Organizational Change Management for the Adoption of Alternative Project

Delivery Methods within the AEC Industry

by

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A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved September 2020 by the
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ARIZONA STATE UNIVERSITY

December 2020

ABSTRACT

The alternative project delivery methods (APDMs) today are being increasingly used by owner organizations in the architecture, engineering, and construction (AEC) industry. Yet the adoption of these methods can be extremely difficult to accomplish and requires significant change management efforts. To facilitate the APDM adoption, this research aimed to better understand how AEC owner organizations have changed from only using the design-bid-build method to also successfully implementing APDMs from an organizational change perspective. This research utilized a literature review, survey and interviews to fulfill the research objectives. The dissertation follows a three paper format. The first paper focuses on identifying organizational change management (OCM) practices that, when effectively executed, lead to increased success rates of adopting APDMs in owner AEC organizations. The results of the first paper indicated that the five OCM practices with the strongest correlations to successful APDM adoption were realistic timeframe, effective change agents, workload adjustments, senior-leadership commitment, and sufficient change-related training. The second paper focuses on investigating AEC employees' reactions to the adoption of APDMs. The findings of the second paper revealed that employees in AEC organizations react favorably to adopting a change in their project delivery systems. The findings further revealed that increasing the use of OCM practices is related to decreased employee resistance to change. The third paper aimed to provide guidelines detailing on how to lead APDM adoption. The findings of the third paper indicated that there was a general sequence of four implementation phases, which were preparing and planning, pilot project testing, expanding to the intended scale, and sustaining and evaluating. The phases include specific OCM practices that increase the

probability of successful APDM adoption. The dissertation results can help in guiding the senior managers of construction organizations and OCM consultants to effectively implement APDMs for the first time in the construction sector.

DEDICATION

To my late father (Medath), Allah bless his soul,

To my mother (Mashaa),

To my lovely wife (Munirah),

To my sons (Mudith and Abdullah),

To my brother (Abdullah),

To my sisters (Noura, Mashael, Monerh, Amsha),

To my country, Saudi Arabia,

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# CHAPTER 1: INTRODUCTION

## 1.1 Introduction

The traditional method for delivering engineering and construction projects is design-bid-build (DBB). The DBB method is a linear process and two separate contracts between the owner and the designer and the owner and the contractor. This method can lead to adverse relationships between project stakeholders (owner, designer, and contractor) due to the absence of communication and a lack of stakeholder integration (Francom et al. 2016). In today's rapidly evolving in the architecture, engineering, and construction (AEC) industry, owner organizations have become increasingly interested in implementing alternative project delivery methods (APDMs) to enhance their project performance (Minchin et al. 2014). Several APDMs are currently being used in the AEC industry, such as design-build (DB), construction manager at risk (CMAR), integrated project delivery (IPD), and public-private partnerships (PPPs). APDMs have been used to increase the project's stakeholder integration and eventually enhance project performance (Konchar and Sanvido 1998; El Asmar et al. 2016). Yet successful implementation of the APDMs can be difficult to owner organizations to achieve and require organizational change effort (Migliaccio et al. 2008; Lines et al. 2014a). The existing literature in the field of AEC has primarily investigated and compared benefits of using APDMs on project performance (e.g., Konchar and Sanvido 1998; Shane et al. 2013; Francom et al. 2014), with limited focus on the organizational change management context. To address this gap, this research was conducted to provide a better understanding of how to successfully implement APDMs across the AEC industry from an organizational change perspective.

**1.2 Problem Statement**

In today's construction climate, owner organizations are finding themselves under pressure to improve their project performance. In response to this pressure, organizations are pursuing the use of alternative project delivery strategies to enhance their project performance. Although numerous studies have been conducted on alternative project delivery methods, most of these studies have focused on the positive side of these methods on project performance without due consideration of how to successfully implement these methods within AEC owner organizations at the organizational level. The implementation of a new project delivery method can be extremely difficult to accomplish and requires a significant organizational change effort to ensure the change is a success. An extensive review of change implementation studies in the AEC literature found that there was little information on how a change in project delivery method construction is implemented by owner organizations, especially at the organizational level, which presents a clear need for this study to be conducted.

**1.3 Description of the Research**

This section provides a detailed description of the main goal and the objectives of this research. The research approach followed to achieve these objectives are also presented. The primary goal of this research was to better understand how AEC owner organizations have changed from only using the DBB method to also successfully implementing and adopting APDMs from the organizational change perspective. This research was divided into three subtopics to achieve the goal:

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a) *Best Practices of Organizational Change for Adopting APDMs*

This subtopic was performed by conducting a review of previous studies on organizational change initiatives in the AEC literature with the objective of identifying OCM practices. Then, the questionnaire survey were utilized to measure the effectiveness of these practices with the organizational adoption of APDMs.

b) *Employee Reactions to and communication methods for APDM adoption*

For the second part of the research, employees' reactions to APDM adoption were gathered from the previous survey. The purpose was to investigate how AEC employees react to APDMs adoption and to determine whether employee reactions mediate the effect of the relationship between OCM practices and successful APDM adoption. In addition, the survey collected the methods that AEC organizations used to communicate the APDM adoption process to employees.

c) *Guidelines for APDM Adoption in AEC Owner Organizations*

Interviews were conducted with industry professionals to understand their APDM adoption experience and how they adopted the APDMs successfully. The purpose of the interviews was to provide guidelines detailing on how to lead APDM adoption to owner organizations that are willing to use APDMs for the first time.

**1.4 Dissertation Structure**

This dissertation is organized into five chapters. In addition, the dissertation includes two appendices that provide a copy of the study survey questionnaire and a copy of the interview questions.

**Chapter One** includes an introduction, research problem, description of the research, and dissertation structure.

**Chapter Two** of this dissertation presents the research conducted on best practices of organizational change for adopting alternative project delivery methods in the AEC industry. This chapter has its own introduction, literature review, methodology, results, discussion, conclusion, contributions, limitations and recommendations for future research. This chapter was documented in the journal paper format, and the paper has been published in *Journal of Engineering, Construction and Architectural Management* for publication.

**Chapter Three** documents the research conducted on employee reactions to the adoption of alternative project delivery methods within the AEC industry. This chapter documents the introduction, literature review, research objective and questions, methodology, method of survey analysis, results, discussion, conclusions, contributions, and limitations and recommendations for future research. This chapter is also presented in the form of a journal article.

**Chapter Four** presents the research conducted on alternative project delivery method adoption in the AEC industry from an organizational change perspective. This chapter has its own introduction, literature review, methodology, results, discussion, conclusion, contributions, limitations and recommendations. This chapter is also presented in the form of an article format.

Finally, **Chapter Five** presents a summary of the research findings and also provides thoughts on future work. The references and appendices for this dissertation are provided following Chapter 5.

# CHAPTER 2: BEST PRACTICES OF ORGANIZATIONAL CHANGE FOR ADOPTING ALTERNATIVE PROJECT DELIVERY METHODS IN THE AEC INDUSTRY

## 2.1 Abstract

Although numerous studies have examined alternative project delivery methods (APDMs), most of these studies have focused on the relationship between these methods and improved project performance. Limited research identifies how to successfully add these methods within architectural, engineering, and construction (AEC) organizations. The purpose of this paper is to identifying organizational change management (OCM) practices that, when effectively executed, lead to increased success rates of adopting APDMs in owner AEC organizations. Seven OCM practices were identified through a comprehensive literature review. Then, through a survey of 140 individuals at 98 AEC organizations, the relationships between OCM practices and organizational adoption of APDMs were established. The findings indicate that OCM practices with the strongest relationship to successful APDM adoption are realistic timeframe, effective change agents, workloads adjustments, senior-leadership commitment, and sufficient change-related training. Adopting APDMs can be extremely difficult and requires significant organizational change efforts to ensure the change is a success. Organizations that are implementing APDMs for the first time should consider applying the OCM practices that this study identifies as most related to successful APDM adoption. This study contributes to the existing body of knowledge by identifying the OCM practices that are the most significantly associated with successfully adopting APDMs.

