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Decision support system for selecting the proper project delivery method using analytical hierarchy process (AHP)

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Abstract

Owners are presented with different options for their project delivery process, which include the traditional method (design-bid-build), construction management or design-build delivery methods. This paper examines the compatibility of various project delivery methods with specific types of owners and projects. While no project delivery option is perfect, one may be better suited than another based on the requirements of a particular project. These requirements should be evaluated to determine which of the various options would most likely produce the best outcome for the owners. The proper selection of a project delivery method is based on a high degree of technical factors and low construction costs. In this study, a multi-criterion decision-making methodology using the analytical hierarchy process is provided to assist decision-makers in selecting the proper delivery method for their projects. An example application for selecting the proper project delivery method for an actual project is provided.

Keywords: Alternative project delivery methods; Design-bid-build; Design-build; Construction management agency and construction management at risk; Analytical hierarchy process

1. Introduction

A project delivery option is defined as a method for procurement by which the owner's assignment of "delivery" risk and performance for design and construction has been transferred to another party (parties). These parties typically are a design entity who takes responsibility for the design and a contractor who takes responsibility for the performance of the construction [1].

There are many factors that can be used to define project delivery options. By using a different combination of these factors, each option can be uniquely defined. The more factors used to define a delivery option, the more unique combinations and thus, more delivery options that will end up on the list. There are three factors which can be used to define each option through the unique combinations they create including;

- Are the design and construction contracts combined or separate?
- Is construction cost of work a selection criterion?
- Is total construction cost the sole selection criterion?

The unique combination of factors and characteristics for each option are listed below. Some characteristics that are typical of each option are provided, as well as an overview of the typical Phases of each delivery option.

The list of delivery options in this study include:

1. Design/bid/build – competitive sealed bid (D/B/B).

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2. Construction management/general contractor-competitive cost proposal (CM/GC CC) or competitive qualifications proposal (CM/GC CQ).
3. Design/build – competitive cost proposal (D/B CC); competitive sealed bid (D/B Bid) or competitive qualifications proposal (D/B CQ).

With competitive sealed bid, the selection is based solely on price (which must be clearly defined), with the award going to the responsible and responsive bidder submitting the lowest price [2]. Proposals require the use of evaluation factors, which may or may not include price, cost, or fee as part of the evaluation criteria. While no project delivery option is perfect, one option may be better suited than another based on the unique requirements of a particular project. The requirements for each project should be evaluated to determine which of the various options would most likely produce the best outcome for the public or private owners. What the owner should really be seeking is the best value for its money, not necessarily the lowest initial cost.

2. Typical project delivery methods

The choice of the most appropriate delivery method for a particular project is dependent upon a number of factors, however, the number of delivery methods and variations thereof has expanded so that public agencies can deliver more projects. Examples of the most common methods used, their advantages and disadvantages are as follows.

2.1. Design-bid-build

Design-bid-build (DBB) is the most common project delivery option. It is often referred to as the "traditional" option. There are three prime players: owner, designer (architect) and builder (general contractor). Two separate entities are engaged for design and construction, and award of the design contract is based on a quality-based selection. Design is followed by construction, which is generally bid competitively, and then by some sort of inspection/quality assurance or even complete construction management services.

The *architect* is responsible to the owner for the design of the project and also administers the construction contract as the owner's representative. The *contractor* is responsible to the owner for the proper construction of the design and is responsible for methods and procedures of construction. This creates an independent relationship between the architect and the contractor with each directly responsible to the owner. The separation of the architect and the contractor in DBB projects creates a system of checks and balances because the architect and the contractor are in a position to discover errors committed by the other and most contracts require them report these errors to the owner so the effects of an error can be eliminated or minimized. Therefore, the use of this method (DBB), promotes the construction of a quality project. Under many industry contracts, failure to report an error that becomes known or to take proactive steps may result in liability [3].

This method (DBB), is typically used for most public works projects and for many private work projects. It is used for specialized facilities where the design must be completed in great detail and built accordingly in order to meet the owner's requirements. The owner's responsibilities include:

- Defining project requirements.
- Providing financing.
- Providing whatever standards and contractual terms which are to be followed.

