

Choosing the best project delivery method for contractor success^{1, 2}

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ABSTRACT

Failure of projects in the construction industry is a common notion and it is widely increasing with time and different constraints. In this paper we have managed to analyze the various reasons for contractor failures, how contractors can be protected by surety companies and mainly classified and analyzed between the different project delivery methods of projects to arrive at a conclusion “the best project delivery method” that supports successful delivery. Project delivery method defines the process by which we understand the roles and descriptions of the jobs of each personnel in the project undertaken and it is necessary to choose the right project delivery method for the significant project; as identified project delivery method is also one of the main reason that leads to contractor failures. Hence we must identify and categorize the project into the required delivery method and this paper justifies this choice of decisions on a number of attributes related to the alternatives.

Keywords: Contractors, Construction, Failure, Surety, Industry, Project management, Portfolio, Project delivery method, Control, Schedule

INTRODUCTION

The construction industry is an exceptionally widespread industry comprising of activities that range from quarrying, mining, construction of buildings or infrastructures, supply and manufacturing of products and also consists of operations, maintenance and disposal. “The construction industry has proved to generate an output of £110 billion per annum and also contributes to 7% of the GDP in the UK according (to ref Government Construction Strategy)”³. Such a widespread and growth promoting industry is interdependent on other industries and

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³ Assets.publishing.service.gov.uk. (2018). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/61152/Government-Construction-Strategy_0.pdf

hence has a higher rate of chance of failure. “Shedding light on the U.S data of census from 1989 to 2002 the average failure rate in the construction industry is almost 14% which is higher than other industries that sum up to only under 12 percent”⁴.

Contractor failure is a miserable and at times a pre-destined circumstance. “According to reports from Bizminer, an analysis of the industry showcased that out of 850,029 contractors operating in the construction industry in 2004 only 649,602 prospered by 2006 which equivalents to a 23.6% failure rate. It also states that companies that had a lifespan of less than a year had an even higher failure rate of 36.8%”⁵.

