Trends in Expectations about Duties and Responsibilities of Construction Managers

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Abstract: This paper discusses the findings of a study conducted under the direction and supervision of the ASCE Committee on Management Practices in Construction (MPIC) to investigate the expectations of the parties involved in the construction process including designers, general contractors, subcontractors, owners, construction managers (CMs), and educators, relative to construction managers' duties and responsibilities. Statistical analysis was conducted to investigate if consensus exists among the parties and to highlight the agreements and disagreements between them. The findings were compared against the findings of an identical study also commissioned by MPIC 10 years before this study was performed. This study raises awareness among project participants about the fact that they should reconcile their differences and have a common understanding of CM duties over all phases of the construction project since general agreement over CM duties makes CM scope negotiations all the easier. **DOI:** 10.1061/(ASCE)CO.1943-7862.0001661.

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Introduction

The construction process was managed as efficiently as possible as early as the prehistoric ages when primitive people had to build their shelters as fast and as strong as possible in order to reduce the time of exposure to the conditions in the wilderness. How efficiently the construction project is managed today is still a major factor that determines the success of the venture. However, consensus appears to be lacking about what constitutes construction management primarily because of the fragmented nature of the modern construction industry, which involves many different parties with different objectives, interests, and cultures in the construction process. For a harmonious and efficient construction process, it is necessary to understand the priorities and expectations of the parties relative to construction management, to compare them and, if possible, to reconcile them.

Historical Perspective

The term *construction management* became part of the construction vocabulary in the late 1960s. Many architect-engineers (AEs) and contracting companies claim that they were practicing it for years even before the 1960s. It is generally accepted that the term reached a professional meaning after 1970. It was indeed after 1970 that organizations like the Associated General Contractors of America (AGC) and the American Institute of Architects (AIA) attempted to institutionalize construction management by defining the activities involved in the practice of such a profession (AGC 1972) and by drawing standard forms of agreement between owners and construction managers (CMs) (AIA 1973; AGC 1974).

It was also in the early 1970s that the Construction Division of ASCE formed a Task Committee on Management of Construction Projects whose objective was defined as to (1) develop, review, codify, and disseminate recommended sound principles of construction management; (2) explore the use of the construction manager technique; and (3) encourage the study of management procedures and the preparation of practical papers. As a result, professional construction management was defined as a form of project organization in which a project management team, consisting of the owner, the construction manager, the design organization, and sometimes the general contractor, is formed to satisfy the owner's construction needs (Barrie and Paulson 1976); the essential tasks of a construction manager were identified and defined in five main stages, namely, conceptual, program planning, design, construction, and close out and start up (Madsen 1979); a specification for construction management services, responsibilities, and authorities was designed (Kettle 1979). Evaluation methodologies of CM firms were proposed (Tatum 1979). Surveys were conducted to identify contractors' and designers' views (Barrie 1979; Tatum et al. 1980). The title of the ASCE *Journal of the Construction Division* was changed to the ASCE *Journal of Construction Engineering and Management* as of its first issue in 1983. Finally, the Construction Management Association of America (CMAA) was founded in 1981 by 40 founding members (ENR 1981). CMAA's first objective was to establish CM as a profession and to define the CM firm's tasks, responsibilities, and duties. The first draft of the "Standards of Practice" was issued by CMAA in 1986 (CMAA 1986). Issues regarding CM education were discussed (Oglesby 1982; Arditi 1984; Haltenhoff 1986). The publication of books that examine various aspects of construction management in detail followed in later years (e.g., Adrian 1981; Clough et al. 2015; Walker 2015).

The CM activities of the top 400 contractors and the top 500 design firms were included for the first time in the *Engineering News-Record* (ENR) reports covering the year 1971. A survey

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conducted in 1976 indicated that 49% of the top 500 design firms and 28% of the top 400 contracting companies listed by the *Engineering News-Record* offered construction management services (Rad and Miller 1978). The first ENR issue that listed the top 100 CM firms appeared in 1989. CM was becoming an important part of the construction activity not only in local markets but also in the international arena.

Current Situation

Construction management has come a long way since the 1970s. For example, the methods used by practitioners have become more sophisticated; the proportion of construction management services offered by contractors and designers has increased a great deal both in national and international contracts; computerization has improved speed and accuracy in most construction management services; web-based systems have improved access, communication, and efficiency; the construction management project delivery system has become a standard way of conducting business in many sectors; and the number of educational programs in construction management has increased significantly (Clough et al. 2015; Hegazy 2013; Hughes et al. 2015; Lee et al. 2013). Many more examples could be added to this list.