The owner may either self-perform or retain a design professional to join a project for the planning, conceptual design and design services.

This method is often criticized because of the extended time involved in designing and constructing the project as well as the somewhat adversarial nature of the relationship between the architect and the contractor [4]. Because of this situation, many variations of this project delivery method have developed. The architect must estimate the construction cost of the project during design, but he is a step removed from the formal pricing which takes place after the documents are already complete and the project is issued for tendering. Cost savings and alternate methods are only considered if the project tenders (bids) come in over previous estimates. If the actual tender (bid) amount far exceeds estimates, then the owner may suffer sticker shock, which creates tensions between the owner and the architect. There would then likely be a lengthy time of redesigning, re-pricing, value engineering and eventually contract awarding.

2.2. Design-build

The design-build (DB) project delivery system has grown in popularity and is seen by some in the industry as the perfect solution in addressing the limitations of other methods. For an owner, the primary benefit is the simplicity of having one party responsible for the development of the project. While the other systems often give rise to disputes among various project participants – with owner acting as referee (or party ultimately to blame) – in DB many of these disputes become internal DB team issues, which do not affect the owner. Design-build differs from traditional delivery methods in many ways. Listed below are some of the unique characteristics of DB:

- The owner typically completes only 5–30% of the project's preliminary design before it is turned over to design-build team for completion [5].
- The owner develops a detailed request for qualifications (RFQ), instructions to bidders (ITB) and request for proposals (RFP). These documents are then used to identify and short-list interested DB teams and provide instructions for the short-list DB teams to follow as they develop their proposals [6].
- The owner conducts a thorough up-front effort to identify project-specific goals and technical, public and political challenges that may hinder achievement of those goals.
- The owner conducts a risk assessment workshop with key team members from the owner's team and resource agencies to identify risks (technical, political, environmental, etc.) to the project's goals and to determine if the project scope should be adjusted to adequately address identified risks [7].
- The owner conducts a follow-up risk assignment workshop with key team members from the owner's team and resource agencies to assign identified risks contractually to the party (owner or DB team) who is best able to manage that risk.
- DB provides an opportunity for the design-builder to incorporate alternative technical concepts at the proposal and construction phases to more efficiency deliver the project.
- DB requires both the owner and the DB team members to assume new roles.
- Because the owner and the design builder assume new roles, the owner will conduct audit and oversight responsibilities while maintaining project control with fewer staff. Conversely, the design-build firms must increase the size of their staffs to fully perform their contract obligations [3].
- Because the owner and the design builder assume new roles, the owner, resource agencies and design builder will need to conduct education and training sessions on their respective roles and responsibilities with their staff to ensure delivery success [7].

2.3. Construction management at risk (CMR)

Construction management at risk (CMR) is a delivery method wherein an Architect/Engineer is selected to design the project and separately a construction manager at risk is selected to serve as a general contractor [8]. The construction manager (CM) assumes the risk for construction at a guaranteed price and provides design phase consultation in evaluating costs, schedule, implications of alternative designs and systems and materials during and after design of the facility. This delivery system is similar in many ways to the traditional design-bid-build system, in that CM acts as a general contractor during construction. That is, the CM holds the risk of subletting the construction work to trade subcontractors and guaranteeing completion of the project for either a fixed or negotiated price following completion of the design. This delivery system has three key differences to that of design/bid/build:

- A construction manager is hired to manage the construction process, including the selection of subcontractors.
- Through coordination between the architect and construction manager, the design and construction phases can be overlapped thereby expediting delivery process.
- The construction manager, who is responsible for quality control, scheduling and the estimate of construction costs, provides a guaranteed maximum price for the project.

The objective of the construction manger should be to give their clients the best possible experience with design and construction. The question is how the CM can improve an owner's experience by accepting the transfer of some cost risk, without endangering the relationship of trust, or the CM 'firms' financial footing. This can be achieved by providing the owner with the benefit of pre-construction services, which may result in advantageous changes to the project. At the same time, the possibility of earlier involvement of the constructor allows the CMR to have input into design during its schematic or its development stages.

