

Construction Partnering on Alternative Project Delivery Methods: A Case Study of Construction Manager/General Contractor Partnered Transportation Projects

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ABSTRACT

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Since its adoption by the transportation sector in the early 1990s, partnering has been broadly used with the traditional delivery method by many agencies with significant reported benefits. During the same era, a number of transportation agencies (DOTs) started experimenting with a wide variety of alternative project delivery methods (APDMs) aimed at improving the delivery of highway construction projects. The effect of collaborative working strategies such as partnering, together with the APDMs have become somehow interrelated posing a potential challenge on how to effectively integrate partnering as a concept in the APDMs. The salient question has been if the collaborative nature of these APDMs has affected how partnering is being used by state DOTs. Through an extensive literature review, analysis of 32 CMGC RFPs/RFQs and review of three CMGC case studies, the study found that there is limited information in state DOT documents that show procedures on the usage of partnering with CMGC projects. Majority of DOTs are relying on the inherent nature of the CMGC contract to promote healthy collaborative practices and there is the need to consider partnering during preconstruction and construction separately to cater for any personnel change over. The study also revealed that partnering may become less important at the construction phase due to overlap between partnering and CMGC practices. In support of this finding, a CMGC partnering model was developed that can be adopted by DOTs. This paper contributes to both research and practice by expanding the existing knowledge on partnering on APDMs.

Keywords: Partnering, Construction manager/general contractor, Alternative project delivery methods, Transportation

INTRODUCTION

Construction partnering, whether formal or informal, is an exercise in delivering shared project goals through building relationships of mutual trust [2]. The partnering concept became necessary in the construction industry as stakeholders looked for more collaborative ways of working [24]. In the past two decades, state Departments of Transportation (DOTs) and public sector transportation agencies turned to a nonbinding form of partnering to improve the adversarial atmosphere in which most public projects were delivered in a low bid design-bid-build (DBB) procurement [15]. With everyone “fed up” with the litigious nature of the industry, partnering represented



an opportunity for owners, designers, contractors, subcontractors, and suppliers to maximize their individual abilities in a synergistic arena [24]. Partnering aligns each party's business objectives by utilizing team-building tools and fostering an early understanding of the specific challenges of the project. After two decades of use, the results of partnering have generally been positive [1].

Beginning in the 1990s, state DOTs also realized the need to accelerate project delivery due to the increased deterioration of the highway system and began experimenting with alternative project delivery methods (APDMs) [20]. The aim was to meet aggressive schedules and improve project performance by increasing the level of integration and collaboration between the owner, the designer, and the contractor [20]. APDMs are widely used by transportation agencies today. The fundamental principle of these APDMs, such as construction manager/general contractor (CMGC), is to improve project performance by bringing together all project parties early in the project and provide a collaborative environment for the project parties.

Both partnering and the APDMs improve efficiency and project performance through enhanced communication, coordination and collaboration among stakeholders. With the advent of these APDMs, the salient question has been whether the collaborative nature of the APDMs has affected how partnering is being used by state DOTs. In order to strike a balance between the two, Ernzen et al. [6] argued that there is a need to adjust the fundamental structure of partnering to accommodate the change in the contract brought about by the APDMs. A report by the American Association of State Highway and Transportation Officials (AASHTO) stipulated that in order to implement partnering in the APDMs, it requires a shift in institutional business culture, which can create discomfort among those who must deliver the project using the APDM for the first time. Further, the report also revealed that a number of state DOTs including North Dakota and Oregon stopped using formal partnering after implementing it because they failed to make a compelling business case for the invested resources and time. However, some of these state DOTs have institutionalized the principles of partnering as routine business practices [1].

As APDMs inherently increase project integration and collaboration, partnering can provide a forum in which this alignment of goals can be achieved. The integration of partnering in APDMs can also build teams within which good business relationships form the foundation from which crises can be averted or resolved, and the project can be delivered as planned [1]. It is, therefore, important for state DOTs to explore these benefits by developing effective strategies to successfully integrate partnering in the APDMs. Given that there are no empirical studies exploring the integration of partnering in transportation projects delivered by the APDMs, the aim of this study was to fill this gap by investigating the use of partnering on CMGC projects through a review of documents from state DOTs, Federal Highway Administration (FHWA), and data from CMGC case studies. A CMGC partnering model was also developed that can be used by DOTs to effectively and seamlessly integrate partnering in CMGC. The significance of this study is in expanding the knowledge on partnering and CMGC integration and providing empirical evidence on successful integration using real CMGC projects.

