYSIS**

### **3.8.1 RESULTS**

#### **3.8.1.1 Contract Transition**

Due to the owner's desire to fast-track the project, Zahran paid Arabtec a down payment and asked them to start the construction in conjunction with Turner to finalize the contract document for approval and signature. Once Arabtec received the payment, their relationship with SDC, the owner and Turner worsened. They signed the contract with Zahran after the work started, but filed for numerous change orders. Zahran, being risk averse and expecting the delivery of an on-budget project which had accounted for the fast-tracked nature previously discussed, was not pleased with the work and the constant claims. Finally in 2009, Zahran chose to stop the project and relieved Arabtec from their duties. Moreover, the developer, Cayan, was charging a tremendous amount of money for their services. They were able to sell the entire Tower 1 by the end of 2007 when the market was low, but as the market strengthened and the prices went up, they realized that they could have sold the apartments at a higher price. Thus, Zahran also decided to relieve them of their duties as well.

The case went to court where Zahran settled with Arabtec. Liquidated damages were paid, however the exact specifics may not be disclosed. The owner purchased all the



equipment that was already on site, such as tower cranes, formwork and steel so that the next contractor would not have to remobilize the site, thus saving time and cost in the next contract. Once Zahran successfully terminated the contract and removed Arabtec from the job, they were able to rebid the project.

Following the rebidding of the project, there were issues of scope definition in the new contract and it lacked relevant as-built information from Arabtec. The issues of scope definition arose due to the incompleteness of Arabtec's work in accordance with the contract prior to termination. SLTCC was therefore required to complete works at lower levels to continue work within the contract's defined scope. While it is mentioned above that the contract structure allocated risk to the contractor and essentially barred change orders, this change in scope necessitated the negotiation of a change order that is currently in progress. This transition affected the CM as well because not only did they have to act as an owner's representative, but also had to coordinate between the different contractors.

### **3.8.1.2 Interaction between Parties**

Given the contentious relationships between the owner, his fiduciaries, and the contractor Arabtec, it was found that after awarding a new contract, the relationships with the new multiple prime contractors allowed better delivery. While the owner desired a relationship with a contractor that was friendlier and based less on contract, it was found that Arabtec handled its business solely on the parameters of the contract. Zahran had agreed to the contract with the understanding that Arabtec, having experience in hotel construction, would provide a service-based approach. When it was found otherwise, the

relationships between the owner, design team and CM no longer allowed for the trust and cohesiveness necessary to produce the product desired.

After the termination of Arabtec, the intentions of flexibility were well set in the contract language and allowed Zahran to contract with a builder who better understood the core of the project and who would be able to provide such a service-based approach. While there have been some relationship issues, mostly resulting from matters of operation, the relationships are extensively more productive and respectful and the project is functioning well.

### **3.8.1.3 Delays**

Due to the fast-tracked nature and the flexibility desired in the construction project, there have been some delays, as was expected and reiterated in contract by the owner. However, the largest delay is due to the termination of the general contractor after the commencement of work. By restructuring and rebidding the contract, the entire Lamar Towers project was delayed by two years. Also, during this time project delay, there has been over layering due to Zahran's desire to alter the design, including: adding floors to the original towers proposed, and to continue the process of value engineering, yielding ongoing changes to the construction documents.

There have also been delays in construction due to untimely inspection of work by the engineers and the CM. It has been stated that a shortage of engineers and CM personnel available to inspect work, prior to casting concrete, has delayed the process. Such issues, although currently diminishing, were a result of mismanagement by the project consultants in handling the work demand until December of 2010.

There have also been delays in the project because of a lack of shop drawings necessary. Since SLTCC's scope was extended to the substructure, they have been required to continue work of the existing work and without the original shop drawings detailing all proposed construction. Additionally, while it was originally conveyed to SLTCC that shop drawings were available to level 12 of the building, they were not accessible and there has been delay as they are finished and released for construction. Such delays are, however, inevitable as the design team is attempting to finish and release detailed documents at a schedule only slightly ahead of ongoing construction.

Some work has been stalled from the original proposed schedule because of a slow mobilization of the required equipment. Current crane positioning does not allow the service of the core construction efforts and the slab construction at the same time. There is currently a lack of efficiency, which may be remedied when the erection of several tower cranes is completed that will allow service in all necessary regions of the project.