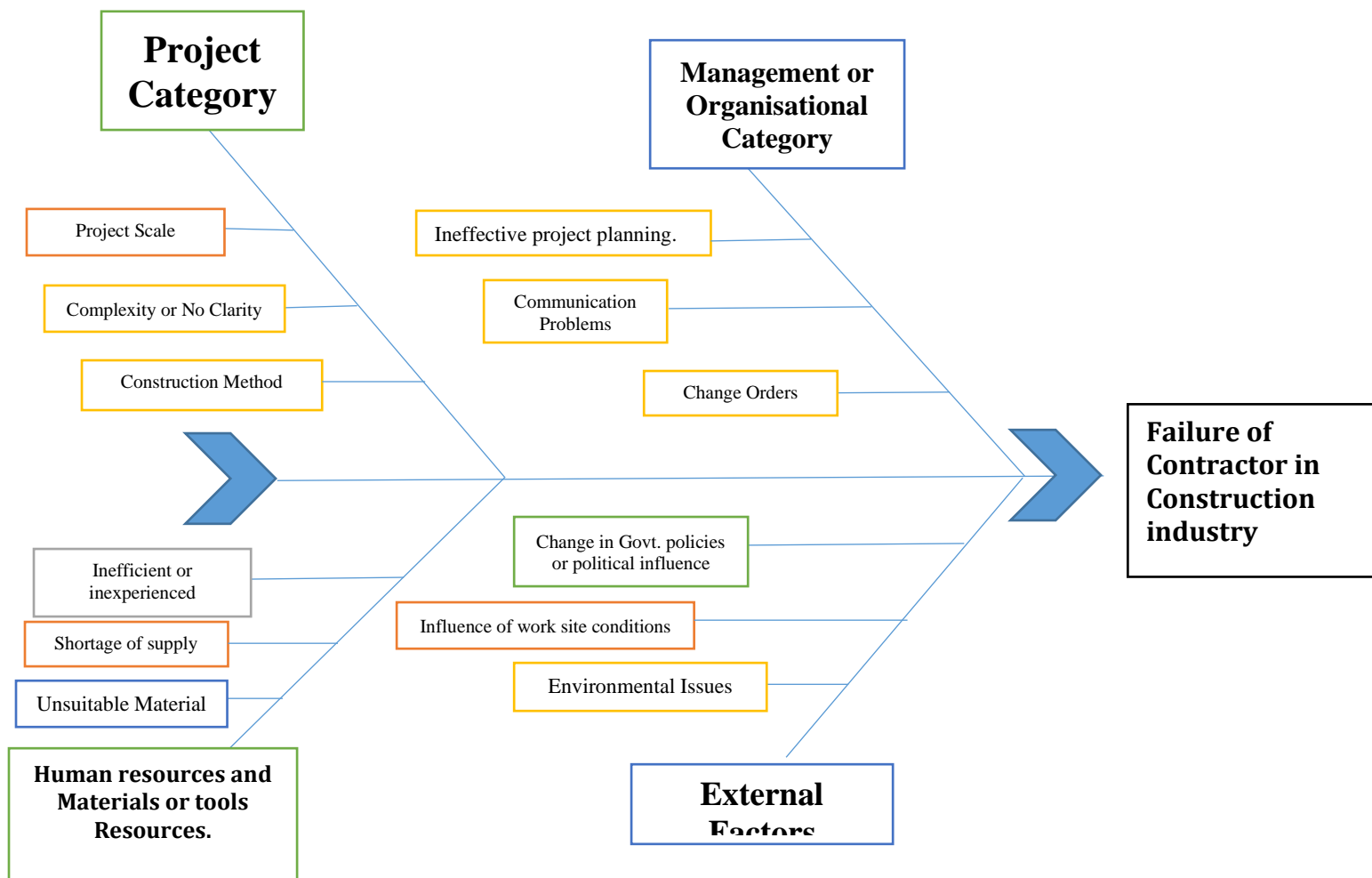


Figure 1. Fish bone diagram of root cause analysis of Failure of Contractors in the construction industry⁶

⁴ Anon, (2018): <https://www.census.gov/const/www/cci/frames.html>

⁵ Bizminer.com. (2018): <http://www.bizminer.com/reports/samples/industry-financial.pdf>

⁶ By Author, with reference to Robles, G., A. Stifi, José L, Gentes, S., & Tienda, P. (2014). Labor Productivity in the Construction Industry -Factors Influencing the Spanish Construction Labor Productivity.

We can infer from the fishbone diagram the reasons that contractors fail are due to firstly ineffective and inefficient project planning that lacks a good business plan which covers the finance, marketing and development aspects of a company. It also includes not assessing or considering all the risks that may arise during the course of a contract. The absence of such plans can lead to an inability to withhold and forecast developments or changes that can be external or internal. Secondly, strong factors that come from the client side such as change orders in the project which makes it hard for the contractors to adapt accordingly and contain the risks related. As well as to add, delays in validating funds and documental signatures which expands the scope of time. Thirdly, inappropriate accounting which is a major factor that is required to support any project and is the engine which runs the project. Lastly, external factors such as government policy changes or character issues of the contract such as no management plan for the transition of posts in the case of a death or disability of a member.

When contractors fail, in the scenario of an un-bonded project, the construction project owner or lender pays while as in the case of a bonded project, the surety industry jumps in and takes action and pays for completing the project. “According to reports from Surety and Fidelity Association of America (SFAA) it has been stated that Sureties have settled more than \$ 10 billion on contract bond claims since 1992”⁷. Surety bond ensures financial security and assurance of completion of construction to project owners by making sure if the contractors are well efficient of carrying out the work and conduct their duties as per the standards. Surety industry has been well positioned to investigate and overlook the dangers associated with contractors because of their close connections. They work in close proximity with contractors to draft the important documents that should meet the prequalification process led by them. During this phase, the surety confirms the contractor’s capability to fulfill the financial commitments with respect to the contractor’s ongoing projects and commitments. “The expansion of the private construction market demonstrates that the promotional and educational efforts on behalf of the industry have raised awareness on the benefits of the surety bonds and have shown others what we, in the industry, have known for years: that bonding protects said “⁸ Mr. Ross Fisher (Chair of the Surety and Fidelity Association of America and Vice President of specialty commercial at Hartford) .