3. Advantages of the CM at risk

- Earlier knowledge of costs.
- Owner has familiarity with the process.
- The construction manager CMR is an agent of the owner in managing the design process, but takes the role of a vendor when a total cost guarantee is given. Many professional CMR are leery of this change of role and resist being placed ''At risk''.
- CMR is faster than traditional design-bid-build.
- More professional relationship with the constructor.
- The CMR option offers the opportunity to begin construction prior to completion of the design.
- The CMR can bid and subcontract portions of the work at any time, often while design of unrelated portions are still not complete.

3.1. Disadvantages of the CM at risk

The contractual relationship among designer, CMR and owner, once construction begins is underway, the CMR converts from professional advisory role of the construction manager to the contractual role of the

general contractor. At that time, tension over construction quality, completeness of the design and impacts to schedule and budget can arise:

- Since a commitment is made to a contractor earlier in the process, a premium is placed on the proper selection of the CMR to provide the best value to the owner.
- There are still two contracts for the owner to manage.
- Contractually, the parties have different agenda and objectives.
- The designer may not include constructor input.
- Firm costs for the project are seldom known until later.
- CMR project delivery is slower than design-build.

3.2. Construction Management Agency (CMA)

Construction management agent (CMA) is a delivery method wherein an Architect/Engineer is selected to design the project 'Texas Water Development Board [9]'. At the same time a separate selection is made for a construction manager to serve as an agent for the client, providing administration and management services. The CMA provides design phase assistance but neither holds subcontracts nor provides bonding for construction of the project.

Selection of the CMA is based on qualifications and experience 'PB Network [10]'.

4. Advantages of the CMA

- The work is divided into multiple packages and bid directly to the trades.
- The project's owner holds all trade contracts and the CM acts as the client's agent in the management and direction of the work.
- The CMA is normally selected at the same time as the Architect/Engineer or shortly thereafter and provides assistance to the project's owner during the design phase for costs, schedule and constructability.
- The client has the possibility of speeding the construction by awarding elements of the work prior to the completion of design.

5. Disadvantages of the CMA

- No single point of responsibility (multiple trade contractors).
- No guaranteed price.
- Clients must manage more contracts.
- Potential for additional design costs.

5.1. Factors affecting the selection process

A review was carried out to identify the different factors that may affect the selection of a proper project delivery method. In order to identify the relative of importance of these factors, an initial literature study was carried out and a questionnaire was developed. Thirty-four factors were identified and categorized into seven factor areas as shown in Table 1. The description of each these factors is indicated in Appendix I. The identification of the relative importance of these factors was carried out via structured interviews with selected experts to make sure that the survey results had enough practicality and were realistic. In additions, the number of agencies which could be contacted by mail were not enough to secure a representative number of replies, therefore, structured interviews were conducted with selected experts from the industry who fulfilled certain conditions, such as that an expert should have 15 years experience in the construction industry and at least have 5 years of experience in contracting field. Sixteen interviews were carried out for this purpose. An analysis was carried out using the *AHP* approach to determine their relative importance.

5.2. Concept of analytical hierarchy process (AHP)

'Thomas Saaty [11]' developed the mathematical foundations of the analytical hierarchal process (AHP) at the University of Pittsburgh. With the advent of the personal computer during the 1980s and 1990s this decision support tool, as implemented in several software packages, especially Expert Choice developed by Forman, Saaty, Selly and Waldron [12] has become very popular. Increasingly, AHP's power has been validated in empirical use, Chang, Ibbs and Crandall [13] extended by research and expanded by new theoretical insights as reported in series of international symposia devoted to AHP.