LITERATURE REVIEW

Partnering in the Transportation Industry

Partnering has been defined differently depending on the industry. However, in construction, the concept of partnering is described as a generic term of management approach to align project goals [3]. In transportation, the definitions from the Arizona Department of Transportation (AzDOT) and Ohio Department of Transportation (OhDOT) can be synthesized as an orchestrated collaborative teamwork by all stakeholders to establish an environment of mutual trust, open communication, cooperation and teamwork in achieving the mutually agreed upon goals and objectives [4, 21]. A simple review of these and other definitions and descriptions of partnering reveal certain common essential characteristics: shared interests, mutual goals, commitment, teamwork, trust, problem solving, and a synergistic relationship.

Traditional partnering became firmly established in the United States in the 1990s and it has been broadly used by many state and federal agencies with significant reported benefits [16]. A study by Gransberg et al. [14] on partnering with data from more than 400 Texas Department of Transportation (TxDOT) projects revealed that partnered projects outperformed non-partnered projects in virtually every category if they were awarded at a price above \$5 million. Another study conducted by Rogge et al. [22] for the Oregon Department of Transportation (OrDOT) showed that respondents feel partnering improves communication, trust, and teamwork. Additionally, AASHTO [1] reported that state DOTs are using partnering to solve problems collaboratively, increase work efficiency, implement innovative products, provide services that exceed customer expectations, and manage project risks collaboratively. Thus, the significance of partnering is no longer in doubt. However, in order to reap the benefits of partnering, DOTs and state agencies need to evaluate their fundamental business practices to adapt to partnering's principles and assess if their members have embraced the values associated with partnering [1].

The performance of partnered projects can be measured either in terms of tangible or intangible attributes [17]. According to AASHTO [1], the business case for partnering has mostly been reliant on the quantitative tangible attributes such as cost, time, safety and quality. However, in their research, Kereri and Harper [18], identified eight intangible attributes commonly used by state DOTs in partnered projects. These include early involvement of key participants, joint decision making, jointly developed goals, advanced communication and information tools, pre-agreed conflict resolution, team building activities, and continuous workshopping [18].

Today, most state DOTs require implementation of partnering on construction projects in excess of \$10 million and optional for projects over \$1 million in value [16]. A study conducted by Rogge et al. [22] reported sixteen states use formal criteria for making decisions about whether partnering should be used on a specific project. Further, while partnering is optional on projects over \$1 million at the request of the contractor, for projects over \$25 million, a mandatory "Training in Partnering Concepts" session is given to both the State and the contractor. According to Hannon and Zhang [16], partnering general chain of events include: (1) the facilitator conducts a one-day training event or workshop for all project team members; (2) a date and location is then set for the 'formal'

partnering session or workshop and key stakeholders are invited where a project ‘Charter’ is the result/deliverable of the first session; (3) a schedule of ‘follow-up’ periodic partnering meetings, typically three – four months apart and with a duration of one-half day are created to assess the metrics of project goals originally stated in the Charter; and (4) a ‘Close-Out’ partnering session is scheduled and conducted for the purpose of reflection and documenting ‘lessons learned’.

Construction Manager/General Contractor Delivery Method

The CMGC project delivery method is fast becoming more popular in accelerating the delivery of highway projects [25]. CMGC is an integrated team approach consisting of the owner; the designer, who might be an in-house engineer; and the at-risk construction manager. The CMGC contract has two main phases: (1) preconstruction services and (2) construction [12]. Figure I illustrates the structure of the CMGC method with the two phases. The DOT hires the construction manager (CM) during the preconstruction phase and authorizes the CM to provide input during the project design. The CM generally assists in cost information, value engineering, risk management and constructability [13]. After design development or a substantial percentage (60% to 90%), the same CM becomes the general contractor (GC) and enters into a contract with the DOT to construct the project [11, 23].