**2.2 Introduction**

An organizational change initiative is the strategic implementation of a process, technology, or tool that is new to an organization (Barrett and Sexton, 2006). Studies show that more than half of organizational change initiatives fail to fully achieve their objectives (Beer and Nohria, 2000; Ahn *et al.*, 2004). This high failure rate indicates the absence of an effective organizational change framework (By, 2005). This study examined the organizational change initiatives to adopt alternative project delivery methods (APDMs), such as design-build (DB), construction manager at risk (CMAR), integrated project delivery (IPD), and public-private partnerships (PPPs) in architectural, engineering, and construction (AEC) owner organizations. Adopting a new project delivery method is an organizational change initiative because the adoption will affect processes in the organization.

A project delivery method is a comprehensive process through which a construction project is designed and constructed for the project owner. The method affects the contractual relationships between the project stakeholders and when they engage in the project (El Asmar *et al.*, 2013). In the traditional design-bid-build (DBB) method, the contractor is engaged when the design packages are fully complete; in contrast, with APDMs, the contractor can become involved earlier. For example, in IPD, all project stakeholders (owner, designer, and contractor) are engaged before starting the design. In DB, the contractor typically becomes involved when the design is around 20% complete. In CMAR, the construction manager engages while the design is still being developed, but typically not as early as in DB (Francom *et al.*, 2014).

In the past, public and private organizations have developed project delivery strategies based on the DBB method and the low-bid procurement system. Today, an increasing number of owner organizations are implementing APDMs to procure and deliver AEC projects. However, changing from a DBB, low-bid approach to APDMs is difficult and requires significant organizational change management efforts to facilitate the change (Migliaccio *et al.*, 2008; Lines *et al.*, 2014a). To successfully implement an APDM, it may be necessary to modify work processes, organizational structures, and personnel roles and responsibilities (Migliaccio *et al.*, 2008).

To increase the likelihood of successfully implementing APDMs, organizations are applying organizational change management (OCM) practices. In this context, OCM practices include specific approaches and techniques that are most effective to facilitate organizational change adoption (Lines and Smithwick, 2019). Research shows that some OCM practices have a direct positive relationship with the successful adoption of organizational change (Self and Schraeder, 2009). Because OCM practices are important, the literature on organizational change in the AEC industry was reviewed to identify OCM practices that can increase the probability of successfully adopting APDMs. The results of this study are anticipated to confirm that there are OCM practices that can be used by owner organizations to adopt APDMs more successfully.

This study had three objectives. The first objective was to identify OCM practices used in the AEC industry. This objective was accomplished through conducting an extensive literature review. The second objective was to investigate whether there is a relationship between identified OCM practices from the AEC literature and the successful

adoption of APDMs in AEC organizations. Further investigation also focuses on differences that may exist based upon the different demographic characteristics of the survey respondents. The third objective was to investigate whether there is a significant difference in APDM adoption based on whether organizations hired OCM consultants or did not hire OCM consultants. The second and third objectives were achieved through surveying 140 members of AEC organizations that had adopted APDMs.

**2.3 Literature Review**

Numerous studies have been conducted on the adoption of organizational change initiatives in the AEC industry. A review by Lines and Reddy Vardireddy (2017) indicates that the majority of studies on organizational change in the AEC industry focused on initiatives to implement software, other technology, and risk management programs. As an illustration, many researchers have studied the adoption of building information modeling (BIM) (Arayici *et al.*, 2011; Barlish and Sullivan, 2012; Ding *et al.*, 2015). Other types of technology implementation that have been researched include web-based project management systems (Nitithamyong and Skibniewski, 2006; Dossick and Sakagami, 2008) and radio-frequency identification technology (Li and Becerik-Gerber, 2011). Researchers have also examined efforts to adopt management-focused practices, such as Six Sigma (Pheng and Hui, 2004), safety management (Lai *et al.*, 2011), total quality management (Burati and Oswald, 1993; Pheng and Teo, 2014), enterprise risk management (Zhao *et al.*, 2015), program management (Shehu and Akintoye, 2010), and quality management (Sullivan, 2011).

A few researchers have investigated how a new project delivery method was adopted. For example, Chan *et al.* (2009) conducted a survey to explore and compare the key drivers for adopting PPPs in China and Hong Kong. Babatunde *et al.* (2015) identified the barriers that prevented local governments in Nigeria from successfully adopting PPPs. Other researchers have studied strategies to successfully adopt the DB delivery method in owner organizations (Jergeas and Fahmy, 2006; Park *et al.*, 2009). For example, Jergeas and Fahmy (2006) surveyed 411 individuals in the United States and Canada whose organizations had implemented the DB method. Three practices that most respondents mentioned are preparing an adequate request for proposal, understanding the DB process, and paying special attention to education and training. Additionally, Migliaccio *et al.* (2008) proposed a conceptual framework to help transportation agencies adopt the DB method. However, there has not been a study that investigated OCM practices to facilitate the adoption of APDMs at the organizational level.

The comprehensive literature review indicates there are several gaps in AEC research. First, most of the studies have focused on the technical aspects and benefits of organizational changes with limited focus on organizational change management in the context of OCM practices. Second, little information is available regarding how AEC organizations implement new strategies at the organizational level for procuring and delivering construction projects. These gaps indicate the need for research on the OCM practices that AEC organizations in the United States use to adopt APDMs. A better understanding of the OCM practices used and which ones are strongly correlated with successful APDM implementation can help AEC owners effectively implement change.

**2.4 Research Methodology**

Wang *et al.* (2013) reviewed the methodologies that have been used to explore change management research in the AEC literature and found that the most common methods are literature reviews and surveys. Therefore, these two methods were used in the current study.

First, studies on organizational change initiatives in the AEC industry were reviewed with the objective of identifying OCM practices that have a positive relationship with successfully implementing change initiatives. This review resulted in the identification of seven effective OCM practices. Second, a survey was developed to determine whether these practices are effective when organizations are adopting APDMs.

*2.4.1 Literature Review Method*

The first step in the literature review involved searching for relevant studies in the AEC literature. To search for literature, the following online databases were used: Emerald Insight, Academic Search Premier, and Elsevier. The focus was on finding articles in the following journals: *Automation in Construction*; *Journal of Management in Engineering*; *Journal of Construction, Engineering and Management*; *International Journal of Project Management, Engineering, Construction and Architectural Management*; and *International Journal of Construction Education and Research*. The keyword phrases used were *organizational change*, *change management practices*, *change adoption and implementation*, and *AEC industry*. The scope of the search was limited to articles published from 1990 to the search date.

This search resulted in the identification of 163 articles; 124 of these articles were removed from the review because they were not focused on organizational change adoption or did not include OCM practices in the AEC industry. The 39 remaining articles were considered relevant and were grouped into five categories based on the types of change initiatives examined, as shown in Table 1.