Project management as defined in Max Wideman Glossary is “planning, scheduling and controlling of project activities to achieve performance, cost and time objectives for a given scope of work while using resources efficiently and effectively”⁹. The key features of a construction project are complexity, interdependency and large interpersonal interaction. However large or small scale projects may be, they require scrupulous planning, right allocation of resources and a check over the production process involved in the sequential stages of a

⁷ Suretyinfo.org. (2018). *Why Contractors Fail*. <https://suretyinfo.org/pdf/WhyContractorsFailMCS.pdf>

⁸ The Surety & Fidelity Association of America. (n.d.). Statistical Information - The Surety & Fidelity Association of America (SFAA). Retrieved from <https://www.surety.org/page/StatisticalPublic>

⁹ Wideman, R. (2018). *Wideman Comparative Glossary of Project Management Terms*.

http://www.maxwideman.com/pmglossary/PMG_PI6.htm#Project%20Management%20System

project. Walker (1996:5) defined the connection between management and an organization to a construction project as following, “an organization can be said to be a pattern of interrelationships, authority and responsibility that is established between the contributors to achieve the construction; client’s objective management is the dynamic input that makes the organization work”¹⁰. According to the Guild of Project Control “KPMG and different investigations are revealing to us that OWNERS are not content with contractual workers and see regions for upgrades, look into demonstrates that the CONTRACTORS are doing likewise falling flat with disturbing recurrence. Research supported and distributed by the Surety Information Office (SIO) www.sio.org, National Association of Surety Bond Producers (NASBP) www.nasbp.org and the Surety and Fidelity Association of America (SFAA) www.surety.org in 2014 demonstrated exactly how RISKY the contracting business is for contractual workers. The figure beneath demonstrates the contractual worker failure rates over a time span of 2011 and 2013 increased from 20% to 29%. Also, it is almost certain that these rates apply not exclusively to the USA however to different nations too”¹¹. Construction projects can be represented as a system which can be broken down into subsystems that consists of resources such as people, organization, information and other components. According to the Guild of project controls compendium “the system can be defined as a portfolio of assets and can be classified into 5 major types of assets as inferred”¹² :

- **Information Assets**
- **Human Assets**
- **Physical Assets**
- **Financial Assets**
- **Intangible Assets**

The next step aims to integrate and coordinate the activities across the system and subsystems to achieve smooth and efficient performance. “Ackoff defined a system as an entity, conceptual or physical that consists of interdependence parts. Each of a system element is connected to every other element directly or indirectly and no sub-set of elements is unrelated to any other sub-set”¹³. Construction industry being such a vast and interlinked system in order to prosper, requires exceptional project management skill set to be applied and showcased.

¹⁰ Uher, T. and Loosemore, M. (2018).

https://books.google.co.uk/books?hl=fr&lr=&id=BNVOAaPw6qMC&oi=fnd&pg=PR6&dq=essentials+of+project+management+in+contracting+industry&ots=sDneEGH1IV&sig=i0DeZ7sDOj_o86fB0l2mO18EAS8#v=onepage&q&f=false

¹¹ Planningplanet.com. (2018). *GUILD OF PROJECT CONTROLS COMPENDIUM*

<http://www.planningplanet.com/guild/gpccar/introduction-to-managing-project-controls>

¹² Planningplanet.com. (2018). *GUILD OF PROJECT CONTROLS COMPENDIUM*

<http://www.planningplanet.com/guild/gpccar/introduction-to-managing-project-controls>

¹³ Uher, T. and Loosemore, M. (2018). *Essentials of Construction Project Management*.