The FHWA Every Day Counts program is encouraging state DOTs to adopt CMGC as a tool to deliver badly needed rapid renewal projects [25]. This is partly because apart from fast-tracking projects, the CMGC delivery method has several benefits, which include stakeholder integration and improvement of project performance. The CMGC method allows the DOTs to deliver projects that reduce costly change orders, decrease risk, optimize the construction schedule and minimize impact to the traveling public. The CMGC delivery method is being used for

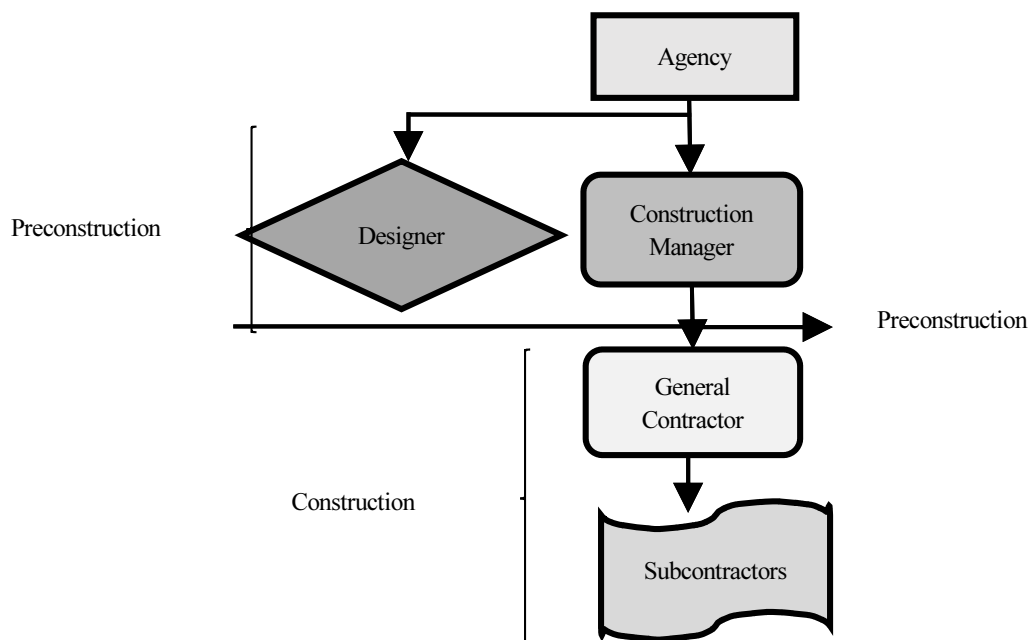


FIGURE I. CMGC STRUCTURE

transportation projects with sensitive schedules and potential constructability challenges that require special qualifications and extraordinary contractor cooperation, such as those in busy urban areas [9]. Other projects that are a good fit for the CMGC method are those that have public involvement or include right-of-way or utility issues that could affect the overall schedule.

Partnering in Construction Manager/General Contractor Delivery Method

The CMGC delivery method, by its design requires collaboration between the owner, design engineer, and the CM especially during the preconstruction phase [25]. This collaboration may form the basis for partnering. However, it is important to note that this collaboration may not be extended to the construction phase as the CM assumes the general contractor's position and hence reverts to a relationship seen in a typical traditional delivery system [1]. The argument has been made that since the CMGC contractor will be working closely with the designer and the owner during the preconstruction phase, there is no need for formal partnering as the nature of the contract is one that promotes healthy relationships and collaborative business practices [1]. While this may be true, those desirable outcomes do not happen automatically when the contracts are signed. To foster and continue partnering throughout the project, partnering must be consciously established and be part of the CMGC method.

The collaborative concept of CMGC includes early involvement of key participants selection as a team, joint decision making, early planning, open communication and information sharing, pre-agreed dispute resolution methods, and team building activities. All these form part of the formal partnering process providing the opportunity to establish it during the preconstruction phase of the CMGC method. The selection of the CMGC contractor is typically through best value selection, which removes the requirement to award to the lowest bidder [5]. This approach should set in motion the strategic relationships that will produce positive outcomes for both the DOT and contractor. Although partnering can be a voluntary system of working cooperatively, some DOTs such as OhDOT, OrDOT and Nevada Department of Transportation (NDOT) have embraced partnering as a way of doing business making prospective contractors aware of the use of partnering on the project through the request for qualifications or request for proposals (RFQs/RFPs) [4, 22]. With this expectation, both the contractor and DOT would avail themselves to the partnering requirements within CMGC.