In general terms, there is now consensus that construction management involves the optimum use of available funds; the control of the scope of the work; effective project scheduling; the avoidance of delays, changes, and disputes; enhanced project design and construction quality; and optimum flexibility in contracting and procurement. There are, however, differing views concerning how these major objectives are to be achieved.

Despite the wealth of accumulated experience in the last 40 years, some confusion still seems to exist as to what exactly construction management is and how it should be practiced (Arditi and Polat 2010; Arditi et al. 2009). One major reason for this confusion is the different expectations of the different parties in the construction process. This confusion is believed to reflect on the educational system that produces construction managers. This confusion also reflects on the quality of the construction management services performed, and on the frequency and severity of claims and disputes. For a healthier construction industry, the expectations of the different parties relative to construction management need to be identified.

Even though several construction industry associations have strived to formalize the duties and responsibilities of construction managers (e.g., AIA, AGC, ASCE, and CMAA), it is necessary to ensure that these duties and responsibilities are identified from the viewpoint of all the parties involved [i.e., designers (Ds), general contractors (GCs), subcontractors (SCs), owners (Os), CMs, and educators (Es)].

Objective

The objective of this study is to duplicate the ASCE Committee on Management Practices in Construction (MPIC) study conducted in 2006 by Arditi et al. (2009). The list of duties and responsibilities was updated, information from the same six constituencies involved in the construction process (i.e., owners, general contractors, subcontractors, construction managers, designers, and educators) was collected, and the results were statistically analyzed to highlight the agreements and disagreements between the parties. The findings of this study and the findings of the 2006 study were compared to shed light on the extent to which opinions have changed over the last 10 years and to find out which parties have major disagreements with others. The study is expected to contribute to MPIC's and other interested parties' efforts to develop and recommend practices that are acceptable to most parties.

Construction Management Practices

The construction industry has been forced to improve its management practices as construction projects have become more complex and sophisticated. Construction managers also need to improve their management abilities to approach such complex projects. Moreover, construction projects involve multiple stakeholders including designers, contractors, subcontractors, owners, and construction managers, each of which has different objectives and conflicting interests. Therefore, construction management responsibilities must be considered from the viewpoint of all the parties involved in construction projects. Many textbooks indicate that the following are the major disciplines with which construction managers should be familiar (Barrie and Paulson 1992; Clough et al. 2015; CMAA 1993; Fisk and Reynolds 2014; Harris and McCaffer 2013; Halpin et al. 2017; Haltenhoff 1999; Hinze 2000; Sears et al. 2015):

- Project management: As part of their *project management* duties, CMs are expected to determine, formulate, develop, install, coordinate, and administer the necessary elements from the beginning of design to the termination of warranty by coordinating the efforts of the team and making sure all stakeholders perform efficiently to achieve the common goal (CMAA 1993).
- Quality management: Crosby (1984) defines quality as "conformance to requirements," but CM responsibilities relative to *quality management* involve more than that, including establishing and administering systems such as total quality management [ISO 9000 (ISO 2015)] or formal quality improvement programs to achieve the quality stipulated by the owner and designed into the project by the AE, and to minimize the cost of rework, an important part of the overall cost according to Loushine et al. (2003).
- Information management: Given the spectacular improvements in computer technologies and internet facilities, the CM's *information management* role is directed to improving project accountability by collecting, documenting, disseminating, safekeeping and disposing of verbal and graphic project-related information in a multilevel, need-to-know reporting structure (Hardin and McCool 2015).
- Risk management: The CM's *risk management* duties include identifying the internal and external risks that are likely to affect the project, documenting the characteristics of each risk, assessing the potential impacts of risks on project costs and schedule, and responding to risk by avoiding it, mitigating it or accepting its consequences, using various tools such as bonding, insurance, contingencies, and retainage.
- Safety management: Although each contractor and subcontractor bears the responsibility for the safe practices of its own employees, the CM's s*afety management* responsibilities include coordinating safety requirements common to all contractors and subcontractors and seeing that safety provisions are included in construction contracts.
- Value management: The *value management*–related activities of the CM involve extracting maximum value for the owner by identifying designs that can be performed with less money but without sacrificing quality or function, and by addressing constructability issues (Kelly et al. 2014).
- Contract management: *Contract management* is the process that enables the owner and the contractor to meet their obligations in order to deliver the objectives required from the contract

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throughout the life of the contract and is facilitated by the CM who manages the operational and administrative provisions proactively to anticipate future needs as well as to react to situations that arise (Clough et al. 2015).
- Schedule management: The CM uses *schedule management* to combine the element of time with the project's resources from the start of design to owner occupancy and to eliminate or mitigate potential time-resource crises by predicting start and finish dates for intermediate project milestones.