Professional Expert Choice© (2000) was implemented to develop the proposed decision system for identifying the optimum house delivery system in this paper. In Professional Expert Choice, the decision-maker first structures the problem into different hierarchical levels. Top down structuring is best used when the objectives are more known than the alternatives. The model is built from the top starting with the most general objectives, then the more specific (sub-objectives), and finally the alternatives of choice. At the top of the hierarchy the goal of the decision can be clearly stated, which is defined in this paper as the ''Optimum House Construction Delivery Approach''. Then, the evaluation criteria and sub-criteria which were called objectives are clearly represented. Seven objectives are included in the first level of hierarchy and 34 objectives in the second level, as shown in Table 1.

Table 1
Factors affecting the identification of the optimum house construction delivery approach

Owner characteristics	Project characteristics	Design characteristics	Regulatory	Contractor characteristics	Risk	Claims and disputes
Owner understanding the project scope	Precise cost estimate before contract signing	Potential for design changes during construction	Allowance for competitive bidding	Availability of experience for carrying out the delivery option	Risk management improvement	Claims and disputes between design and builder/single point responsibility
Owner control over design	Time reduction	Design quality	Desired contractual relationship	Familiarity and establishment	Risk allocation	Conflict of interest
Owner benefits from cost saving	Tight project milestone or deadlines	Flexibility to redesign after construction cost commitment	Regulatory and statutory requirements	Contractor input in design		
Owner involvement in project details	Cost saving	Effectiveness and constructability of the design (VE)	Complexity of decision-making	Experience needed for a particular delivery option		
Applicability	Project budget		Reduction in administrative staff	Construction quality		
	Ability to define the project scope		Enough experience to carry out the delivery option	Coordination and communications		
	Project size and complexity		Funding cycle	Clarity of defined roles		

Table 2
Linguistic measures of importance [11]

Intensity of importance (1)	Definition (2)
1	Equal importance
3	Weak importance
5	Strong importance
7	Demonstrated importance
9	Absolute importance
2, 4, 6, 8	Intermediate values

Once the hierarchy structure is established, the decision-making process takes place. The decision-maker derives ratio-scale (as shown in Table 2) priorities reflecting the relative importance of objectives via pairwise comparisons with respect to the goal of the problem. Similarly, the decision-maker derives ratio-scale priorities reflecting the relative preference of alternatives relative to each objective.

Finally, the judgments are further synthesized to provide a ranking of the alternatives for the best choice. A further refinement of these decisions is provided by sensitivity analysis. Sensitivity analysis enables the decision-maker to see how the final priorities will be affected by changes in the relative importance of the objectives. In Expert choice this option is supported by graphics.

5.3. Analysis using AHP

The different factor areas that have a direct effect in deciding the proper delivery option using the AHP illustrates that the "project characteristics" factor area represents the most significant factor area (about 26.6%). The "project characteristics" factor area is higher than "Owner characteristics" by about 32% and is double the level of importance for the areas of "design characteristics", "risk allocation and risk management improvement" and "regulatory", as shown in Fig. 1.

5.4. Sensitivity analysis

An analysis approach using the AHP reveals the design-build (DB) as the most proper project delivery option if all factor areas were considered, as shown in Fig. 1. A sensitivity analysis was carried out to study the impact of the different factor areas on deciding the proper project delivery option. This analysis has two-folds. In onefold, the relative importance of one factor area is changed from the value recorded as the basis of survey to be the only factor in deciding the proper project delivery option. The other fold reveals the proper project delivery that when factor area is not considered.

Increasing the relative importance for the factor area "Project characteristics (F1)" to be 100% means that