“Project Delivery is a comprehensive process including planning, design and construction required to execute and complete a building facility or other type of project. Choosing a project delivery method is one of the fundamental decisions owners make while developing their acquisition strategy. Determining the project delivery method is one of the most important decisions made by every owner embarking on a construction project.

Choosing the best method for any project must start with a good understanding of the choices available. Owners must also have a firm grasp of the impact of each choice, because the delivery method establishes when parties become engaged; it influences the choices of contractual relationships; and it influences ownership and impact of changes and modification of project costs. It is important to choose a delivery method that best meets the unique needs of each owner and their project”¹⁴.

METHODOLOGY

Problem Statement

The purpose of this paper is to analyze and answer the following questions:

- What are the reasons for the failure of contractors in the construction industry?
- Analyze and assess between the different project delivery methods to arrive at a conclusion to find the best method that can enhance the chance of success of contractors.

“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. 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”¹⁵.

Feasible Alternatives and Attributes

From the wide range of project delivery methods, we are going to compare and analyze the best technique to provide contractor success with reference to the articles that were published

https://books.google.co.uk/books?hl=fr&lr=&id=BNVOAaPw6qMC&oi=fnd&pg=PR6&dq=essentials+of+project+management+in+contracting+industry&ots=sDneEGH1IV&sig=i0DeZ7sDOj_o86fB0l2mO18EAS8#v=onepage&q&f=false

¹⁴ Dbia.org. (2018).

<https://dbia.org/wp-content/uploads/2018/05/Primers-Choosing-Delivery-Method.pdf>

¹⁵ Mahdi, I. M., & Alreshaid, K. (2005, October 7). Decision support system for selecting the proper project delivery method using analytical hierarchy process (AHP). Retrieved from <https://www.sciencedirect.com/science/article/abs/pii/S0263786305000608>

by Design Build Institute of America and Construction Productivity blog. In this paper we are going to analyze the eight different delivery methods¹⁶:

- Design-Bid-Build method
- Design-Build method
- Construction management at risk method
- Bridging Design Build method
- Bridging Construction Management at risk method
- Multi-Prime method¹⁷
- Integrated Project delivery method
- Construction management Agency method

| | Owner Assumes Most Risks | Owner and Contractor Share Risks | | | | | | Contractor Assumes Most Risks | | |
|--|--------------------------|----------------------------------|------|------|----|----|------|-------------------------------|--------|-----|
| Contract TYPES | CPCC | CPFF | CPAF | CPIF | CS | CR | FPIF | FPUP | FP/EPA | FFP |
| Project Delivery METHODS | | | | | | | | | | |
| Design>Bid>Build (Traditional Firm Fixed Price) 1 | | | | | | | ✓ | ✓ | ✓ | ✓ |
| Design>Build (Also known as Engineer, Procure, Construct (EPC)) 2 | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| Bridging Design>Build 3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Construction Management @ Risk (CM) 4 | | | | | | | ✓ | ✓ | ✓ | ✓ |
| Bridging CM @ Risk 5 | | | | | | | ✓ | ✓ | ✓ | ✓ |
| Construction Management Agency 6 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Integrated Project Delivery (IPD) 7 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | |

Fig.2 “Various types of project delivery method ranked in order of their application according to *GUILD OF PROJECT CONTROLS COMPENDIUM*”¹⁸.