The same literature also revealed that the CM has a different set of duties and responsibilities in each phase of a construction project.

Summary of the 2006 Study

In a study spearheaded by the MPIC Committee of ASCE's Construction Institute in 2006, 124 CM duties were identified by using the general literature and the CMAA, AIA, and AGC standard forms of agreement between owner and construction manager (Arditi et al. 2009). These CM duties were circulated to MPIC members and were revised based on the input received. The CM duties were split into five project phases:
- Predesign (19 duties);
- Design (30 duties);
- Bidding (25 duties);
- Construction (34 duties); and
- Postconstruction (16 duties).

The study involved a survey of the main participants to the construction process, including (1) owners; (2) general contractors; (3) subcontractors; (4) construction managers; (5) designers; and (6) educators. The nonparametric Kruskal-Wallis and Dunn's tests were used to analyze the data collected from these six constituencies. The findings of the 2006 study can be summarized as follows:
- There was consensus among the parties on 66 out of 124 CM duties (53%) and there was disagreement on 58 (47%).
- CM duties in the construction phase were well established and well recognized by all parties.
- More of the disagreements occurred between contractors and designers (in 60% of CM duties) than between any other pair of parties. Disagreements between designers and contractors dated back to the early 1980s and were based on conflicting interests. Disagreements between designers and educators (in 13% of CM duties) ranked a distant second.
- Most of the disagreements were related to CM duties performed in the bidding (76%) and postconstruction (75%) phases of projects, whereas fewer disagreements were observed in the predesign (32%), design (33%), and construction (32%) phases.
- Notwithstanding the disagreements between the parties, the CM duties that were considered by the average respondent to be of priority were those that CMs perform in the construction phase, while those that were of least relevance were those that CMs perform in the predesign and design phases.

It was concluded that it would be advantageous for all parties concerned to reconcile their differences and have a common understanding of CM duties over all project phases.

Methodology of the Study

The study was conducted by researchers at the Illinois Institute of Technology under the direction and supervision of the MPIC Committee of ASCE's Construction Institute. A survey was administered to the very same groups of participants that were targeted in the 2006 survey (i.e., construction owners, general contractors, construction managers, subcontractors, designers, and educators). The survey sought the respondents' expectations about CMs' duties and responsibilities. The emphasis was on management practices rather than the project delivery system. The construction managers who were surveyed were employees of construction management firms.

All parties were surveyed by using the very same survey tool used in the 2006 study to allow the researchers to compare the respondents' opinions in 2006 and 2016. The CM duties used in the 2006 questionnaire were updated to reflect the latest developments in the profession such as practices related to building information modeling (BIM) and sustainability (Tables S1–S5). The additional items were reviewed and approved by MPIC. The final questionnaire in the 2016 survey included a total of 150 CM duties as opposed to 124 duties in the 2006 questionnaire.

The names and addresses of the respondents were sought from various associations including ASCE, AIA, AGC, CMAA, American Subcontractors Association (ASA), Construction Owners Association of America (COAA), ENR, and Peterson's *Guide to Colleges and Universities*, in the same way it was done in the 2006 survey.

An attempt to conduct the survey by means of a web-based system was abandoned because names and email addresses were not available. Instead, a regular mail survey was conducted by using names and addresses obtained from the sources mentioned previously.

Analyzing and Interpreting the Collected Data

Similar questions were posed relative to all five phases covered in the study, namely, predesign, design, bidding, construction, and postconstruction. For example, the question related to CM duties in the predesign phase was worded as follows: "Please indicate below the construction management services expected *in the predesign phase* of the typical construction projects undertaken by your company." The wording was slightly altered depending on whether the recipient was an owner, a designer, a CM, a contractor, a subcontractor, or an educator. For all statements, a scoring system of 1–5 was used to assess the answers and an average score was calculated by using Eq. (1). In the 1–5 scoring system, 5 = always expected, 4 = often expected, 3 = sometimes expected, 2 = seldom expected, and 1 = never expected

$$\text{Average score} = \frac{(5 \times A) + (4 \times B) + (3 \times C) + (2 \times D) + (1 \times E)}{A + B + C + D + E} \tag{1}$$

where A = number of respondents who answered "always expected"; B = number of respondents who answered "often

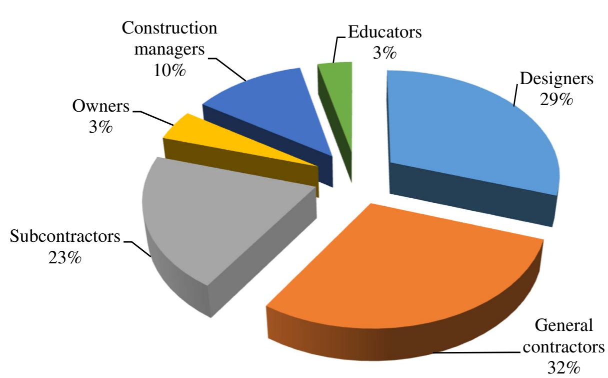

Fig. 1. Distribution of survey respondents.

expected"; C = number of respondents who answered "sometimes expected"; D = number of respondents who answered "seldom expected"; and E = number of respondents who answered "never expected."