Moreover, coordination between trades that the CM is responsible for, has proved to cause some delay, as work performed by the mechanical and electrical package contractors required dimension changes in a retaining wall on site. Other unavoidable delays have arisen due to weather which has halted work several times. Recently, a steel shortage in the market has caused purchasing delays. The demand placed on the market by resuming work on the project, in conjunction with material demands from ongoing construction in the Saudi city of Riyadh, has caused intermittent insufficient supplies.

#### **3.8.1.4 Risk/Reward**

While the original project schedule has not been achieved, the revised schedule, following the rebidding of the job, is currently on time. Now, construction is at the twelfth floor of the development and is utilizing the jump-forming technique to improve speed and efficiency. As relationships are presently in good terms and SLTCC has been open to working with Zahran and its representatives with design changes and satisfying quality assurance requirements, it is projected that the vision and service based product will be delivered as desired. Also, the project has received promising interest from buyers, and all condominium units in Tower 1 have been sold.

However, there have not yet been any condominium sales in Tower 2, as Zahran is seeking to maximize profits by putting a hold on sales. Since Tower 1 units were sold at a low point in the market, there is a deficit in sales revenue from those expected at the onset of the project. This has led to a value engineering effort led by Tuner which is attempting to lower the total cost of construction to recouperate these losses. Additionally, it is projected that the real estate market in Jeddah will continue to rise, thus allowing Zahran to use the market to its benefit and sell the remaining units at a higher cost. While this halt in presales does create a decrease in capital funds for construction, Zahran Holding has proven to be a strong enough owner to make up for this decrease and continue the project without any financial crises.

However, while this project may continue to be successful after the hiatus and rebidding, it is obvious from the result of the project, that even if the development goes on to be successful and profitable, it was not delivered with the efficiency possible and thus

losses from the Lamar Towers project's full potential are unavoidable. While the original schedule placed the completion date of the project by March of 2011, its current scheduled completion date is March 31, 2013. This delay of two years is associated with a loss of profit due to taxes paid on a site for a longer period of time than necessary, and the loss of revenue because of delayed occupancy.

It can be argued that the attempt to fast-track the project by one or two months, by beginning work based on a down payment before the final contract was agreed upon by the owner and Arabtec, ended up delaying the project by two years. This risk taken on the part of the owner set the project back from the beginning and it seems it would have been wise to postpone construction until the final contract documents were completed. In this case, the owner suffered from believing that the chosen contractor would act as fiduciary.

Another aspect in the Lamar Towers project which must be addressed is its revolutionary nature. There are very few high-rise buildings in Jeddah, let alone in Saudi Arabia as a whole. Also, current typical housing trends are based on large individual residences with property. Therefore, this undertaking required Zahran to speculate as to whether such a development would be profitable. As indicated in the discussion of project drivers and market drivers, it was necessary that the project deliver a marquis, luxurious and high quality product which would be able to draw the attention and desire of the target market to deviate from current norms. If the project does indeed prove to be profitable, as current conditions indicate it will be, then this project will have demonstrated an excellent example of risk/reward relationships and speculative real estate development.

## **3.8.2 SUGGESTIONS**

### **3.8.2.1 Amending Process Used**

There are certain cultural and traditional drivers that make some aspects of this program difficult to change. Given the location of the Lamar Towers, it was necessary that a lump sum contract and design-bid-build process be used. However, some of the ways in which this method was altered to allow fast-tracking could have been handled with better success. Also, it is important to consider what methods may have been used with greater success had such de facto restrictions existed.

It proved that the first selection of the general contractor by Zahran and Turner was a mistake, seriously affecting the outcome of the project. While in many regards it seems like Zahran took a responsible approach toward the bid process, inevitably the wrong choice was made and there were no indicators that the owner or Turner could have noticed before it was too late. The process itself seemed analyzed and did consider the drivers unique to the project: only inviting prequalified contractors, requiring detailed bids, seeking advice from the CM at the time of bids and reserving the right to not award the contract to the low bidder. However, the due diligence taken did not prevent Zahran from choosing a contractor ill-suited to deliver the project in the method desired. Since Arabtec had so successfully completed jobs which were similar in quality and magnitude, it was assumed that the same service could be extended to the Lamar Towers project. However, the decision neglected the specific needs of the client to maintain the contractor as a fiduciary throughout the process. While such errors in judgment can never be eliminated, it

seems in hindsight that Zahran should never have proceeded to authorize work before a contract was officially agreed upon both parties.