¹⁶ Planningplanet.com. (2018). *GUILD OF PROJECT CONTROLS COMPENDIUM*: <http://www.planningplanet.com/guild/gpccar/managing-contracts-select-project-delivery-method-contract-type>

¹⁷ PlanGrid Construction Productivity Blog. (2018). *The Ultimate Guide to Choosing the Best Project Delivery Method*. <https://blog.plangrid.com/2018/03/the-ultimate-guide-to-choosing-the-best-project-delivery-method/>

¹⁸ Planningplanet.com. (2018). *GUILD OF PROJECT CONTROLS COMPENDIUM*: <http://www.planningplanet.com/guild/gpccar/managing-contracts-select-project-delivery-method-contract-type>

Development of Feasible alternatives

Firstly, the design bid build model (DBB) method which is a traditional and commonly used methodology. To begin with, the owner selects an architect who designs the project prior to the selection of a contractor. Once the bid is won, following the submittal of the contractors the build phase commences. In such type of methodology, the architect and the contractor work individually for the owner and there is no prior interaction between the both which may lead to change orders or delays in future since there is no level of collaboration. Also the owner takes responsibility in such a case since the owner authorizes the plan of the architect. DBB but benefits on the cost upfront during the initial stage and the owner has opportunities to provide inputs since the owner work directly with the architect.

Secondly, the design build method (DB) which has been gaining attention and momentum and rising to be one of the most popular project delivery method. In this type of methodology the owner forms one contract and the design and build phases are taken care of by the same firm which maximizes efficiency by reducing the number of change orders and hence reducing the cost. Also promotes project delivery at a faster rate. Changes can be screened and executed quicker in this sort of methodology.

Thirdly construction management at risk method (CRM). It is used when the owner requires an overall estimate of the project and a well-defined completion date. In this type of methodology the owner assigns a CMR manager who plays the role of a consultant and oversees the work of the subcontractors. Like DBB the owner works closely with both the CMR manager and the designer, if done right and early it can reduce change orders and quicken the project delivery process. Still the owner plays a major role in this method and dissimilarities can lead to delay in schedule, increasing cost, etc.

Fourthly, the Multi-Prime method (MP) which categorizes a project into three phases i.e. Design, engineering and construction. The owner has separate contracts with each phase professionals heading that phase. The owner has majority control in such methodology and must act as one's own general contractor to keep all the prime contractors coordinated. This is one of the major drawback also of this methodology since lack of communication or improper coordination may lead to omission on orders or haphazardness.

Fifthly, Bridging Construction management at risk method retains all the benefits of the owner and helps improve the control of the owner in other aspects. It gives the owner a chance to make a fixed price and hence enforcing a more fixed price which reduces the chance of contractors to pursue change orders or to work within a particular budget. Reduces owner's exposure to disputes post construction and flaws due to design or construction.

Sixthly, construction management agency method it is the basic idea that emerged in the earlier stages and was basically the construction management method where a construction management is hired and paid a fee for each particular stages and they act as representatives to

the owner. They make advices to the owner and helps in the go or no-go decision. They do not come into a contract and only provides the required pieces of advice and is not accountable for the budget and scheduling of the project.

Seventhly, the bridging method which focuses primarily on protecting owner interests. The final design and responsibility of construction is held by the contractor which minimizes the risk of the owner again. The contractor provides with an overall estimate of the designs and the cost and this is kept fixed throughout the project. Which leverages the power of contractors to make change orders further in the project. It is a method which highly safeguards the interest of the owner.

Lastly, the integrated project delivery method (IPD) which is one of the upcoming techniques applied in the construction industry which emphasizes on teamwork and collaboration. It aims at equal distribution of risk, responsibilities and liabilities among various stakeholders involved in the construction industry. IPD can be integrated with lean management to reduce waste and increase cost savings. The owner contractor and the designer all are linked by one contract. IPD can be challenging since it is just budding and is time-consuming at the beginning to get the consent of all the stakeholders to form a contract as well as pose a threat whether all the team members are going to work in coordination or well together.