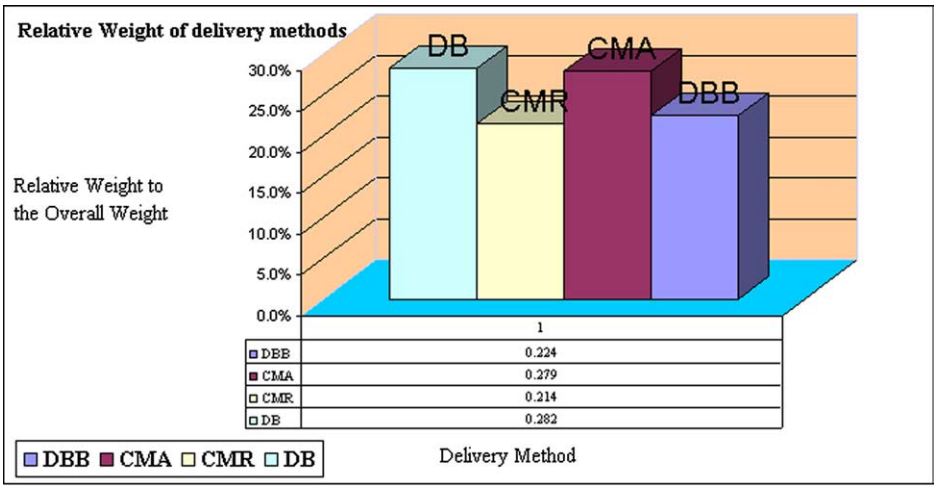

Fig. 1. Relative weight of delivery methods based on the analysis from survey conducted.

this factor is the only factor area considered in deciding the proper project delivery option. The result in this case reveals that the construction management agency (CMA) would be the most appropriate project delivery method to the owner, registering about 29.5% as shown in Table 3. This means that when the decision maker introduces the "project characteristics" factor as the most important factor, attention should paid to the risks expected in the project in hand. In this case, the construction management agency (CMA) becomes the proper option to deal with the different project characteristics. In addition, DB come in at the second place of importance, registering about 25.6% as shown in Table 3, while DBB come in last place of importance, registering about 22.1%.

If one of the three factor areas "Owner characteristics (F2)", "Regulatory (F4)" or "Contractor characteristics (F5)" is considered only in deciding the proper project delivery option, the design-bid and build (DBB) project delivery option would be the most appropriate option, as indicated in Table 3. This selection is resulted mainly from a little willingness of the owner or contractor to accept a project delivery method different than the well known traditional option of the DBB. In addition, by considering the DBB delivery option as a well established option, this clarifies why the regulatory factor supported the selection of DBB as the proper option.

Considering either the factor areas F2, F4 or F5 as the only deciding factor supported the project delivery option CMA as the second option where it registered a close level of relative importance to the DBB. This may be due to the possibility of delegating the project responsibility to the CM in an approach close to that followed in the traditional DBB, and for the same reason, DB and CMR come in at a low level of importance as shown in Table 3.

Considering either the factor areas "Design characteristics (F3)", "Risk (F6)" or "Claims and Disputes (F7)" as the only deciding factor, design-bid (DB) would be nominated as the most appropriate project delivery option as shown in Table 3. This may be due to considering the project design as the main concern of the

Table 3
Relative weight of delivery methods if the factor area will be overriding

Factor areas	Changing the relative weight of factor area to be 100% and others are 0%	Relative weight of delivery methods if the factor area will be overriding			
		DBB (%)	CMA (%)	CMR (%)	DB (%)
Project characteristics (F1)	100% and the others have 0%	22.1	29.5	22.8	25.6
Owner characteristics (F2)	100% and the others have 0%	38.2	30.2	15.4	16.2
Design characteristics (F3)	100% and the others have 0%	8.3	22.0	22.4	47.3
Regulatory (F4)	100% and the others have 0%	30.1	29.2	18.0	22.7
Contractor characteristics (F5)	100% and the others have 0%	35.0	30.0	18.3	16.7
Risk allocation and risk management improvement (F6)	100% and the others have 0%	7.3	28.2	25.7	38.8
Claims and disputes (F7)	100% and the others have 0%	11.1	23.3	30.5	35.1

decision maker in order to give more flexibility in the design performance process and in addition, to shorten the project duration by phasing the design and construction. At the same time minimization of claims and disputes resulted from the improvement in risk management which is seen as a main advantage of DB project delivery option. F3 recorded the greatest effect in deciding the proper delivery option. Where the DB recorded about double the value of importance over the CMA and CMR factor areas (about 22.4%) and about six times the value of importance for the design-bid-build (DBB). F7 also supported the CMR factor area in the second place of importance similar to F3 but with close level of importance to the option DB as shown in Table 3. While F6 supported CMA factor area in the second place of importance and CMR in the third place, but either F3, F6 or F7 gave a very low level of relative importance for the DBB option. This may due to the inflexibility of this option in satisfying the project need for design changes or a weak ability to deal with the resulting claims and disputes or the project risks.