**Table 1. Categories of organizational change initiatives documented in AEC literature**

| Organizational Change Category | Frequency | Initiatives |
|---|---|---|
| Software | 14 | BIM (11), Web-Based Project Management Systems (2), Enterprise Resource Planning (1) |
| Management and Operations | 13 | Program Management (1), Knowledge Management (1), Quality Management Programs, TQM (4), Six Sigma (1), Alternative Procurement: Best Value (2), Alternative Project Delivery: DB (2), PPPs (2) |
| Technology Application | 6 | Information and Communication Technology (3), Collaboration Technology (3) |
| Safety or Risk Programs | 5 | Enterprise Risk Management (1), Value Management (1), Safety Management (2), Risk Management Systems (1) |
| Other | 1 | Restructuring (1) |

The 39 studies were examined to identify the factors that helped organizations succeed, the challenges organizations faced, and how the organizations overcame the challenges. Many OCM practices have been identified by various researchers to help in introducing a change within AEC organizations. Through analyzing the 39 articles, seven OCM practices were identified as frequently being discussed regarding the organizational change in the AEC industry. These practices are listed in Table 2.

**Table 2. A summary of OCM practices captured in the AEC literature**

| OCM Practices | References |
|---|---|
| Senior-Leadership Commitment | Pheng and Teo (2004); Pheng and Hui (2004); Peansupap and Walker (2006); Nikas et al., (2007); Erdogan et al., (2008); Dossick and Sakagami (2008); Elghamrawy and Shibayama (2008); Shehu and Akintoye (2010); Arayici et al., (2011); Tan et al., (2012); Hwang et al., (2015); Lines et al., (2014b); Zhao et al., (2015); Son et al., (2015); Ding et al., (2015); Ozorhon and Cinar (2015), Yiu et al., (2018) |
| Sufficient Change-Related Training | Burati and Oswald (1993); Pheng and Hui, (2004); Pheng and Teo (2004); Jergeas and Fahmy (2006); Williams et al., (2007); Dossick and Sakagami (2008); Erdogan, et al., (2008); Elghamrawy and Shibayama (2008); Sullivan et al., (2010); Shehu and Akintoye (2010); Lai et al., (2011); Khosrowshahi and Arayici (2012); Lines et al., (2014b); Hwang et al., (2015); Rogers et al., (2015); Ozorhon and Cinar (2015), Liao and Teo (2018), Yiu et al., (2018). |
| Effective Communication about Change | Singh and Shoura (1999); Peansupap and Walker (2006); Williams et al., (2007); Erdogan et al., (2008); Gu and London (2010); Henderson and Ruikar (2010); Arayici et al., (2011); Lai et al., (2011); Lines et al., (2014b), Liao and Teo (2018). |
| Realistic Timeframe | Pheng and Teo (2004); Peansupap and Walker (2006); Jergeas and Fahmy (2006); Sullivan et al., (2010); Tan et al., (2012); Jensen and Johannesson (2013); Loosemore and Cheung (2015). |
| Measurement of Performance Benchmarks | Pheng and Teo (2004); Williams et al., (2007); Elghamrawy and Shibayama (2008); Park et al., (2009); Eadie et al., (2013); Erdogan et al., (2014); Lee et al., (2015); Zhao et al., (2015). |
| Effective Change Agents | Burati and Oswald (1993); Nitithamyong and Skibniewski (2006); Peansupap and Walker (2006); Dossick and Sakagami (2008); Won et al., (2013); Erdogan et al., (2014); Lines et al., (2014b), Ozorhon and Cinar (2015). |
| Workload Adjustments | Pheng and Teo (2004); Peansupap and Walker (2006); Tan et al., (2012); Loosemore and Cheung (2015). |

The review of the literature indicates that the seven practices should be considered critical to successfully implementing organizational change. Each practice is briefly described below.

*2.4.1.1 Senior-Leadership Commitment*

Senior leaders' commitment to and support of an organizational change initiative is widely cited as critical to successful change implementation. When senior managers do not view a change as a priority, other employees may ignore change efforts or may view the change as an activity to "check a box."

Pheng and Teo (2004) found that senior leaders' support plays an important role in implementing total quality management in Singaporean construction firms because the support helps ensure that implementation plans are appropriate and that sufficient resources are allocated for training staff. Nikas *et al.* (2007) studied organizations in Greece and reported that collaboration technologies could not be successfully adopted without the commitment and support of senior management. In another study, Arayici *et al.* (2011) showed that support from senior leaders was critical for the success of implementing BIM in architectural companies in the United Kingdom. Furthermore, Shehu and Akimtoye (2010) found that the lack of commitment from senior leaders was the largest barrier to successfully implementing program management in the UK construction industry.

Tan *et al.* (2012) found that for knowledge management to be implemented successfully in a medium-sized construction firm, senior managers need to allocate resources (e.g., staff time and budget allocation). On the other hand, Zhao *et al.* (2015) found that resources are not only limited to time, money, and people, but organizational leaders should also consistently allocate other resources, including knowledge and skills, when implementing enterprise risk management (ERM). The researcher also recommended

that the ERM implementation plan approved by senior management should include resource allocation.

*2.4.1.2 Sufficient Change-Related Training*

Employees often resist change when organizations do not provide enough change-related training (Schneider *et al.*, 1994; Alvesson, 2012). Pheng and Hui (2004) found that relevant training is essential for employees involved in the process of implementing Six Sigma in construction. Lines and Smithwick (2019) interviewed electrical contractors and found that sufficient change-related training was important in successfully implementing change.

*2.4.1.3 Effective Communication about the Change*

Another factor related to successfully implementing change is the effectiveness of communicating the change to employees. The purpose of communicating about the change is to educate personnel about the goals of and strategy for the change. Researchers have found a direct relationship between change-message delivery and change-management success (Schneider *et al.*, 1994; Alvesson, 2012). Lines *et al.* (2016) recommended conveying the change message to employees before starting to implement the change. Communicating beforehand gives employees time to understand the change, thereby reducing their resistance to the change (Erdogan *et al.*, 2014).

Researchers have identified methods for communicating the change in an organization. Singh and Shoura (1999) recommended communicating to employees through newsletters, memos, and bulletin boards. Lai *et al.* (2011), who studied the implementation of safety management programs in construction projects in Singapore and

the United States, suggested developing communication methods and receiving feedback occasionally from employees.

*2.4.1.4 Realistic Timeframe*

Though construction organizations need time to adopt a change, organizations typically underestimate how long implementing a change will take (Pheng and Teo, 2004). A lack of time is one of the main barriers to implementing systems thinking in order to manage risk in PPPs (Loosemore and Cheung, 2015). Sullivan *et al.* (2010) found that trying to implement a change too quickly is one of the challenges in implementing the best-value process. The researchers recommended implementing the change slowly and documenting the results.

*2.4.1.5 Measurement of Performance Benchmarks*

There is a lack of consensus in the existing literature on how to measure the implementation of organizational change (Hughes, 2011). The purpose of the measurement is to identify areas of weakness and benefits of the new implementation in order to sustain the new process long-term. Kanter *et al.* (1992) emphasized the significance of sustaining the change by continuously providing feedback techniques to record organizational change performance in terms of results metrics and process metrics. Zhao *et al.* (2015) found that the lack of a set of metrics for measuring performance is a barrier to implementing enterprise risk management in Chinese construction firms.

*2.4.1.6 Effective Change Agents*

Owner organizations that seek to change should identify a core group of change agents to lead the transition. The role of change agents is to engage in day-to-day aspects

of the change implementation. Hunsucker and Loos (1989) defined change agents as internal champions of the change who lead the transition. Wong and Zhang (2013) studied the implementation of a web-based project management system in China and found that one of the key success factors is the presence of an internal champion. Sullivan *et al.* (2011) emphasized that change agents should have operational-level knowledge of the problems and desired solutions because this knowledge enables the individuals to effectively lead the change. Change agents are responsible for regularly reporting implementation progress to the executive leaders and for identifying any organizational barriers that exist (Lines *et al.*, 2014b). Another significant responsibility of change agents is to provide change-related training to affected employees (Said, 2015).