Selection of criteria

In this paper we are going to assess the different responses with respect to the multi-attribute decision making process (MADM). This decision-making process helps us to take into consideration the factors that can distinguish and help us rank the different responses from a sequence of best to worst .In order to compare and rank the alternatives, we are going to consider the following attributes on the basis of the article provided by DBIA¹⁹ and The Guild COMPENDIUM and REFERENCE (CaR)²⁰ that are:

1. Owner's control- which refers to the proximity of control that is possessed by the owner on a particular project delivery method
2. Project coordination control- refers to the coordination between the different team members involved in the project and how efficient the coordination is.
3. Project budget control-refers to the extent to which the project budget is under control and doesn't exceed the initial cost estimates.

¹⁹ Dbia.org. (2018).

<https://dbia.org/wp-content/uploads/2018/05/Primers-Choosing-Delivery-Method.pdf>

²⁰ Planningplanet.com. (2018). *GUILD OF PROJECT CONTROLS COMPENDIUM*:

<http://www.planningplanet.com/guild/gpccar/managing-contracts-select-project-delivery-method-contract-type>

4. Project schedule control - similarly refers to the extent to which the project is on track.

5. Owner's risk - refers to the amount or share of risk the project delivery method pose towards the owner.

6. Contractor risk – refers to the amount or share of risk the project delivery method pose towards the contractor.

7. Engineer Decision Power, according to FIDIC - characterizes an individual of three fundamental jobs and duties. From which it very well may be distinguished that the Engineer assumes a fundamental job in the agreement, yet it can't go past the Employer's capacity. Despite what might be expected, the Contractor must pursue the directions of both the Employer and the Engineer.

8. Architect Decision Power, according to AIA - aims to make a reasonable situation for all members in the development venture. The AIA endeavors to adjust those interests through a sensible allocation of dangers and obligations that is considered the best for the project. The architect preferentially has the upper hands to take decision.

9. Project Manager Decision Power, according to the Consensus Docs, has in excess of 80 contracts and structures to address an assortment of project conveyance strategies. It is adjusted for good execution of the venture instead of any one party. The ideas in the Consensus Docs are entirely different from other contract archives, which may prompt the misconception of the agreement. Furthermore, this is the main contract putting the Owner and the Contractor in an equivalent position. The project manager has an upper hand in the decision making process. These attributes have been selected with reference to DBIA "Choosing a project delivery method"²¹ and also the Guild COMPENDIUM and REFERENCE (CaR)²² since it concludes to provide a clear evaluation when taking into consideration these attributes. The above attributes take into consideration almost all the areas of a project for choosing the apt project delivery method.

²¹ Dbia.org. (2018)

<https://dbia.org/wp-content/uploads/2018/05/Primers-Choosing-Delivery-Method.pdf>

²² Planningplanet.com. (2018). *GUILD OF PROJECT CONTROLS COMPENDIUM*:

<http://www.planningplanet.com/guild/gpccar/managing-contracts-select-project-delivery-method-contract-type>

| Factors \ Alternatives | Owner Control. | Project coordination Control. | Project Budget Control. | Project Schedule Control. | Owner Risk. | Contractor risk | Engineer Decision Power | Architect Decision Power | Project Manager Decision Power |
|---|----------------|-------------------------------|-------------------------|---------------------------|-------------|-----------------|-------------------------|--------------------------|--------------------------------|
| Design Bid Build (DBB) | High | Low | Medium | Medium | Medium | Low | High | High | Low |
| Design Build (DB) | High | High | Medium | High | Medium | Low | Low | Medium | High |
| Construction Management at Risk (CMR) | Low | Medium | Medium | Medium | Low | Medium | Least | Low | High |
| Multi-Prime (MP) | High | Low | Medium | Low | Medium | Low | Medium | Medium | Medium |
| Bridging Construction management at risk method | Low | Medium | Medium | Medium | Low | Medium | Medium | Medium | Medium |
| Construction Management agency Method | Medium | Low | Low | Low | Low | Medium | Low | Medium | High |
| Bridging Method | High | Medium | Medium | Medium | Least | Medium | Low | Low | High |
| Integrated Project Delivery (IPD) | High | Medium | Medium | Medium | Low | Medium | Medium | Medium | Medium |

Figure 3. Qualitative Analysis²³

By aligning, the various Alternatives and the attributes using a MADM decision table we can arrive at an outlook of the overall characteristics of each alternative against the attributes.