Nonparametric tests were used to analyze the data because collected data were not always normally distributed. The Kruskal-Wallis test compares three or more unpaired groups. The Kruskal-Wallis statistic K is calculated by using Eq. (2)

Table 1. Rates of response

Parties	Sources of information	Number of firms that received questionnaires		Number of responses		Rate of response	
		2006	2016	2006	2016	2006 (%)	2016 (%)
D	"Top 500 Design Firms" (ENR 2015e)	488	463	46	65	9	14
GC	"Top 400 Contractors" (ENR 2015d)	393	375	35	63	9	17
SC	"Top 600 Specialty Contractors" (ENR 2015f)	596	580	13	44	2	8
O	"Top 425 Owners 2015" (ENR 2015a)	405	412	28	10	7	2
CM	"Top 100 CMs for Fee" (ENR 2015c); "Top 100 CMs at Risk" (ENR 2015b), "Certified CMs" (CMAA 2016)	179	178	25	26	14	15
E	"Graduate Programs in Construction Management" (Peterson's 2016)	48	50	10	8	21	16
Total	—	2.109	2,058	157	216	7	10

Table 2. Average scores in predesign phase

Statement number	Duties of construction manager in predesign phase	Average scores D	C	SC	O	CM	E	Overall	P-value	Kruskal-Wallis statistic	Statistically different opinions by Dunn's test
1	Develop scope of project and areas of use	3.20	3.49	3.30	4.50	3.81	3.88	3.46	0.1021	9.181	None
2	Conduct market research	2.03	2.16	1.93	2.30	2.04	2.38	2.07	0.5534	3.973	None
3	Collect typical operating costs, tax information, etc.	2.46	2.38	2.39	3.70	2.46	3.13	2.50	0.0761	9.97	None
4	Establish models for optimizing return on investment	2.08	2.10	2.20	3.70	2.08	2.50	2.20	0.0191[a]	13.5	D/O, GC/O, SC/O, O/CM
5	Develop broad outline schedule	4.00	4.41	3.59	4.90	4.42	4.38	4.14	0.0008[a]	21.01	GC/SC, SC/O
6	Develop conceptual budget	4.14	4.46	3.80	4.60	4.31	4.38	4.21	0.1027	9.163	None
7	Evaluate financing sources and alternatives	2.34	2.19	1.91	3.20	2.12	2.75	2.24	0.0306[a]	12.33	None
8	Develop target design fees	3.12	2.83	2.84	3.50	2.65	3.50	2.95	0.4157	5.001	None
9	Develop feasibility study report	2.89	2.38	2.39	3.50	2.23	3.75	2.62	0.001[a]	20.59	None
10	Establish cash flow projections	2.71	3.46	2.57	3.70	3.54	3.38	3.07	0.0008[a]	20.96	D/GC, GC/SC
11	Determine organization and staffing to administer project	3.52	3.94	3.41	4.10	4.12	4.13	3.74	0.0587	10.65	None
12	Outline responsibilities of the project team	3.51	4.02	3.43	4.40	4.19	4.38	3.80	0.0283[a]	12.52	None
13	Establish basic communication procedures	3.63	3.87	3.16	4.10	4.15	4.13	3.71	0.0416[a]	11.54	None
14	Prepare contractual agreements	3.42	3.76	3.00	3.90	3.92	4.25	3.55	0.0305[a]	12.33	None
15	Prepare the procedures for claim avoidance[b]	2.85	2.68	2.32	3.30	3.15	2.75	2.75	0.0364[a]	11.88	None
16	Prepare BIM execution plan[b]	2.66	2.90	2.66	3.20	3.23	3.13	2.84	0.1262	8.599	None
17	Establish reporting and accounting procedures	3.00	3.22	2.55	3.90	3.58	4.13	3.13	0.0033[a]	17.71	None
18	Interview and select architects, engineers, estimators, land surveyor, and other consultants	2.86	2.87	2.64	3.30	2.92	3.88	2.88	0.1414	8.282	None
19	Conduct site evaluation	3.45	3.63	3.34	4.20	3.50	4.25	3.55	0.2293	6.885	None
20	Plan for logistics including temporary construction requirements[b]	3.69	4.10	3.34	4.30	4.04	4.25	3.83	0.023[a]	12.97	None
21	Overview of Leadership in Energy and Environmental Design (LEED) green building strategies and set the LEED goals[b]	2.68	3.00	2.64	2.90	3.00	3.50	2.84	0.1763	7.654	None
22	Select project delivery system (e.g., traditional, design-build, multiple primes)	3.11	3.16	2.84	3.90	3.23	4.38	3.17	0.0257[a]	12.76	SC/E
23	Explore partnering possibilities between parties	2.80	3.00	2.80	3.20	3.08	3.75	2.94	0.2761	6.322	None
24	Plan for risk management steps with regard to such duties	2.95	3.24	2.75	3.40	3.38	4.38	3.12	0.0077[a]	15.72	D/E, SC/E