*2.4.1.7 Workload Adjustments*

Organizations should consider how the change will affect the workloads of affected employees. For example, these employees who participated in organizational change adoption will likely need to attend change-related meetings and training added to their workloads. In a quantitative study in the Australian construction industry, Peansupap and Walker (2006) found that one of the barriers to successfully implementing information communication technology is the limited time employees have available to participate in the implementation process. Pheng and Teo (2004) recommended that employees need to be shown how to reallocate their time and energy.

*2.4.2 Survey Method*

A pilot survey was distributed to several participants via e-mail. Based on the participants' suggestions, the survey was revised. The final survey was then sent via e-mail

to collect feedback from AEC owners regarding their experience with organizational change management for APDM adoption. Conducting a survey via e-mail is a widely used data collection method because it is an easy way to reach a large number of potential participants.

The survey was organized into four main sections (see Appendix A). In the first section, respondents were asked to describe the APDM change that their organizations implemented. In the second section, respondents were asked to rate the effectiveness of the seven OCM practices (independent variables) selected based on the literature review. The respondents were also asked to rate how successful the APDM adoption initiatives were (dependent variables). The respondents rated the effectiveness of the OCM practices and the APDM adoption measures through using a 7-point Likert-type ordinal scale, with responses ranging from "strongly disagree" to "strongly agree." The scale was developed to measure participants' agreement or disagreement with a particular statement (Likert, 1932). The OCM practices and APDM adoption measures are summarized in Table 3. In the third section, respondents were asked whether their organizations hired an external organizational change management consultant to assist with implementing the change. In the fourth section, respondents provided general information about themselves, including their current positions and years of professional experience, and information about their organizations.

**Table 3. List of OCM practices and APDM adoption measures**

| OCM Practices Abbreviation | Definition |
| --- | --- |
| Senior-Leadership Commitment | The organization's senior leadership was committed to making the change a success ("walked the talk") |
| Sufficient Change-Related Training | Employees had a clear understanding of the action steps for how to implement the change within their job functions. |
| Effective Communication about Change | Employees had a clear idea of how the change would benefit them personally (within their job function). |
| Realistic Timeframe | The timescale/speed that the organization implemented the change was realistic and achievable. |
| Measurement of Performance Benchmarks | The organization established clear benchmarks to measure success compared to previous performance. |
| Effective Change Agents | The "change agents" (or transition team) responsible for managing the change within the organization were effective. |
| Workload Adjustments | The organization leadership had appropriately adjusted the workloads to increase the capacity for staff to focus on the implementation of the change. |

| APDM Adoption Measure Abbreviation | Definition |
| --- | --- |
| Adopted as Intended | The organizational change was successfully adopted as intended. |
| Achieved Beneficial Impacts | The organization achieved the beneficial impacts and performance gains that were desired from the change initiative. |
| Sustained Long-Term | The organization sustained the change into its long-term operations (or is currently on track to sustain the change). |

Potential respondents' e-mail addresses were obtained through browsing the websites of public sector organizations (e.g., state, county, and city agency, university, and school districts), private companies, and professional groups in the AEC industry in the

United States. Of the e-mail addresses collected, 2,211 addresses from 712 organizations were randomly selected. The chosen individuals represented a broad spectrum of construction professionals, which enabled the study to obtain a balanced view. Of those invited to complete the survey, 140 individuals from 98 organizations did so, resulting in a response rate of 13.8%. The profiles of the respondents and their organizations are presented in Table 4.

As Table 4 shows, 87.9% of the respondents were from the public sector, while the remaining 12.1% were from the private sector. Almost half (44.3%) of the respondents were second-tier supervisors (regional managers and directors). Almost three-quarters (73.6%) of the respondents had more than 20 years of professional experience. One-third of the respondents worked for companies with more than 500 full-time employees and annual budgets of at least $500 million for construction.

**Table 4. Survey respondent characteristics**

| | | |
|---|---|---|
| No. of Responses | | 140 |
| No. of Organizations | | 98 |
| Organization Type | Frequency | Percentage (%) |
| Public | 123 | 87.9 |
| Private | 17 | 12.1 |
| Organization's Total Construction Spent Per Year | Frequency | Percentage (%) |
| Less than $10M | 15 | 10.7 |
| $10-30M | 15 | 10.7 |
| $30-49M | 8 | 5.7 |
| $50-99M | 20 | 14.3 |
| $100-499M | 29 | 20.7 |
| $500M+ | 50 | 35.7 |
| Unknown | 3 | 2.1 |
| Full-Time Employees | Frequency | Percentage (%) |
| Less than 10 | 17 | 12.1 |
| 10-19 | 14 | 10 |
| 20-49 | 26 | 18.6 |
| 50-99 | 12 | 8.6 |
| 100-499 | 21 | 15 |
| 500+ | 49 | 35 |
| Unknown | 1 | 0.7 |
| Years of Professional Experience | Frequency | Percentage (%) |
| Less than 5 years | 3 | 2.1 |
| 5-9 years | 10 | 7.1 |
| 10-19 years | 24 | 17.1 |
| 20-29 years | 50 | 35.7 |
| 30-39 years | 41 | 29.3 |
| 40+ years | 12 | 8.6 |
| Work Group | Frequency | Percentage (%) |
| Design and planning | 44 | 31.4 |
| Construction | 30 | 21.4 |
| Facilities operation and maintenance | 13 | 9.3 |
| Contracts and procurement | 29 | 20.7 |
| Other | 24 | 17.1 |
| Job Position | Frequency | Percentage (%) |
| Non-supervisory (front line / project team member) | 9 | 6.4 |
| First-Tier supervisor (project manager, crew lead) | 37 | 26.4 |
| Second-Tier supervisor (regional manager, director, etc.) | 62 | 44.3 |
| Senior Executive (AVP, VP, C-suite) | 30 | 21.4 |
| Unknown | 2 | 1.4 |
| Hired External OCM Consultant | Frequency | Percentage (%) |
| No | 118 | 84.3 |
| Yes | 22 | 15.7 |

*2.4.3 Methods of Survey Analysis*

The survey results were analyzed using the software program SPSS. First, the internal reliability of the three APDM adoption measures (adopted as intended, achieved

beneficial impacts, and sustained long-term) was assessed through using Cronbach's alpha. Second, principal component analysis was performed to establish a composite measure of the three measures; this composite measure, named the *change adoption construct*, represents the organization's level of success in adopting an APDM. Third, Spearman's rank-order correlation was used to test the bivariate relationships between individual OCM practices and APDM adoption measures. Forth, Spearman's correlation was also used to measure the change adoption construct in relation to the respondents' demographics. Finally, the Mann-Whitney U test was performed to compare how change-adoption success differed between organizations that hired an external OCM consultant and organizations that did not.

**2.5 Results and Discussion**

*2.5.1 APDM types and year of adoption*

AEC organizations in the United States adopt various APDMs. Table 5 shows how frequently each method was adopted at the respondents' organizations. In the survey, the respondents could select more than one method.

**Table 5. Summary of adopted APDMs**

| Project Delivery Method | Responses | |
|---|---|---|
| | Frequency (N) | Percent (%) |
| Design-Build (DB) | 101 | 35.80 |
| Construction Manager at Risk (CMAR) | 90 | 31.90 |
| Integrated Project Delivery (IPD) | 14 | 5.00 |
| Public-Private Partnerships (PPPs) | 52 | 18.40 |
| Other | 25 | 8.90 |

As shown in Table 5, the most commonly implemented APDM was DB (35.8%), followed by CMAR (31.9%). APDMs that were less commonly implemented were PPPs

(18.4%) and IPD (5.0%). In addition to these APDM approaches, which were listed in the survey, participants had the opportunity to type in other project delivery methods. Of the 25 respondents who typed in another project delivery method, 14 listed job order contracting.