According to AASHTO [1], partnering should be established during the preconstruction phase aimed at achieving the following objectives:

- A mutual understanding of the scope of the preconstruction services to be provided by the contractor.
- Establishing an agreed methodology for the contractor to furnish priced design alternatives as required by the owner and/or its designer during the design period.
- A design issue escalation ladder for resolving professional differences of opinion and conflicts between design preferences and constructability.
- Establishing the protocol for negotiating the final construction cost/GMP and, if applicable, the role of the

independent cost estimator during those negotiations.

- Setting the ground rules for contingency ownership and management during both preconstruction and construction.

The quality of the relationships developed during preconstruction will determine the required level of partnering intensity necessary during the construction phase. However, to sustain the partnership spirit through the construction phase, it is recommended that a second partnering effort should be made before the start of construction [1].

RESEARCH METHODOLOGY

The aim of this paper was to investigate the use of partnering in CMGC project delivery in transportation. In order to achieve this aim, a two-step methodology was used. First, an intensive systematic literature review was conducted using published articles and RFP/RFQ of CMGC transportation projects. Second, case study analysis was conducted on three CMGC projects.

Review of Literature and Solicitation Documents

The first step was to identify journals, conferences, databases and websites that may contain relevant material for this review. The search was conducted on databases such as ScienceOpen, SCOPUS, Google Scholar, and EBSCO. Keywords such as “partnering”, “construction manager/general contractor”, “construction manager at risk” and “collaboration” were used to identify articles from the databases. The search was further limited to only articles relevant to transportation. A total of 51 articles and CMGC reports were reviewed for this study.

Since this research is focused on transportation, 32 CMGC RFQ/RFPs from multiple DOTs including Ohio, Nevada, Texas, Colorado, California, Wisconsin, Arizona, Florida, Michigan, Minnesota, Oregon and Utah were collected and analyzed. The literature review was very important in this study because it provided a basis to understand the state of the art of practice of partnering with CMGC by the DOTs.

Case Studies

The second process was to collect data from three projects used as case studies in order to understand how partnering is being implemented in CMGC projects. Data from these projects was gathered through review of documents and interviews with project participants. The different parties from the owner (DOT), contractor, subcontractors, and consultants involved in these projects were contacted through emails and follow up phone calls to ask them of their willingness and availability to participate in the research. A total of 20 participants for case study 1, 18 for case study 2 and six for case study 3 responded to our emails and phone calls for their willingness to participate in the study. However, only 15 for project case study 1 and 13 for case study 2 could be reached for the interviews. Interviews were conducted over the phone for approximately 45-60 minutes. Interviews were conducted with participants using a structured questionnaire and they were required to respond to the questions based on their

experiences on the project and observations of meetings or events relevant to the project under study. Although the focus was more on intangible attributes of the projects, the questionnaire included questions that helped better understand the projects even from the tangible attributes. The questions were thus divided into the two main sections: (1) tangible attributes (general information, project information, cost factors, and time factors) and (2) intangible attributes. During the interviews, the participants were asked if they had more information regarding partnering that they could like to share. They were also asked to attach some partnering documents for more insights on the subject. The tangible data collected enabled the description of the case studies and analysis of their quantitative performance. Table I shows the three projects used in this research as case studies.

TABLE I. CASE STUDY PROJECTS

Project	Agency	Project cost	Cost Growth	Schedule	Time Growth
Case 1: Veterans Memorial Tunnel	CDOT	\$55 million	-5.56%	24 months	0.00%
Case 2: Pecos over I-70	CDOT	\$25.5 million	7.02%	12 months	-10.10%
Case 3: The Winona Bridge Rehabilitation	MnDOT	\$145.9 million	0.00	60 months	-12.5%

The cost growth and time growth metrics were calculated using equation (1) and equation (2) respectively;

$$\text{Cost growth} = \frac{(\text{Final contract amount}) - (\text{Original contract amount})}{(\text{Original contract amount})} \quad \text{Eq. (1)}$$

$$\text{Time growth} = \frac{(\text{Day charged}) - (\text{Total days allowed} + \text{Additional days granted})}{(\text{Total days allowed} + \text{Additional days granted})} \quad \text{Eq. (2)}$$