[a]Statistically significant disagreement between parties ($P \leq 0.05$).
[b]New duty added in 2016.

$$K = \frac{12 \sum_{i=1}^{g} n_i(\overline{r_i} - \bar{r})^2}{N(N+1)} \quad (2)$$

where n_i = the number of observations in group i; $\bar{r}_i = \frac{\sum_{j=1}^{n_i} r_{ij}}{n_i}$ is the average rank of all observations in group i; r_{ij} = rank (among all observations) of observation j from group i; $\bar{r} = \frac{(N+1)}{2}$; and N = the total number of observations across all groups.

Through a series of calculations and ranking of responses, the Kruskal-Wallis test determines a P-value associated with the Kruskal-Wallis statistic. The tests were conducted at a significance level of $\alpha = 0.05$. When $P \leq 0.05$, there is at least 95% confidence that the differences between the perceptions of the groups are statistically different. When $P > 0.05$, it means that the tested groups originated from the same population, implying that all the tested groups share the same perceptions. In other words, a disagreement exists between surveyed parties if the differences between the parties' scores are statistically significant at $\alpha = 0.05$.

Dunn's test, a method for multiple comparisons, was also used as a post hoc test in the analysis of variance. Dunn's test compares the rankings of two groups. The tests were conducted by using Prism, a statistical package developed by GraphPad. The results of the statistical analyses are only representative of the sample that responded to the survey.

Findings and Analysis

The distribution of the different stakeholders who responded to the survey is shown in Fig. 1. It can be seen that all parties involved in a

Table 3. Results of Kruskal-Wallis tests and average scores in predesign phase (2006 versus 2016)

		2006				2016			
Statement number	CM duties in predesign phase	P-value	Kruskal-Wallis statistic	Mean score	Statistically different opinions	P-value	Kruskal-Wallis statistic	Mean score	Statistically different opinions
1	Develop scope of project and areas of use	0.1236	8.656	3.63	None	0.1021	9.181	3.46	None
2	Conduct market research	0.088	9.582	2.18	None	0.5534	3.973	2.07	None
3	Collect typical operating costs, tax information, etc.	0.0714	10.14	2.60	None	0.0761	9.97	2.50	None
4	Establish models for optimizing return on investment	0.0581	10.68	2.47	None	0.0191[a]	13.5	2.20	D/O, GC/O, SC/O, O/CM
5	Develop broad outline schedule	0.3387	5.679	4.28	None	0.0008[a]	21.01	4.14	GC/SC, SC/O
6	Develop conceptual budget	0.1291	8.536	4.43	None	0.1027	9.163	4.21	None
7	Evaluate financing sources and alternatives	0.0158[a]	13.97	2.52	D/E, O/E, GC/E	0.0306[a]	12.33	2.24	None
8	Develop target design fees	0.1297	8.522	3.24	None	0.4157	5.001	2.95	None
9	Develop feasibility study report	0.002[a]	18.87	2.80	D/E, GC/E	0.001[a]	20.59	2.62	None
10	Establish cash flow projections	0.1775	7.636	3.31	None	0.0008[a]	20.96	3.07	D/GC, GC/SC
11	Determine organization and staffing for project	0.07	10.19	3.92	D/CM	0.0587	10.65	3.74	None
12	Outline responsibilities of the project team	0.231	6.863	3.90	None	0.0283[a]	12.52	3.80	None
13	Establish basic communication procedures	0.864	1.891	3.80	None	0.0416[a]	11.54	3.71	None
14	Prepare contractual agreements	0.4693	4.579	3.83	None	0.0305[a]	12.33	3.55	None
15	Prepare the procedures for claim avoidance[b]	—	—	—	—	0.0364[a]	11.88	2.75	None
16	Prepare BIM execution plan[b]	—	—	—	—	0.1262	8.599	2.84	None
17	Establish reporting and accounting procedures	0.3043	6.019	3.55	None	0.0033[a]	17.71	3.13	None
18	Interview and select architects, engineers, estimators, land surveyor, and other consultants	0.005[a]	16.73	3.12	D/O, D/E	0.1414	8.282	2.88	None
19	Conduct site evaluation	0.0021[a]	18.81	3.59	D/E	0.2293	6.885	3.55	None
20	Plan for logistics including temporary construction requirements[b]	—	—	—	—	0.0237[a]	12.97	3.83	None
21	Overview of Leadership in Energy and Environmental Design (LEED) green building strategies and set the LEED goals[b]	—	—	—	—	0.1763	7.654	2.84	None
22	Select project delivery system (e.g., design-bid-build, design-build)	0.0213[a]	13.23	3.34	D/E	0.0257[a]	12.76	3.17	SC/E
23	Explore partnering possibilities between parties	0.0498[a]	11.08	3.00	None	0.2761	6.322	2.94	None
24	Plan for risk management steps with regard to such duties[b]	—	—	—	—	0.0077[a]	15.72	3.12	D/E, SC/E