Respondents were asked to identify when the APDM was adopted, with choices spanning five-year periods. As Table 6 shows, the period with the largest number of APDM adoptions was 2005–2009 (22.1%), followed by 2010–2014 (21.4%) and 2015–2019 (17.9%). Some of the respondents 17.9% did not indicate when the APDMs were adopted.

**Table 6. Frequency of APDM adoption based on time period**

| Period | Frequency (N) | Percent (%) |
| --- | --- | --- |
| Before 1990 | 1 | 0.70 |
| 1990 to 1994 | 2 | 1.40 |
| 1995 to 1999 | 9 | 6.40 |
| 2000 to 2004 | 17 | 12.10 |
| 2005 to 2009 | 31 | 22.10 |
| 2010 to 2014 | 30 | 21.40 |
| 2015 to 2019 | 25 | 17.90 |
| Unknown | 25 | 17.90 |

*2.5.2 Reliability of the change adoption construct*

As part of the analysis, Cronbach's alpha was used to measure the internal consistency reliability of the three APDM adoption measures (dependent variables): adopted as intended, achieved beneficial impacts, and sustained long-term. In this study, Cronbach's alpha was 0.877, which was higher than the acceptable threshold of 0.7 (Cronbach, 1951; Kline, 2015). The alpha value indicated a high internal consistency among the three APDM adoption measures.

Principal component analysis with varimax rotation was performed to establish the change adoption construct, based on the three APDM adoption measures. The appropriateness of the data for factor analysis was verified through using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and through using Bartlett's test of sphericity. Tabachnick *et al.* (2007) suggested that if KMO exceeds 0.6 and Bartlett's test of sphericity is significant ($p < 0.05$), the data are appropriate for conducting factor analysis. As Table 7 shows, the KMO was 0.723, and Bartlett's test of sphericity was large (chi-square = 224.06) and statistically significant (*p*-value of 0.000). Hence, the data were appropriate for factor analysis, which means that there was no need to eliminate any of the variables for the principal component analysis.

**Table 7. KMO and Bartlett's Test results**

| Test | | Variables |
| --- | --- | --- |
| | | **Change Adoption Construct** |
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | | 0.723 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 224.06 |
| | df | 3 |
| | Sig. | 0.000 |

*2.5.3 Relationships between OCM practices and APDM adoption*

Spearman's rank-order correlation was used to investigate the bivariate relationships between individual OCM practices and APDM adoption measures (including the change adoption construct). Spearman's correlation was chosen because the independent variables were ordinal (McClure, 2005). To interpret the size of the effect, Field (2013) recommended that a correlation coefficient between 0.1 and 0.3 indicates a

small effect; between 0.3 and 0.5, a medium effect; and above 0.5, a large effect. The results of Spearman's correlation analysis at a 1% significant level (two-tailed) are shown in Table 8.

**Table 8. Spearman's correlation of OCM practices and APDM adoption measures**

| No. | Variable abbreviation | 1 | 2 | 3 | 4 | 5 | 6 | 7 | A | B | C | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Senior-Leadership Commitment | 1 | - | - | - | - | - | - | - | - | - | - |
| 2 | Sufficient Change-Related Training | 0.471 | 1 | - | - | - | - | - | - | - | - | - |
| 3 | Effective Communication about Change | 0.307 | 0.616 | 1 | - | - | - | - | - | - | - | - |
| 4 | Realistic Timeframe | 0.502 | 0.629 | 0.520 | 1 | - | - | - | - | - | - | - |
| 5 | Measurement of Performance Benchmarks | 0.411 | 0.498 | 0.336 | 0.537 | 1 | - | - | - | - | - | - |
| 6 | Effective Change Agents | 0.517 | 0.554 | 0.537 | 0.651 | 0.559 | 1 | - | - | - | - | - |
| 7 | Workload Adjustments | 0.520 | 0.498 | 0.326 | 0.531 | 0.542 | 0.563 | 1 | - | - | - | - |
| A | Adopted as Intended | 0.528 | 0.536 | 0.470 | 0.685 | 0.414 | 0.635 | 0.519 | 1 | - | - | - |
| B | Achieved Beneficial Impacts | 0.399 | 0.459 | 0.464 | 0.585 | 0.435 | 0.567 | 0.377 | 0.726 | 1 | - | - |
| C | Sustained Long-Term | 0.399 | 0.344 | 0.365 | 0.517 | 0.353 | 0.502 | 0.424 | 0.690 | 0.647 | 1 | - |
| D | Change Adoption Construct | 0.487 | 0.486 | 0.451 | 0.636 | 0.422 | 0.620 | 0.491 | 0.886 | 0.863 | 0.888 | 1 |

Note: all correlations were significant at the 0.01 confidence level (2-tailed).

All bivariate relationships between the OCM practices and APDM adoption measures were positive to a statistically significant degree. Relying on the change adoption construct as a measure for the organization's level of the successful APDM adoption, two of the seven correlations had a large effect, while the other five correlations had a medium effect. There were no weak relationships found between OCM practices and successful APDM adoption. The OCM practice most strongly correlated with successful APDM adoption was realistic timeframe ($r_s = 0.636$, $p < 0.001$), followed closely by effective change agents ($r_s = 0.620$, $p < 0.001$). Three practices had roughly the same moderate correlation: workload adjustments ($r_s = 0.491$, $p < 0.001$), senior-leadership commitment ($r_s = 0.487$, $p < 0.001$), and sufficient change-related training ($r_s = 0.486$, $p < 0.001$). The practice with the sixth strongest correlation, which is a medium strength, was effective communication about the change ($r_s = 0.451$, $p < 0.001$). The practice with the smallest correlation, though still of medium strength, was measurement of performance benchmarks ($r_s = 0.422$, $p < 0.001$).

The bivariate correlations between the seven OCM practices and the change adoption construct are consistent with the findings of Lines and Smithwick (2019), who examined best practices for OCM in the electrical contracting industry. For example, in this study, the OCM practices most strongly associated with successful APDMs were realistic timeframe and effective change agents. These practices were likewise identified by Lines and Smithwick as the OCM practices most strongly correlated with successfully adopting organizational change. Further, in both studies, the OCM practices that had the

smallest association with successful change adoption were effective communication about the change and measurement of performance benchmarks.

Investigating the correlation between the OCM practices and each measure of change adoption (adopted as intended, achieved beneficial impacts, and sustained long-term) revealed that the bivariate correlations were largely similar to the change adoption construct correlations described above. The one major difference was that workload adjustments was the OCM practice with the weakest relationship with the achieved beneficial impacts, whereas this practice had the third-strongest relationship with the change adoption construct.

*2.5.4 APDM adoption construct in relation to respondent demographics*

Correlation analysis was used to investigate the correlations between the change adoption construct and the independent variables in relation to the respondents' demographics (organization type, organization size, years of professional experience, work group, job position, and with or without hiring an OCM consultant). The analysis results are summarized in Table 9 and also described below.