Where,

Days charged = Actual contract duration

Total days allowed = Original contract duration

Additional days granted = Number of days added by change order

Case Study 1 – Colorado DOT Veterans Memorial Tunnel

This Westbound I-70 twin tunnels project widened the westbound bore of the tunnel in Idaho Springs to about 53-feet. This widening was to accommodate a third lane on this highway. This project used partnering tools to enhance collaborative working relationships. A hired external facilitator was used to lead the partnering program. Initial partnering workshop was conducted for the Colorado Department of Transportation (CDOT) personnel and the CMGC contractor before the start of the project. Partnering follow-up sessions were also conducted after every six months. In addition, three partnering progress meetings were conducted. By using the CMGC project delivery method, key project participants were selected as a team and were involved early in the project. There was joint decision-making, financial transparency among key participants, use of collaborative multi-party agreements,

jointly developed goals, and intensified early planning. In addition, the team had pre-agreed dispute resolution methods and they were co-located and conducted team building activities.

Case Study 2 – Colorado DOT Pecos over I-70

This CMGC delivery project included replacing the existing poor bridge structure on Pecos Street over I-70 to improve traffic operations at the Pecos/I-70 interchanges. The project scope included replacing the Pecos structure, installing roundabout type intersections, and a pedestrian bridge structure that spanned the I-70. Although the project did not require formal partnering, a two-day partnering workshop was conducted where a project charter was signed by the CDOT and the contractor. The contractor was expected to adhere to all partnering requirements throughout the project. Partnering tools which are synonymous to CMGC were evident in this project. These include: early involvement of key participants, selection as a team, joint decision making, collaboration, joint decision making, intensified early planning, advanced communication and information sharing tools, pre-agreed dispute resolution methods, team building activities and co-location of team.

Case Study 3 – The Winona Bridge Rehabilitation

This project was Minnesota Department of Transportation (MnDOT)'s first CMGC project. The project consisted of the construction of a 450-foot main span bridge over a commercial navigational channel together with rehabilitating the existing bridge. It also consists of a deck level sidewalk, which is lit by LED accents that provide pedestrians with access across the Mississippi river which also serves as the river view. Through collaboration and partnering between the different parties involved in this project, there was a great reduction in the complexity of dealing with multiple parties within the project. Community participation, involvement and their feedback was easily incorporated into the project through partnering. Partnering also allowed for earlier engagement of all the parties in the project and through the CMGC engagement, risk was reduced.

FINDINGS AND DISCUSSIONS

The objective of this paper was to investigate the use of partnering on CMGC projects aimed at developing a partnering model that can be used by DOTs to effectively and seamlessly integrate partnering in CMGC. Through a review of documents from state DOTs, FHWA, and data from CMGC case studies, the following findings were noted and are discussed in the subsequent sub-sections.

Current State of CMGC and Partnering Practices

At the Federal level, CMGC is listed as one of the FHWA's Every-Day Counts programs that the agency is advocating for as an accelerated project delivery method based on innovation aimed at reducing project cost while enhancing safety and environmental protection [8]. The FHWA recognized the use of innovative contracting methods or what became commonly known as alternative contracting methods under Special Experimental Projects

No. 14 (SEP-14) [7, 8]. Furthermore, under SEP-14, FHWA required that state DOTs submit projects that they intend to undertake using alternative contracting methods for approvals. However, after the passage of Moving Ahead for Progress in the 21st Century Act (MAP-21), SEP-14 is no longer required by DOTs who intend to use CMGC project delivery method. In addition, the FHWA does not have any regulations that currently govern the use of CMGC delivery method [9, 19].

At the state level, there are efforts by individual states to recognize and incorporate CMGC as a project delivery method. This has either been institutionalized through legislation or just as an experiment. Through the review of literature and the CMGC documents, it was found that only 14 states have enabling legislation to use CMGC in their transportation projects. However, more states use CMGC under the SEP-14 where the FHWA allowed them to experiment with innovative contracting methods [8, 10]. In terms of partnering, there is limited information in state DOT documents that show procedures on the usage of partnering with CMGC projects. The 32 CMGC RFPs/RFOs analyzed showed that only five had required formal partnering. Therefore, it was important to focus on case studies where CMGC was used by DOTs in order to analyze the partnering efforts employed and ascertain the necessity of using partnering with CMGC projects. In doing so, it will be easier to make a strong business case on the worthiness of using partnering in CMGC projects.