[a]Statistically significant disagreement between parties ($P \leq 0.05$).
[b]New duty added in 2016.

Table 4. Summary of results (2006 versus 2016) of Kruskal-Wallis tests

Definition	2006	2016
Number of questions	124	150
Disagreements	58 (47%)	97 (65%)
Agreements	66 (53%)	53 (35%)
Decline in average scores	91 (73%)	

construction project are represented in the distribution, with many designers (30% of the total number of respondents) and many general contractors (29% of the total), but fewer owners (5% of the total) and educators (4% of the total) contributing. As seen in Table 1, the overall rate of response was 10%. It was not higher most probably because the respondents had to mark an opinion on a total of 150 CM duties, a task that could take over an hour. While the rates of response of general contractors (17%), CMs (15%), and designers (14%) were on the high side, it was disappointing that owners' rate of response (2%) was quite low. The overall rate of response is quite similar to the rate of response obtained in the 2006 survey. Tables S1–S5 represent the average scores of all survey groups in all phases.

Tables 2 and 3 present the results in the predesign phase only. Table 2 shows the average scores of the survey participants and presents the outcome of the Kruskal-Wallis and Dunn's tests. Table 3 presents and compares the *P*-value, the Kruskal-Wallis statistic, the average score, and the results of Dunn's tests in the 2006 and 2016 surveys. The CM duties that were updated to reflect the latest developments in the profession such as practices related to BIM and sustainability are marked in Tables 2 and 3. Considering the disagreements identified in this study, it is observed that parties disagreed on 65% of CM duties (97 out of 150 CM duties) and agreed on only 35% of CM duties (53 out of 150 CM duties) in 2016 (Table 4). In addition, the parties disagreed on 40% of those CM duties that were added to the questionnaires in 2016 related to BIM and sustainability (10 out of 25 CM duties related to BIM and sustainability). When the disagreements found in the 2016 survey were compared against the disagreements identified in the 2006 study, it was observed that disagreements went up from 47% (58 out of 124 CM duties) in 2006 to 65% in 2016 (97 out of 150 CM duties).

According to Fig. 2, most of the disagreements in 2016 were in the bidding phase where parties disagree on nearly all CM duties (96%, 24 out of 25 CM duties). The disagreements were fewer in the design phase, with parties disagreeing only on 51% of CM duties (20 out of 39 CM duties). Judging from the information

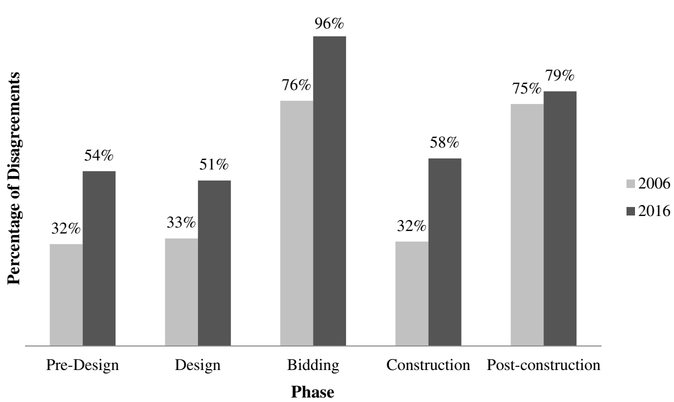

Fig. 2. Percentage of disagreements on CM duties in each project phase (2006 versus 2016) as per the Kruskal-Wallis test.

provided by the Kruskal-Wallis test in Fig. 2, not only did the disagreements between parties increase, but the disagreements in each phase also increased in 2016 compared to 2006.