Additionally, the success thus far of the second contract has clearly shown that the first method could most definitely use improvements. Since Zahran already retained the services of a CM who had the ability to manage the project efficiently, there was no need for the contract to be awarded to a single contractor as it was originally done. The organization, along with Turner, had the sophistication to manage the multiple prime (package) contracts, which were awarded on the second bid process and therefore were able to decrease the dependence of the project's success on a single external entity.

### **3.8.2.2 Alternative Delivery Method**

If one is to consider how such a project may be delivered more efficiently using a method tailored to the specific project, a case may be made from several different methods. However, it is the position of the author that the best method would be to use a Construction Manager with a cost-plus fixed fee contract. Several different factors lead to this conclusion, one being that Zahran has the ability and the sophistication to take on the risk of the project rather than paying a premium to allocate it elsewhere. Zahran's real estate development experience makes it an informed and sophisticated owner, who understands the construction field well enough to evaluate risk appropriately.

The company's aversion to risk was inconsistent with its financial abilities, as shown in the case, through its ability to purchase the construction equipment from Arabtec, delay presales on Tower 2 condominiums and keep the project afloat after a two year delay. Additionally, while Zahran seemed to show that it felt inadequate to manage such a job, the

use of a CM would allow for preconstruction services, putting an expert as a representative for the owner from the beginning of design and allowing for early feasibility and value engineering. This method also would allow for the fast-tracking desired from the onset as it would not be necessary to wait until final completion of bid documents.

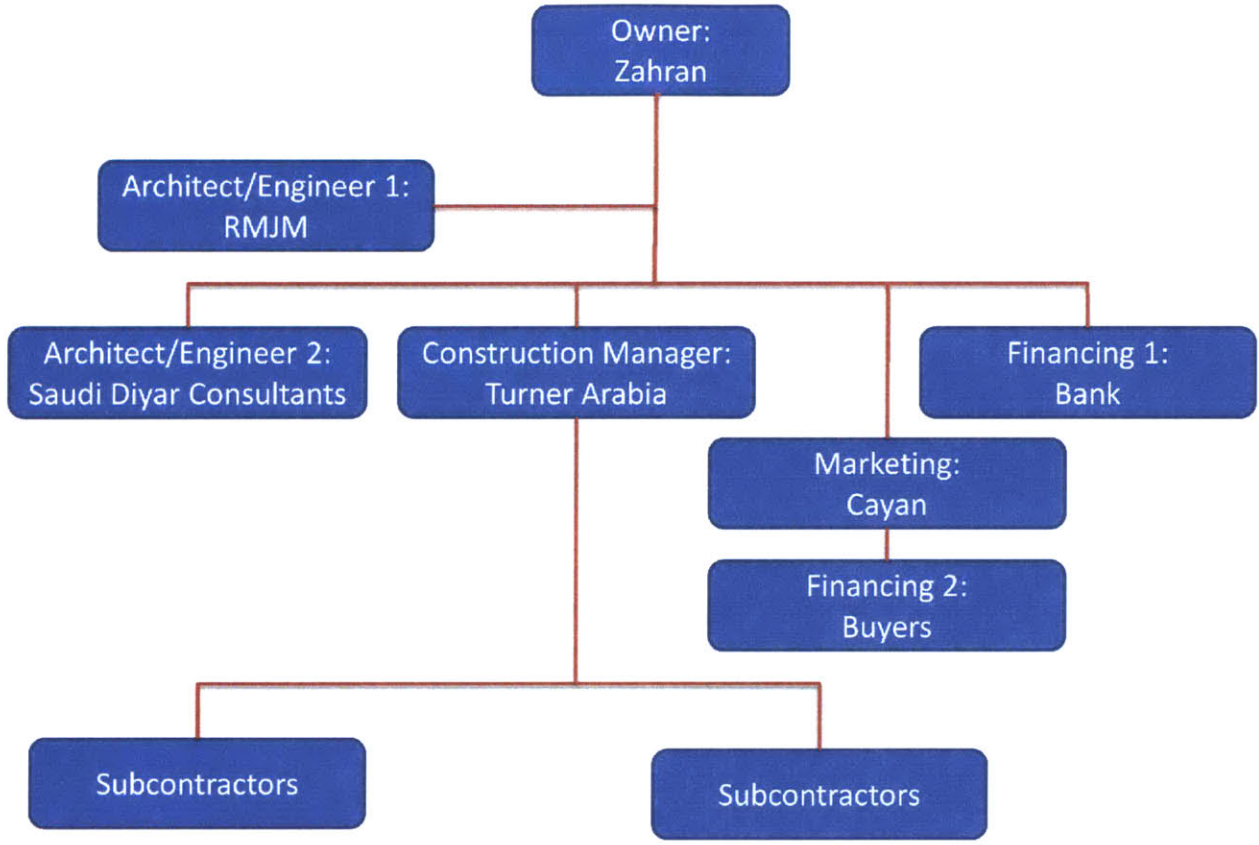
While Zahran did in fact use a CM for such preconstruction services, what makes this method more appropriate for the Lamar Towers project is the payment structure. By using a cost-plus method Zahran would be able to maintain the design integrity as well as have less resistance to design changes. Since such changes will not directly affect the profit of the CM, this would allow Zahran to keep the CM as a fiduciary throughout the construction process. Additionally, Zahran would not have to pay a premium for a different entity to usurp the risk of the project. With the method structure which was, and is still being, used, the contract language was set up to allow for changes to occur. Thus, inevitably, it led to a larger contingency budget for the contractor who may not be certain of the costs, which will be incurred. Therefore, it follows that if Zahran will be paying for the risk anyway, it may as well take that risk on and reap any benefits which may possibly result from an optimal construction process by reimbursing construction costs.