The low number of DOTs that require partnering in CMGC projects largely suggests that more state DOTs are relying on the inherent nature of the CMGC contract to promote healthy relationships and collaborative business practices as a result of the CMGC contractor working closely with the designer and the DOT during the preconstruction phase. However, according to AASHTO [1] the collaborative nature may not automatically produce the desired outcomes if partnering is not consciously established. This assertion by AASHTO [1] points to the need for a structured means of managing and directing CMGC partnered projects.

Generally, this research has revealed that partnering in CMGC project delivery method has two main phases; preconstruction and construction. These two main phases are essential in establishing partnering agreements between the different parties involved. In addition, it was revealed from the case studies that in some instances, there is personnel change over between these two phases as some personnel leave the project after preconstruction and new ones come in at the construction phase. This could hamper the progress and intensity of partnering during the construction phase. This is consistent with the findings of AASHTO. However, the findings of this research further revealed the dwindling fortunes of partnering efforts in CMGC partnered projects as the construction project progresses.

Table II shows the comparison of partnering attributes to CMGC attributes as a project delivery method for the three case studies. The analysis shows that there is an overlap between CMGC characteristics and partnering attributes. The difference is that CMGC is a project delivery method that involves procurement and key parties early on in the project. This involves two separate contracts where the first contract targets the construction manager's input during preconstruction phase while the second one is on construction after completion of design and preparation of construction documents [10, 11]. Furthermore, in CMGC delivery method, parties are selected

based on qualifications, past experience or through best value procedures [11]. By its very nature then, it shows that the preconstruction phase may be more fragmented and there is a need for the team to create and foster better working relationships at the very start of the project. However, as the project progresses into the construction phase, more CMGC characteristics that foster relationships and close working relationships become more important.

TABLE II. COMPARING CMGC AS A PDM AND PARTNERING STRATEGIES/ATTRIBUTES FOR EACH CASE

Strategy	Attributes	Case 1	Case 2	Case 3
Partnering	Early Involvement of Key Participants	x	x	
	Joint Decision Making	x	x	x
	Jointly Developed Goals	x	x	x
	Advanced Communication and Information Tools	x	x	
	Pre-Agreed Conflict Resolution	x	x	x
	Team Building Activities	x	x	x
	External Team Building Expertise	x	x	
	Continuous Workshoping	x	x	
	CMGC as a PDM	Two contracts (architect/engineer and contractor)	x	x
CM selected based on qualifications and fees		x	x	x
Some of the construction risks transferred to the GC		x	x	x
Open book costing strategy		x	x	x
Cost of the project is flexible				x
Subcontractors are reassigned to the CM		x	x	x
Risks can push the CM not to act as owner’s agent				
Contractor is involved early in the project	x	x	x	

“x” represents the application of such a strategy in given project.

Preconstruction Partnering

During preconstruction, the owner can either utilize an in-house or external design team. Whichever the case, both scenarios provide a platform through which a partnering effort is required in order to create collaborative working relationships. From the case studies, it was revealed that, for public projects, DOT personnel usually are not bound under any contract to perform within the project and in most cases, they work on multiple projects at the same time. Therefore, it is important that DOTs hold an internal meeting with the prospective personnel to be involved in the CMGC project if they intend to utilize an in-house design team prior to a preconstruction partnering meeting.

A review of DOT partnering documents in addition to the case studies revealed that a meeting between the DOT staff prior to the initial partnering is essential in setting the tone and the framework for any conflicts between the CMGC project and other projects that they may be handling. Both California and Utah who have successfully delivered CMGC projects have recommended that this meeting with internal staff and design team is essential whether it is in a form of a formal or informal partnering. In general, whether with in-house or external design team, preconstruction partnering also need to include other project parties including the CMGC contractor and the owner

(DOT) or owner's representative. It is expected that in this initial partnering meeting, the expectations of the project design are discussed as well as achievements, the role of the contractor during preconstruction and the approach that will be taken to interface with the CMGC's preconstruction staff.