**Table 9. Correlation results for the change adoption construct by demographic variables**

| Category | Subcategory | Senior-Leadership Commitment | Sufficient Change-Related Training | Effective Communication about Change | Realistic Timeframe | Measurement of Performance Benchmarks | Effective Change Agents | Workload Adjustments |
|---|---|---|---|---|---|---|---|---|
| Organization Type | Public | 0.490 | 0.482 | 0.455 | 0.636 | 0.440 | 0.617 | 0.516 |
| | Private | 0.404 | 0.522 | 0.440 | 0.652 | 0.225 | 0.674 | 0.227 |
| Organizational Size | Less than $10M | 0.617 | 0.555 | 0.603 | 0.511 | 0.410 | 0.776 | 0.759 |
| | $10-30M | 0.159 | 0.476 | 0.736 | 0.464 | 0.336 | 0.557 | 0.296 |
| | $30-49M | 0.564 | 0.462 | 0.428 | 0.830 | 0.327 | 0.925 | 0.641 |
| | $50-99M | 0.180 | 0.528 | 0.442 | 0.713 | 0.615 | 0.519 | 0.477 |
| | $100-499M | 0.432 | 0.443 | 0.423 | 0.651 | 0.477 | 0.685 | 0.439 |
| | $500M+ | 0.609 | 0.519 | 0.386 | 0.667 | 0.468 | 0.566 | 0.474 |
| | Less than 10 | 0.579 | 0.592 | 0.554 | 0.573 | 0.518 | 0.719 | 0.652 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Full-Time Employees | 10-19 | 0.273 | 0.275 | 0.366 | 0.573 | 0.207 | 0.269 | -0.093 |
| | 20-49 | 0.316 | 0.285 | 0.426 | 0.686 | 0.319 | 0.632 | 0.473 |
| | 50-99 | 0.208 | 0.199 | 0.175 | 0.859 | 0.231 | 0.502 | 0.341 |
| | 100-499 | 0.661 | 0.494 | 0.269 | 0.620 | 0.416 | 0.705 | 0.685 |
| | 500+ | 0.609 | 0.461 | 0.456 | 0.682 | 0.542 | 0.664 | 0.595 |
| Experience | Less than 10 | 0.531 | 0.250 | 0.533 | 0.436 | 0.173 | 0.588 | 0.238 |
| | 10-19 years | 0.763 | 0.681 | 0.486 | 0.733 | 0.574 | 0.686 | 0.846 |
| | 20-29 years | 0.378 | 0.526 | 0.539 | 0.652 | 0.493 | 0.659 | 0.490 |
| | 30-39 years | 0.584 | 0.452 | 0.305 | 0.592 | 0.354 | 0.593 | 0.391 |
| | 40+ years | 0.122 | 0.428 | 0.258 | 0.696 | 0.146 | 0.329 | -0.050 |
| Work group | Design and planning | 0.402 | 0.610 | 0.446 | 0.647 | 0.378 | 0.580 | 0.527 |
| | Construction | 0.452 | 0.507 | 0.288 | 0.703 | 0.401 | 0.616 | 0.480 |
| | Facilities operation and maintenance | 0.542 | 0.297 | 0.484 | 0.612 | 0.369 | 0.709 | 0.589 |
| | Contracts and procurement | 0.524 | 0.424 | 0.625 | 0.557 | 0.348 | 0.621 | 0.333 |
| | Other | 0.688 | 0.450 | 0.484 | 0.723 | 0.712 | 0.708 | 0.626 |
| Job Position | Non-supervisory (front line / project team member) | 0.693 | 0.459 | 0.435 | 0.671 | 0.155 | 0.000 | 0.268 |
| | First-Tier supervisor (project manager, crew lead) | 0.466 | 0.702 | 0.524 | 0.636 | 0.414 | 0.591 | 0.396 |
| | Second-Tier supervisor (regional manager, director, etc.) | 0.360 | 0.417 | 0.454 | 0.604 | 0.374 | 0.621 | 0.512 |
| | Senior Executive (AVP, VP, C-suite) | 0.634 | 0.463 | 0.466 | 0.678 | 0.625 | 0.816 | 0.611 |
| Hiring an External OCM Consultant | No | 0.458 | 0.531 | 0.470 | 0.610 | 0.423 | 0.609 | 0.492 |
| | Yes | 0.637 | 0.256 | 0.443 | 0.805 | 0.394 | 0.683 | 0.426 |

*Organization Type -* In both public and private organizations, the OCM practices most highly correlated with successful APDM adoption were realistic timeframe and

effective change agents. In contrast, the practices least correlated with adoption success in private organizations were measurement of performance benchmarks and workload adjustments.

*Organizational Size -* In organizations spending more than $30 million on construction per year, the OCM practices most correlated with successful APDM implementation was realistic timeframe. Conversely, in organizations spending less than $10 million annually on construction, workload adjustments and effective change agents were more correlated with successful implementation. A potential explanation for the difference is that workload adjustments are more critical in organizations with smaller budgets, because these organizations have fewer employees and these employees complete a variety of tasks, potentially leading to heavy workloads. Based on the category of the full-time employee, the bivariate relationships were similar to the bivariate relationships of the organizational size described above.

*Years of Professional Experience -* Respondents with fewer than 10 years of experience, recognized the involvement of effective change agents to have the strongest correlation with the successful APDM adoption. An explanation for that the less-experienced employees perceive the need to be trained and communicated by the change agents. Among respondents with more than 20 years of experience, the OCM practice with the highest correlation to successful APDM adoption was realistic timeframe.

*Work Group -* Respondents working in design and planning departments identified sufficient training resources and realistic timeframe as being of the greatest importance, whereas employees working in contract and procurement departments considered effective

communication about the change and participation of effective change agents as being essential to APDM adoption. Respondents in facilities operation and maintenance departments and in construction departments emphasized the importance of realistic timeframe and effectiveness of change agents for adopting new project delivery approaches within their departments.

*Job Position* - Respondents in non-supervisory roles (e.g., frontline personnel and project team members) appeared to agree on the importance of senior-leadership commitment in driving APDM adoption. One explanation for this finding is that frontline personnel show more resistance to change than do their supervisors and company executives (Lines *et al.*, 2016). Erdogan *et al.* (2008) found that when senior managers increase their organizational commitment, employee resistance is lower. As Table 9 shows, the higher the respondents' position in the organizational hierarchy, the more the presence of effective change agents was perceived as more critical to leading the change implementation.

*Hire an External OCM Consultant -* Regarding organizations that hired external consultants compared to organizations that did not, there were no differences in how strongly the OCM practices were correlated with the success of APDM adoption. However, sufficient change-related training was found to be an unimportant factor for respondents from organizations that utilized consultants.

*2.5.5 Significance of using an OCM consultant*

The Mann-Whitney U test was performed to identify whether there was a statistically significant difference in the responses of participants at organizations that hired

OCM consultants and organizations that did not. The Mann-Whitney U test was appropriate for the study rather than t-tests because the data were not normally distributed (Field, 2013). According to the results of the Mann-Whitney test (see Table 10), the difference between the mean ranks of the two groups was relatively close, indicating there was no statistically significant difference in the success of APDM adoption ($p = 0.280$) between the two groups. In other words, successful APDM adoptions within the AEC industry in both groups were similar to each other. This result suggests the insignificance of the role of external OCM consultants when implementing APDMs in AEC organizations.

**Table 10. A summary result of the Mann-Whitney U test**

| Variable | | Mean Rank | Mann–Whitney $U$ | Z | $p$ |
|---|---|---|---|---|---|
| Utilized an external OCM consultant | Yes | 78.4 | 1101.0 | -1.08 | 0.280 |
| | No | 68.4 | | | |

Note: Dependent Variable: Change Adoption Construct.

## 2.6 Conclusion and Contributions

Organizational change is often needed over time, and organizations can increase the probability of successfully adopting the change by applying OCM practices. This study aimed to identify which OCM practices that AEC owner organizations use are correlated with successful change adoption.

A comprehensive review of the literature was conducted to identify OCM practices, and these practices were later examined through surveying employees at AEC

organizations in the United States. The results indicate that the five OCM practices with the strongest correlations to successful APDM adoption are realistic timeframe, effective change agents, workload adjustments, senior-leadership commitment, and sufficient change-related training. Surprisingly, this study also found that traditional methods of OCM consultants to help implement organizational change does not have a significant impact on the success of adopting APDMs.