The use of a fixed fee payment, in addition to the reimbursed construction costs, also serves a specific purpose. If a cost-plus percentage fee is used, there is incentive for the CM to drive up costs on the project to increase their fee. However, no such incentive exists for a fixed fee payment. While at the surface the use of a fixed may seem as though it would be a deterrent form of Construction Managers, it is necessary to consider both the owner and the CM needs. By using a fixed fee, the CM is taking on the risk that the project may run



longer than intended and they will be forced to utilize more man hours than originally intended when negotiating a fixed fee. However, an experienced and adept Construction Manager may also understand that any delays on such a project are as undesirable to the owner as are to themselves.

While this is not sufficient to eliminate the worry of a CM, the sophistication and construction experience of Zahran predicts that they will be responsible in their decisions and be actively concerned with keeping the project on schedule and avoiding unrealistic changes. In this way, a cost-plus fixed fee serves to motivate both Zahran and a Construction Manager to complete the project as quickly as possible and move on to the next project. Another advantage of this delivery method is that Zahran would still be able to maintain control over the quality of subcontractors, which was sought on the two contract arrangements used in the actual project. Since the construction costs are reimbursable, there is no reason for a CM to be contentious about any exclusion of subcontractors. Lastly, the proposed method detailed, makes certain that the entity which will control the construction of the project understands the complexities of the project as well as any other party when a fixed price is negotiated. After having been involved in the preconstruction services, the CM will be able to identify major areas of risk as well as gage the attitude and tendencies of the owner (Figure 12).



**Figure 12: Proposed Organizational Chart**

## **4 CONCLUSION**

Construction Management proved to be the most appropriate method when owners choose to build complicated and large projects. It permits to bridge the gap between the designer and contractor in order to maximize the outcome for the owner and the adversarial relationship is reduced. In this method, the owner delegates his/her leadership role to the Construction Manager that is now responsible for the project. Whether choosing an Agency CM or CM At-Risk, the role of the CM is to provide project control and coordination in order to meet the budget and schedule constraints. This delivery method also allows for fast-tracking as individual contracts can be awarded as soon as documents are issues. It also allows enough flexibility if changes are needed. Moreover, since the CM can be hired early on, he/she can help during the design process by providing construction services such as estimating, scheduling, value engineering and constructability analysis. However, the drawbacks of this method are that the project's cost and schedule are not guaranteed at the onset of the construction and the outcome of the project relies mainly on the CM.

In addition, although there were some minor issues with the CM method used for the delivery of the Lamar Towers in Saudi Arabia, this method proved to be very effective in controlling and coordinating the project process. In fact, the Construction Manager brought the technical knowledge that the project needed and was able to coordinate the efforts of the different teams to benefit the project. Finally, some modifications were brought forward that would ameliorate this delivery method.

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## **PERSONAL INTERVIEWS**

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Kassouf, Fadi, General Manager, SLTCC