The Dunn's test was performed after the Kruskal-Wallis test to find out which disagreements occur between which two parties. The results of the Dunn's test are presented in Table 5 and show that most disagreements occurred between general contractors and subcontractors (40%), whereas no disagreements occurred between owners and educators (0%) in 2016. The disagreements between subcontractors and CMs (17.1%) and between designers and general contractors were a distant second and third.

Comparing the results of the Dunn's test performed in 2016 against the one performed in 2006, it was found that there are more disagreements in 2016 (152 disagreements) compared to 2006 (only 70 disagreements). Most disagreements were between designers and general contractors (60%) in 2006, but between general contractors and subcontractors in 2016 (40%). Interestingly, the disagreements between designers and all other parties (except subcontractors) went down in 2016 compared to 2006, whereas the disagreements between subcontractors and all other parties went up (Table 5), partly because subcontractors received the lowest average score in 2016 (3.29) compared to all other parties (Table 6). The average score of a surveyed party (e.g., designers in bidding phase) in Table 6 is nothing but the sum of the scores for all CM duties divided by the number of CM duties in that particular phase (i.e., the bidding phase). In addition, the reason very few disagreements occurred between general contractors, owners, construction managers, and educators in 2016 is because, as seen in Table 6, the overall average scores of these participants were very close to each other (3.91 for general contractors, 3.96 for owners, 3.89 for construction managers, and 3.91 for educators).

When the average scores that the parties received in 2016 are compared with the average scores received in 2006, one can observe in Table 5 that fewer disagreements exist between designers and other parties (except subcontractors), but there are more disagreements between subcontractors and other parties. A parallel trend is also observed in the overall average score of designers, which increased (3.64 in 2016 versus 3.53 in 2006), and the overall average score of subcontractors, which decreased in 2016 compared

Table 5. Disagreements between parties (2006 versus 2016) as per Dunn's test

	Number of disagreements between two parties		Distribution of disagreements between two parties (%)	
Parties	2006	2016	2006	2016
Designer versus general contractor	42	24	60.0	15.8
Designer versus subcontractor	2	12	2.9	7.9
Designer versus owner	4	1	5.7	0.7
Designer versus CM	3	2	4.3	1.3
Designer versus educator	9	1	12.9	0.7
General contractor versus subcontractor	4	61	5.7	40.1
General contractor versus owner	1	1	1.4	0.7
General contractor versus CM	0	1	0.0	0.7
General contractor versus educator	2	4	2.9	2.6
Subcontractor versus owner	0	12	0.0	7.9
Subcontractor versus CM	0	26	0.0	17.1
Subcontractor versus educator	1	5	1.4	3.3
Owner versus CM	1	1	1.4	0.7
Owner versus educator	1	0	1.4	0.0
CM versus educator	0	1	0.0	0.7
Total	70	152	100	100

Table 6. Mean scores of surveyed parties by project phase (2006 versus 2016)

Parties	Predesign 2006	Predesign 2016	Design 2006	Design 2016	Bidding 2006	Bidding 2016	Construction 2006	Construction 2016	Postconstruction 2006	Postconstruction 2016	Overall 2006	Overall 2016
D	3.04	3.05	3.10	3.20	3.59	3.98	4.10	4.01	3.84	3.96	3.53	3.64
GC	3.33	3.22	3.59	3.44	4.46	4.30	4.51	4.33	4.41	4.27	4.06	3.91
SC	3.61	2.82	3.62	2.99	3.99	3.26	4.06	3.89	3.78	3.49	3.81	3.29
O	3.43	3.74	3.47	3.57	4.08	3.87	4.26	4.33	4.01	4.28	3.85	3.96
CM	3.45	3.30	3.51	3.36	4.17	4.23	4.38	4.23	4.18	4.32	3.94	3.89
E	3.92	3.72	3.69	3.51	4.44	4.15	4.43	4.19	4.31	3.96	4.16	3.91
Overall	3.46	3.31	3.50	3.35	4.12	3.97	4.29	4.16	4.09	4.05	3.89	3.77

to 2006 (3.29 in 2016 versus 3.81 in 2006). Judging from the results presented in Table 6, it seems that owners expect more from CMs because the overall average score of owners went up from 3.85 in 2006 to 3.96 in 2016 (Table 6).