Although numerous studies have been conducted on implementing organizational change in AEC organizations, the majority of these studies have focused on implementing software, other technology, and risk management programs. The current study was the first to focus on the use of OCM practices when adopting APDMs in the AEC industry. The study contributes to the literature and to industry professionals by providing a better understanding of the relationships between OCM practices and the success of APDM adoption. AEC organizations can use the findings to determine which OCM practices to use when implementing APDMs. Applying the OCM practices with the strongest correlations to implementation success may help AEC organizations increase their likelihood of successfully adopting APDMs.

**2.7 Limitations and Recommendations for Future Research**

This study has several limitations that can be addressed in future research. First, the number of survey respondents was relatively small ($n = 140$). Second, the respondents in the public sector ($n = 123$) far outnumbered respondents in the private sector ($n = 17$). Consequently, the results may be skewed toward the public sector. Third, participation was limited to individuals in the United States. Fourth, only seven OCM practices were

examined in this study. Future research could include a larger sample size, a more even number of respondents from public and private institutions, individuals from other countries, and other OCM practices. Additionally, future researchers could validate the results of this study through conducting case studies on the use of OCM practices when adopting APDMs to show the benefits of using OCM practices.

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# CHAPTER 3: EMPLOYEE REACTIONS TO ADOPTION OF ALTERNATIVE PROJECT DELIVERY METHODS WITHIN THE AEC INDUSTRY

## 3.1 Abstract

The implementation of alternative project delivery methods (APDMs) in the architecture, engineering, and construction (AEC) industry has increased in recent years. Yet implementation of these methods requires an organizational change effort. One of the challenges facing organizations that are implementing organizational change initiatives is employee resistance to change. The aim of this study was to investigate AEC employees' reactions to the adoption of APDMs and to examine the methods used to communicate the APDM adoption to employees. To achieve the aim, survey responses were collected from 140 respondents across AEC owner organizations in the United States. The results indicate that employees in AEC organizations react favorably to adopting a change in their project delivery systems. The results further reveal that increasing the use of organizational change management (OCM) practices is related to decreased employee resistance to change. Surprisingly, employee reactions do not mediate the relationship between OCM practices and APDM adoption. The findings also indicate that the most effective ways to disseminate change messages to employees are presentations, on-the-job support, and meetings. The findings of this study may be useful for change practitioners in which employees' reactions toward the changes in project delivery methods are more supportive than resistive to change.

**3.2 Introduction**

Owner organizations have typically used the traditional design-bid-build (DBB) delivery method along with the low-bid system to award construction project contracts (Tran et al., 2016). However, over the last few decades, owner organizations have increasingly used alternative project delivery methods (APDMs), such as design-build (DB) and construction management at-risk (CMAR), due to their numerous advantages (El Wardani et al., 2006). For owner organizations, adopting a new method to procure services for the delivery of architecture, engineering, and construction (AEC) projects requires significant organizational change efforts. Implementing a new project delivery method is considered an organizational change because the adoption affects the processes in the organization (Migliaccio et al., 2008). Organizations may not be able to successfully adopt a change in project delivery methods unless the employees accept the change. Willingness to accept change could be difficult to achieve in the AEC industry, where conventional project delivery processes have typically been built up through decades of practice and experience (Migliaccio et al., 2008; Lines et al., 2016).

Organizational leaders should attempt to foster favorable employee reactions toward organizational change (Lines et al., 2016). Organizations should also overcome negative feelings about change by providing the benefits that the change will bring and the need for change. Facilitating positive reactions among employees will increase the likelihood that the change will be successfully adopted.

It was widely recognized that employee reactions somehow affect change adoption in the past organizational change literature (Giangreco & Peccei, 2005; Self & Schraeder,

2009). Very little research exists regarding how employees in AEC organizations react to organizational change. To address this gap in the literature, this study aimed to measure how employees in AEC organizations react to the adoption of APDMs, such as Design-Build (DB) and Construction Management At-Risk (CMAR), Integrated Project Delivery (IPD), and Public-Private Partnerships (PPPs). This study also examined whether a relationship exists between employees' responses to change and the success of implementing the change. Measuring how the AEC employees respond to APDM adoption significantly contributes to the literature as past studies have not investigated this topic on an industrywide scale. This study also provides an understanding of the extent that the AEC industry reacts favorably or unfavorably to organizational change adoptions in comparison with other industry sectors.

## 3.3 Literature Review

### 3.3.1 Employees' Reactions to Organizational Change

Bovey and Hede (2001a, 2001b) presented the following categories of employee behaviors regarding organizational change: resistant versus supportive, passive versus active, and overt versus covert. In another study, Lines (2005) categorized a range of behaviors toward organizational change as positive or negative and as strong or weak. Herscovitch and Meyer (2002) categorized employee reactions as favorable or unfavorable. Elrod and Tippett (2002) suggested that organizational change causes employees to experience phases of the grief process identified by Kubler-Ross: denial, anger, bargaining, depression, and acceptance. Employees may not achieve the acceptance phase if they are not supported by leaders (Elrod & Tippett, 2002). When personnel remains resistant to

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organizational change, this resistance can have a significant effect on implementation success. Personnel support is critical for success in organizational change initiatives (Jansen et al., 2009), whereas personnel resistance is the most significant barrier (Peansupap & Walker, 2005).

Resistance to change was defined as any form of dissent that slows, obstructs, opposes, or stops an organizational change process (Maurer, 1996; Giangreco & Peccei, 2005). How employees resist change varies based on their characteristics. Hultman (2006) classified resistance to change into two forms: passive and active behaviors. Active resistance includes behaviors such as finding fault with the organizational change, appealing to fear, ridiculing the change, and manipulating to hinder the change. Passive resistance includes behaviors such as agreeing verbally to participate but not following through, feigning ignorance, and withholding information relevant to the change initiative (Bolognese, 2002).

Many researchers have identified reasons why personnel resist change. The reasons include a lack of information and knowledge, fear of the unknown, fear of failure, lack of perceived rewards, and loss of power (Ford et al., 2002; Hoag et al., 2002; Luecke, 2003; Proctor & Doukakis, 2003). According to Schulz-Knappe et al. (2019), individuals with low self-efficacy are more likely to resist change than are individuals with higher self-efficacy. These researchers also noted that resistance is more likely when employees have limited trust in managers and when change implementation is rushed. Leaders need to understand these reasons in order to address resistance. Rosenberg and Mosca (2011)

organized the significant reasons into three groups: personal factors, organizational factors, and factors that are particular to the change.

*3.3.2 Relationship between Resistance to Change and Success of Change Adoptions*

Many researchers have identified resistance to change as a significant barrier to implementing change initiatives in the AEC industry (Henderson & Ruikar, 2010; Ozorhon et al., 2013; Loosemore & Cheung, 2015; Liao & Teo, 2018). For example, resistance to change is a critical hindrance to implementing BIM in people management (Liao & Teo, 2018). Chan et al. (2016) identified that resistance to change is the most critical barrier to implementing green-building technologies. Loosemore and Cheung (2015) found that resistance to change is one of the main barriers to adopting systems thinking to manage risk in public-private partnership (PPP) projects. Additionally, Ozorhon et al. (2013) noted that employees' resistance to change must be overcome in order to successfully adopt modern methods of construction and lean production. Zhao et al. (2014) found that resistance to organizational change is linked to critical hindrances in implementing enterprise risk management. Specifically, most of the critical hindrances are linked to a "lack of commitment of the board and senior management." This obstacle has a large impact because without commitment, leaders do not invest in sufficient resources and do not facilitate needed communication and training.