The second analysis fold deals with the concept of decreasing the impact of the factor areas to have no effect in deciding the proper project delivery option. This means that these factors have zero level of relative importance. The absence of F1, F2, F4 or F5 while considering the other factor areas in deciding the proper delivery option supported the design-bid (DB) delivery as the most appropriate option. In addition this also supported the construction management agent (CMA) as the second appropriate option, as shown in Table 4. Also, the absence of F3, F6 or F7 while considering the other factor areas in deciding the proper delivery option supported the construction management agent (CMA) delivery as the most appropriate option. In addition this also supported the design-bid (DB) as the second appropriate option, as shown in Table 4. Meanwhile, the alternatives design-bid-build (DBB) and construction management at risk (CMR) recorded the same level of importance (lowest level). This may due to the reduction of constraints resulting from the requirement of different characteristic of project, owner or contractor, as well as, the regulatory conditions. In addition to the flexibility introduced in the DB and CMA as indicated in their advantages.

5.5. Conclusions and discussions

While no project delivery option is perfect, one option may be better suited than another based on the unique requirements of a particular project. The requirements of each project should be evaluated to determine which of the various options would most likely produce the best outcome for the public or private owners. All of the project delivery methods have distinct advantages and disadvantages with the best choice being governed by the requirements of the specific project. The methods discussed in this paper have been used successfully on a wide variety of projects. Moreover, each of the project delivery method has specific weaknesses that have limited their success. What the owner should really be seeking is the best value for money, not necessarily the lowest initial cost. Therefore, when selecting a delivery method for a proposed project, an owner should first know the various types of project delivery methods, the characteristics of the proposed project, and their own abilities. A careful selection can result in cost savings and a much more harmonious project delivery process. Owners will find these delivery methods are competitive within traditional competitive bidding. Different factors were found which have an effect on the selection of a project delivery method. Thirty-four factors were identified and categorized into seven areas. These seven factors areas were considered with different significant levels of importance when deciding the most appropriate project delivery method.

An analysis approach was carried out using the AHP to identify the relative of importance of the dif-

Table 4
Relative weight of delivery methods if the factor area will be neglected

Factor areas	Changing the relative weight of factor area to be 0% and others have values	Relative weight of delivery methods if the factor area will be neglected			
		DBB (%)	CMA (%)	CMR (%)	DB (%)
Project characteristics (F1)	0% and the others have values	22.5	27.3	21.0	29.2
Owner characteristics (F2)	0% and the others have values	18.4	27.3	23.0	31.2
Design characteristics (F3)	0% and the others have values	24.6	28.8	21.3	25.3
Regulatory (F4)	0% and the others have values	21.2	27.7	22.0	29.1
Contractor characteristics (F5)	0% and the others have values	21.5	27.8	21.7	29.1
Risk allocation and risk management improvement (F6)	0% and the others have values	24.7	27.9	20.8	26.6
Claims and disputes (F7)	0% and the others have values	23.2	28.2	20.8	27.7

ferent factors that have an impact when deciding the proper project delivery option. The analysis reveals that the design-build (DB) is the most appropriate option when considering all factor areas. In addition a sensitivity analysis was carried out to study the impact of the different factor areas on deciding the proper delivery option. This analysis was approached from two points of view. In one fold, the impact of each factor area is studied from the view of considering it as the only factor in deciding the proper project delivery option. The other fold reveals the proper project delivery that when factor area is not considered.