The boxes are color coded with Red, Green, Orange and yellow where red shows the least severity, orange shows low severity, yellow shows medium severity and green shows high severity.

²³ By author

FINDINGS

Analysis and comparison of the alternatives

Further to the attributes, each response was graded as follows: - 0 (meaning least severity), 0.25 (meaning low severity), 0.5 (meaning medium severity) and 1 (meaning high severity) and the sum of each factors were added up to a total to arrive at the best to worst project delivery method. The boxes are color coded Green to portray a positive effect, Yellow shows neutral effect, Orange shows a little lesser effect than neutral and Red shows completely negative effect.

| Factors Alternatives | Owner Control. | Project coordination Control. | Project Budget Control. | Project Schedule Control. | Owner Risk. | Contractor risk | Engineer Decision Power | Architect Decision Power | Project Manager Decision Power | Total |
|---|----------------|-------------------------------|-------------------------|---------------------------|-------------|-----------------|-------------------------|--------------------------|--------------------------------|-------|
| Design Bid Build (DBB) | 1 | 0.25 | 0.5 | 0.5 | 0.5 | 0.25 | 1 | 1 | 0.25 | 5.25 |
| Design Build (DB) | 1 | 1 | 0.5 | 1 | 0.5 | 0.25 | 0.25 | 0.5 | 1 | 6 |
| Construction Management at Risk (CMR) | 0.25 | 0.5 | 0.25 | 0.5 | 0.25 | 0.5 | 0 | 0.25 | 1 | 3.5 |
| Multi-Prime (MP) | 1 | 0.25 | 0.5 | 0.25 | 0.5 | 0.25 | 0.5 | 0.5 | 0.5 | 4.25 |
| Bridging Construction management at risk method | 0.25 | 0.5 | 0.5 | 0.5 | 0.25 | 0.5 | 0.5 | 0.5 | 0.5 | 4 |
| Construction Management agency Method | 0.5 | 0.25 | 0.25 | 0.25 | 0.25 | 0.5 | 0.25 | 0.5 | 1 | 3.75 |
| Bridging Method | 1 | 0.5 | 0.5 | 0.5 | 0 | 0.5 | 0.25 | 0.25 | 1 | 4.5 |
| Integrated Project Delivery (IPD) | 1 | 0.5 | 0.5 | 0.5 | 0.25 | 0.5 | 0.5 | 0.5 | 0.5 | 4.75 |

Fig 4. Multi-attribute decision making model with attributes and the factors²⁴.

²⁴ By Author

We can infer from the above table that the design build method has been ranked the highest and the construction management at risk the least. We are going to neglect all those methods that were ranked under a score 4.75 to arrive at a decision to choose the best project delivery method. For the next step we are going to consider the three best alternatives that are DB, DBB and IPD.

From the MADM table we can arrive at the three best alternatives that can be implemented. Alternative 1 (Design bid build) , Alternative 2 (Design Build) and Alternative 8 (Integrated Project Delivery) Between the three alternatives we need to arrive at the best alternative that can be used and in order to do this we use the normalized weight chart table and we obtain as following :