Construction Partnering

During the construction phase, partnering is essentially used to bring on board those parties that were not part of the preconstruction partnering as well as continued partnering spirit. Typically, the parties that will be involved in the construction partnering include:

- Owner's Organization personnel which include; resident and/or project engineers and/or its inspectors, construction quality assurance personnel, safety personnel, contract administration, and operations personnel.
- Design team which include; construction administration and quality oversight personnel.
- CMGC Contractor personnel which include; construction project manager, superintendent, quality assurance, safety personnel, contract administration and logistics personnel, and key subcontractors.

The study revealed that partnering may become less important as the project progresses into the construction phase especially where there are not much personnel change over from key project parties. This is because there is an overlap between partnering attributes and CMGC characteristics which render partnering redundant and thus becomes very difficult to build a strong business case at this point. When transitioning from preconstruction to construction phase in a CMGC delivered project, there is a need to assess the personnel change over. If there is a significant change in the personnel, then the project parties will have to revise the partnering charter to accommodate the new personnel and involve them for the continuity of the partnering efforts.

The quality of relationships at this phase will depend on the quality of relationships formed during preconstruction phase as well as the personnel change over. The findings reveal that the number of personnel at this phase that did not participate in the preconstruction partnering will dictate the intensity of partnering. It is, therefore, essential that continuous partnering efforts such as partnering sessions, workshops, and/or team building activities be held to foster team relationships with the new personnel.

Proposed CMGC Partnering Framework

Partnering provides the momentum for CMGC to deliver on the advantages it presents. Effective partnering strategy will help CMGC delivered projects to achieve the needed innovation in meeting tight project timelines and enhance project delivery performance. Partnering should, therefore, be used to complement CMGC project delivery. Based on the information gathered from the literature review, DOTs construction documents and the case studies, the authors propose a framework model for CMGC partnering as shown in Figure II. By streamlining the partnering practices with that of CMGC, this model effectively overcomes the current shortfalls of overlap which render partnering redundant making it difficult to build a strong business case for it. Furthermore, by separating preconstruction and construction phases in the executive partnering agreement, this model will benefit project team

members and partnering facilitators avoid duplication of efforts in a bid to foster relationships within the team. Other potential benefits of this model are further explained through the different stages presented by the model.