The effect of all factors, when their values increased to be the only deciding factor to the four project delivery options showed that the design-build (DB) is the most appropriate option. In addition, the construction management agency (CMA) alternative comes in at the second level of importance. Design-bid-build (DBB) and construction management at risk (CMR) recorded the same level of importance (lowest level). Summing up the effect of all factors when their values have no effect on the selection process also confirms the design-build (DB) method as the most appropriate method, while the construction management agency (CMA) method is confirmed at the second level of importance and design-bid-build (DBB) comes in at the third level of importance. This may be due to considering the project design as the main concern of the decision maker in order to give more flexibility in the design performance process as well as, to shorten the project duration by phasing the design and construction. At the same time minimization claims and disputes resulted from the improvement in risk management which is a main advantage of DB project delivery option. In addition this may be due to the reduction of constraints which resulted from the requirements of different characteristics of the project, owner or contractor, as well as the regulatory conditions. The construction management at risk (CMR) recorded the lowest level of importance.

Appendix I

- *Tight project milestone or deadlines*: by determining if the project requires a schedule that can only be maintained by overlapping of the design and construction phases to consider one alternative delivery options. If the project has a fixed schedule or finish date before it is submitted to its executor.
- *Time reduction*: is there time to complete the design development stage of the design process prior to starting construction. The owner should specify his/her needs to reduce the project time duration.
- *Cost saving*: identifying the possibility of cost saving for each alternative delivery option.
- *Precise cost estimate before contract signing*: the owner's need for a more precise cost estimate before contract signing in case there is a limited budget.
- *Project budget*: the project has a fixed cost before it is submitted to the designer.
- *Ability to define the project scope*: the owner has a precise understanding of the project scope before it is submitted to the designer.
- *Project size and complexity*: the size and monetary amount of a project as compared to others available for the designer and contractors. If the project uses unique or specialized building techniques (e.g., industrial production plant). If the owner has the ability to define the project scope. If the owner can manage the project with either in house staff or with a pre-construction consultant.
- *Applicability*: the possibility of applying the different delivery options by the owner.
- *Owner control over design*: ability or desire to take responsibility for managing the design. Does the owner have in-house design resources qualified to manage the design professional.
- *Owner understanding the project scope*: the owner, designer and contractor share a clear understanding of functional and technical performance required in the finished project.
- *Owner benefits from cost saving*: is the owner getting a benefit from cost saving.
- *Owner involvement in project details*: does the owner wish to have complete involvement in the project details?
- *Design quality*: is it available in house or does the owner need outside resources to verify the design quality.
- *Potential for design changes during construction*: is there is a significant potential for changes during the construction phase.
- *Flexibility to redesign after construction cost commitment*: is a significant amount of flexibility required after commitment to a contractor.
- *Effectiveness and constructability of the design (VE)*.
- *Proper performance:* ability to assess scheduling and cost ramifications in different design stages.
- *Familiarity and establishment*.
- *Contractor input in design*: is contractor input during design required or desired to assist in defining scope, constructability reviews, schedule determination or budget confirmation.
- *Construction quality*.
- *Expertise required*: experience with the particular delivery method. If it is available by the owner in-house personal or by other agency.
- *Coordination and communications*.

- *Clarity of defined roles*.
- *Risk allocation and risk management improvement*: the owner prefers to shift some of the traditional risks (e.g., design errors and omissions) to the design-builder.
- *Allowance for competitive bidding*.
- *Desired contractual relationship*: it is dependant on the owner's selection of the construction entity and the contractual relationship created which will affect what information is required to be provided and when.
- *Regulatory and statutory requirements*: do laws rules, regulations, etc., permit the use of an alternative project delivery method?
- *Complexity of Decision Making*.
- *Reduction in administrative staff*: the owner has a project manager or staff that can be dedicated to the specific project delivery method.
- *Funding cycle*: is the project's funding available for construction at initiation of the design?
- *Availability of experience required to carry out the delivery option*: the number of local designers contractors and design-build firms with appropriate experience.
- *Conflict of Interest*.
- *Type of contract*: whether the project is being awarded as lump sum, unit price, guaranteed maximum price, fixed fee, or other.
- *Claims and disputes between design and builder/single point responsibility*: does the owner desire to hold a single entity responsible for coordination, collaboration and productivity for the entire project?

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