As shown in Table 6, since the highest overall average score (4.16) occurs in the construction phase in 2016, those CM duties that are performed in the construction phase are considered by the average respondent to be a priority, whereas those CM duties that are performed in the predesign phase are considered to be least relevant because the lowest overall average score (3.31) was obtained in the predesign phase. This finding has not changed between 2006 and 2016.

Conclusion

Construction projects have multiple players with different roles and goals. Even though the term *construction management* has been part of the construction vocabulary for a long time, the expectations of the multiple players relative to the duties of a CM have varied. Ten years after a 2006 survey was commissioned by MPIC (Arditi et al. 2009), there still seem to be discrepancies between the expectations of the parties in 2016. Surveying the same parties in a 2016 study confirmed that the problem is more pronounced in 2016, as evidenced by lower scores and a larger number of disagreements in 2016 across all phases and across all parties.

The 2016 survey investigated the perceptions of designers, contractors, subcontractors, owners, CMs, and educators relative to 150 CM duties extracted from the literature and various publications of ASCE, CMAA, AIA, and AGC. The rate of response was generally low, but enough data were collected to perform nonparametric statistical analysis. The findings of the study allow MPIC and professional associations to recognize the disagreements between different parties about CM duties, reconcile the differences, and pave the way to smooth relationships between the parties. The findings suggest that

- In 2016, there was consensus among the parties on only 53 out of 150 CM duties (35%) and there was disagreement on 97 (65%), as opposed to the findings in the 2006 survey, which indicated consensus among the parties on 66 out of 124 CM duties (53%) and disagreement on 58 (47%). This result shows that the number of CM duties on which there is disagreement between parties went up significantly between 2006 and 2016.
- In 2016, most of the disagreements (61 out of 152, or 40%) existed between general contractors and subcontractors, with disagreements between subcontractors and CMs (26 out of 152, or 17%) being a distant second; whereas in 2006, most disagreements (42 out of the 70, or 60%) existed between contractors and designers, with disagreements between designers and educators (9 out of 70, or 13%) being a distant second. This result shows that the parties that mostly disagree with each other have changed between 2006 and 2016.
- In 2016, most of the disagreements were related to CM duties performed in the bidding (96%) and postconstruction (79%) phases of projects, whereas fewer disagreements were observed in predesign (54%), design (51%), and construction (58%). Comparing the results of the 2016 and 2006 surveys shows that although the phases with most disagreements have not changed, the percentage of disagreements between parties increased in all phases in 2016.
- In 2016, notwithstanding the disagreements between the parties, the CM duties that were considered by the average respondent to be a priority continued to be those that CMs perform in the construction phase, while those that are of least relevance continued to be those CMs perform in the predesign phase. This finding has not changed between 2006 and 2016.
- Interestingly, the number of disagreements between subcontractors and all other parties has gone up from 2006 to 2016, while at the same time subcontractors expect less from CMs.
- In 2016, the number of disagreements between educators and the remaining parties went down significantly. For example, there are no disagreements between educators and owners. This finding is not surprising because educators spearheaded a multitude of 2-year, 4-year and master's programs in the 10-year study period (2006–2016), and may have paid special attention to industry needs while developing their curricula. In addition, the vast amount of research that was published in numerous journals and presented at numerous conferences in this period may have drawn some practitioners' attention.

In consideration of the preceding conclusions, it may be worth noting that the number of disagreements between parties about CM duties has increased over the last 10 years despite the fact that the construction industry is moving to more collaborative and integrated project delivery systems (Franz and Leicht 2012; Garcia et al. 2014). Though the variation between parties could be an indication of increased fragmentation in the construction industry, it may also point to a shift in participation expectation. Either paradigm requires additional communication between the parties to a construction project.

Just as was concluded after the 2006 study, it would be advantageous for all parties involved in construction projects to reconcile their differences and have a common understanding of CM duties over all phases of the construction project. A uniform understanding of CM duties across the industry would be beneficial for all parties concerned. It is reassuring to know that CM duties are well established and well recognized by most parties at least in the construction phase of a project, but it is disappointing that a larger number of disagreements existed in 2016 than in 2006, even though these disagreements can be accommodated when the scope of CM services is negotiated by different parties in different project settings.

Data Availability Statement

Data generated or analyzed during the study are available from the corresponding author by request. Information about the *Journal*'s data-sharing policy can be found here: http://ascelibrary.org/doi/10.1061/(ASCE)CO.1943-7862.0001263.

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Supplemental Data

Tables S1–S5 are available online in the ASCE Library (www.ascelibrary.org).

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