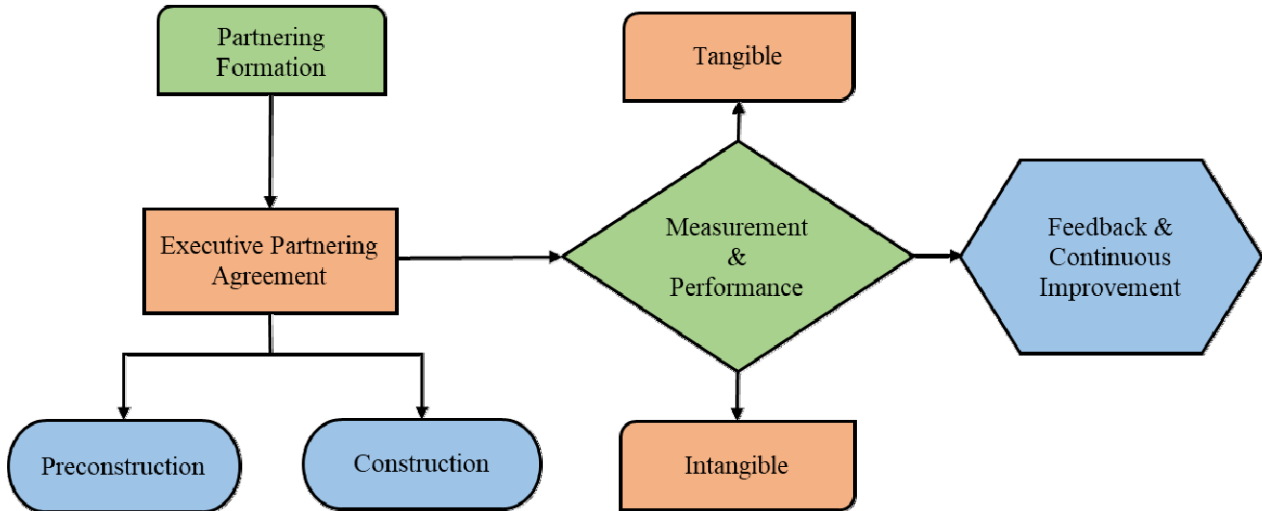


FIGURE II. PROPOSED CMGC PARTNERING MODEL

Partnering Formation

Through the operational terms in the CMGC delivery method, there is early involvement of key project parties, which is also an attribute in partnering strategy. Therefore, there is a need to have a partnering agreement between all the parties that are involved in preconstruction. This process of partnering formation will take a similar form as that of general partnering and parties will sign a partnering charter. At this point, the DOT will decide how prepared they are to handle the partnering process, the expertise available internally and/or whether they will involve a third party to facilitate the process. Also, DOT guidelines on which projects they can use partnering are reviewed and then a detailed plan on how partnering will be implemented is developed.

Executing Partnering Agreement

This stage starts when the contract has been awarded and key project parties have been selected. In executing the partnering agreement, the process in CMGC method differs greatly from the general model of partnering presented earlier in the paper. Here, partnering is divided into two sections; preconstruction and construction phases. This is to take into consideration the personnel change over from preconstruction to construction. Essentially, this stage starts with the initial partnering workshop/meeting. Then follow-up meetings will be conducted thereafter. At this stage, progress reviews are conducted at every meeting. It is at this stage that project corrective actions for any project occurrences are taken. Team building activities are also undertaken here in order to foster team working relationships.

Measurement and Performance

The proposed framework provides for a platform where the benefits of partnering to the project can be quantified. This process occurs as long as the project is ongoing, and the partnering agreement is in force. Traditionally, project performance has been measured in terms of quantitative attributes herein the model referred to as tangibles, which include time, cost, and quality. More recently, there has emerged more qualitative measures of project performance also referred to as intangible attributes [17]. Periodic cost/schedule reviews are conducted together with the other performance metrics such as quality, and safety. Other intangible benefits of partnering including trust, communication, and information sharing among others highlighted earlier in the paper.

Feedback and Continuous Improvement

Once the partnering process has been completed, the executing agency (DOT) needs to document the feedback from the project parties, challenges and lessons learned. This is important for institutional knowledge and to show areas of improvement in future projects. This can be used by the agency in developing its documents or build up a database to be used for future projects as well as to be used by upper management in tracking the overall performance of the partnering program.

CONCLUSION

The objective of this paper was to investigate the use of partnering on CMGC project delivery method. The research involved an extensive literature review, analysis of state DOTs CMGC solicitation documents and review of three CMGC case studies. The study found that there is limited information in state DOT documents that show procedures on the usage of partnering with CMGC projects. In addition, review of documents revealed a very low number of DOTs require partnering in CMGC projects suggesting that more state DOTs are relying on the inherent nature of the CMGC contract to promote healthy relationships and collaborative business practices.

Based on the findings of this paper, the authors conclude that partnering is an important component in CMGC projects at the preconstruction stage. The benefits of using partnering in CMGC during preconstruction phase is that collaboration is established by bringing together key project parties early in the project and not just the CMGC and the DOT representatives. At this point, both parties strike a consensus on partnering formation together with the process of establishing project cost. The DOT has the responsibility of ensuring that key project parties continuously cooperate with one another by promoting partnering activities such as partnering sessions, partnering workshops, and team building activities using either an internal or external partnering facilitator.

The study also revealed that partnering may become less important as the project progresses into the construction phase especially where there are not much personnel change over from key project parties. This is because there is an overlap between partnering attributes and CMGC characteristics which render partnering redundant and thus becomes very difficult to build a strong business case at this point. When transitioning from preconstruction to construction phase in a CMGC delivered project, there is a need to assess the personnel change over. If there is a

significant change in the personnel, then the project parties will have to revise the partnering charter to accommodate the new personnel and involve them for the continuity of the partnering efforts.

Further, this paper contributes to the body of knowledge by specifically looking at the overlap between partnering and CMGC and developing a framework that can be used by practitioners in directing partnering in CMGC projects. Through the extensive analysis of the states DOTs construction documents, literature and three case study projects, this paper has presented a proposed partnering framework for CMGC partnered projects. However, this paper is limited to three case study projects from two DOTs. It is, therefore, recommended that further investigation be conducted using more case studies across the United States. By so doing, the data collected and analyzed can give more insights on the use of partnering in CMGC projects and possibly add to the proposed framework.

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