| Attribute | STEP 1 | STEP 2 | | ALTERNATIVE 1 | | ALTERNATIVE 2 | | ALTERNATIVE 8 | | |
|-------------------------------|---------------|-----------------------|-----|---------------|------------|---------------|---------|---------------|---------|--------|
| | Relative Rank | Normalized Weight (A) | | (B) | (A)x(B) | (C) | (A)x(C) | D | (A)x(D) | |
| Owner Control. | 1 | 1/45 | SUM | 0.022 | 1 | 0.022 | 1 | 0.022 | 1 | 0.022 |
| Project Coordination Control. | 6 | 6/45 | | 0.133 | 0.25 | 0.033 | 1 | 0.133 | 0.5 | 0.0665 |
| Project Budget Control. | 5 | 5/45 | | 0.11 | 0.5 | 0.055 | 0.5 | 0.055 | 0.5 | 0.055 |
| Project Schedule Control. | 4 | 4/45 | | 0.089 | 0.5 | 0.0445 | 1 | 0.089 | 0.5 | 0.0445 |
| Owner Risk. | 2 | 2/45 | | 0.044 | 0.5 | 0.022 | 0.5 | 0.022 | 0.25 | 0.011 |
| Contractor risk | 3 | 3/45 | | 0.067 | 0.25 | 0.0167 | 0.25 | 0.0167 | 0.5 | 0.0335 |
| FIDIC | 9 | 9/45 | | 0.2 | 1 | 0.2 | 0.25 | 0.05 | 0.5 | 0.1 |
| AIA | 8 | 8/45 | | 0.178 | 1 | 0.178 | 0.5 | 0.089 | 0.5 | 0.089 |
| Consensus Doc | 7 | 7/45 | | 0.156 | 0.25 | 0.039 | 1 | 0.156 | 0.5 | 0.078 |
| SUM | 45 | | | 1 | SUM | 0.6102 | | 0.6327 | | 0.5 |

Figure 5: Additive Weighting Technique²⁵

²⁵ By author

Selection of the preferred alternative

In the figure above, the attributes have been relatively ranked on the basis of importance for project success with respect to contractors. From the MADM table, we can arrive at the following calculation:

Sum of Alternative 2 / Sum of Alternative 1 = $(6/5.25)*100 = 114.28\%$ which means that alternative 2 is 114.28% better than Alternative 1. And hence also proved better than Alternative 8 since the sum of Alternative 8 is less than sum of Alternative 1.

We can infer from the Normalized weight table calculations that:

Sum of Alternative 2 / Sum of Alternative 1 = $(0.63/0.61)*100=103.27\%$. Again with respect to this analysis we find that Alternative 2 is better than Alternative 1. And also we can infer that Sum of Alternative 1 / Sum of Alternative 8.

= $(0.61/0.5)*100=122\%$ which means that Alternative 1 is better than Alternative 8.

Hence, we can conclude after analyzing from both the tables (analysis methods) that Alternative 2 turns out to be the best method or Alternative that must be more frequently used for delivering project success.

Performance monitoring and post-evaluation of results

Hence, we have come to the conclusion that Alternative 2 is the best option “considering the analysis between the project delivery methods “to promote project success. In order to track and evaluate the performance of this solution, different approaches exist:

- Firstly, comparing the project delivery success ratios between the one that is suggested by us and the other methods.
- Secondly, comparing the project time controls, coordination control between the suggested alternative and the other alternatives that exists.
- Thirdly, performing a Before-After Pareto Analysis which can highlight the solutions positive impact. Whereby we will have a clear picture on why the suggested method is a better fit for project success.

CONCLUSION

Construction is an ever growing industry that is vast and wide spread. Contractors in the construction industry is constantly thriving for project success even with various risks coming their way. In this paper we have analyzed between the different project delivery methods that

can benefit or bring harm to the contractors or owners. There are different project delivery methods that can be used which varies from one another. We have analyzed these methods to arrive at a conclusion to find the best fit for delivering project success by the contractors. Design build methodology gives the contractor more control over the project which allows them to take decisions more competitively and at the same time it also reduces the risk factor upon them by sharing it directly with the owner. We were also able to arrive at a conclusion that this methodology also helps in keeping the project within schedule and budget at the same time compared to other methodologies. Hence, Contractors must inculcate such a methodology in the construction industry projects to increase the chances of success of the project.

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