In contrast to researchers who consider employee resistance to be negative, Courpasson et al. (2012) asserted that resistance can be productive, leading to organizational decisions that address employees' needs and perspectives. Schulz-Knappe et al. (2019) explained that resistance to change can be beneficial if personnel resist the

change because of flaws in the proposed change initiative and then management implements strategies to address the flaws.

### 3.3.3 Organizational Change Management Practices and Relationship with Employee Reactions to Organizational Change

Because of the large effect on whether change initiatives are successful, resistance to change is an important issue that needs to be addressed (Mabin et al., 2001). Researchers have presented specific organizational change management (OCM) practices that can reduce resistance to organizational change. Henderson and Ruikar (2010) observed that in order to overcome resistance to implementing new technologies in construction organizations, the following practices are needed: communication, education and training regarding the change, and involvement in the change implementation process. These practices are discussed in the following paragraphs.

Information about the change that will take place and how it will affect the organization and its employees is necessary. Wanberg and Banas (2000) found a positive correlation between information received about organizational change and employees' openness to organizational change. Similarly, Lewis (2006) found that resistance to change is inversely correlated with the perceived quality of information about the change initiative. In addition to improving employees' attitude to the change, information may reduce employee uncertainty and anxiety about the change (Schweiger & Denisi, 1991). Erdogan et al. (2005) concluded that if resistance comes from a lack of information, organizations can overcome the resistance through communication and education about the change. Other researchers have argued that managers must not only prove that there is a need for

change but also give employees sufficient information that indicates the proposed change initiative is appropriate (Self & Schreader, 2009).

Erwin and Garmin (2010) and Rosenberg and Mosca (2011) reported that a lack of employee participation in change initiatives causes resistance. Henderson and Ruikar (2010) noted that employees in the lowest hierarchical level of an organization are the least involved in the implementation process but are the most affected by organizational changes. This lack of participation may be one reason that frontline personnel shows a less favorable response to change implementation than do supervisors and executives (Lines et al., 2016). According to Schweiger et al. (2018), employee participation decreases resistance because the participation increases awareness of why the change is needed, gives employees an opportunity to negotiate and reach compromises with leaders, increases employees' feelings of empowerment, and increases employees' trust in change agents.

Employees' resistance to change is influenced by managers' commitment to the change initiative. When senior leaders do not view a change as a priority, the organization's other employees may ignore change efforts or view the change as unnecessary. Senior leaders must support the change through participating in the change process (Fernandez & Rainey, 2006). Erdogan et al. (2008), who studied the implementation of collaboration systems in construction organizations, found that when senior managers increase their commitment to their organization, employee resistance lowers. Another study, by Xerri et al. (2014), supports the claim that if employees receive adequate organizational support, they may have higher levels of affective organizational commitment.

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Organizational leaders must also implement the change initiative appropriately. When employees perceive that the change implementation is not procedurally fair, their initial acceptance of the change may decrease. For employees to view the implementation as procedurally fair, leaders must ensure that employees have an opportunity to provide input on the change and that employees feel their input is important to leaders (Jiao & Zhao, 2013).

Several researchers have examined the relationship between change agents' involvement and employees' resistance to organizational change (Lines et al., 2015, 2016). Change agents are crucial in implementing change. They play a significant role in overcoming employee resistance to change by clarifying the benefits and the need for change. Lines et al. (2015) found that AEC owner organizations that designated change agents to lead the implementation of a new project delivery system encountered less resistance than organizations that did not designate change agents. However, change agents can increase employee resistance when the change agents expect employees to be resistant, when the change agents break agreements and violate trust, and when the change agents do not communicate effectively regarding the change (Ford et al., 2008). For change agents to be effective, they should first build positive working relationships with the employees implementing the change initiative. This relationship contributes to employees' commitment to the organizational change initiative and, thus, decreases resistance to the change (Xerri et al., 2014).

Employees' first reactions to new business processes are often shock and a feeling of insecurity (Luecke, 2003). If employees are not clearly informed of the benefits that the

change will bring, they will feel stressed and will resist change because of uncertainty regarding the results and how to perform their tasks (Bourne et al., 2002; Wolpert, 2010). To reduce fear and uncertainty among organizational members, extensive change-related training is necessary (Wolpert, 2010). Henderson and Ruikar (2010) noted that education and training should come before any change to ensure that employees are ready for the change. Similarly, Lines et al. (2016) recommended that information regarding the change needs to be conveyed to employees prior to implementing the change. Cameron and Quinn (1999) emphasized that the change message should not only explain the benefits of the change but also explain the problems associated with not implementing the change.

*3.3.4 Methods of Communicating Organizational Change to Employees*

Many researchers have mentioned the significance of effective communication in reducing employees' resistance to change (e.g., Kitchen & Daly, 2002; Proctor & Doukakis, 2003). Researchers on the AEC construction have identified methods for communicating information about a change within an organization. Singh and Shoura (1999) asserted that leaders should communicate information about the change through newsletters, memos, and bulletin boards. Lai et al. (2011) recommended providing employees with information about the change and occasionally requesting feedback from employees. Pheng and Hui (2004) found that relevant training is essential for employees involved in implementing Six Sigma in construction organizations. Balogun and Hailey (2008) emphasized that when change is communicated to employees early in the implementation process, employees have enough time to understand the change and are therefore less resistant to the change. Oreg (2006) warned that communicating a large

amount of information can increase resistance. One potential reason is that if employees already oppose the change for logical reasons, then the more information they receive, the more strongly they will resist the information and the change (Oreg, 2006).

**3.4 Research Objectives and Questions**

The objectives of this study were threefold. The first objective was to measure how AEC employees react to the adoption of APDMs in their organizations. The second objective was to determine whether employee reactions mediate the relationship between OCM practices and successful APDM adoption. The third objective was to investigate methods of communicating change-related training throughout an organization.

In this study, three research questions were formulated in order to achieve the research objectives:

1- How do AEC employees react to APDM adoption in their organizations?

2- Do employee reactions mediate the relationship between OCM practices and APDMs adoption?

3- What methods do AEC organizations use to communicate APDM adoption process to employees?

**3.5 Study Methodology**

Data were collected through an online survey. The specific survey tool was selected because it provided flexibility in creating and distributing the survey and because it eased the process of reaching large numbers of potential participants. The survey was designed to collect information about employees' reactions to APDM adoption, methods of communicating the adoption, and the effectiveness of seven OCM practices and three

APDM adoption measures. The effectiveness of the OCM practices and APDM adoption measures (see Table 11), were rated through using a 7-point Likert-type ordinal scale (7 = strongly agree, 6 = agree, 5 = somewhat agree, 4 = neutral, 3 = somewhat disagree, 2 = disagree, and 1 = strongly disagree). The APDM adoption measures were focused on quantifying the extent to which the organization successfully executed an organizational change of adopting APDMs. Three measurements of successful adoption of APDMs in the AEC industry have been identified from studies on organizational change within the AEC industry in the United States (Lines and Smithwick 2019) and internationally (Lines and Vardireddy 2017).

**Table 11. List of OCM practices and APDM adoption measures**

| OCM Practices Abbreviation | Definition |
|---|---|
| Senior-Leadership Commitment | The organization's **senior leadership** was committed to making the change a success ("walked the talk"). |
| Sufficient Change-Related Training | Employees had a clear **understanding** of the action steps for **how to implement** the change within their job function. |
| Effective Communication about Change | Employees had a clear idea of how the change would **benefit** them personally (within their job function). |
| Realistic Timeframe | The **timescale/speed** that the organization implemented the change was **realistic** and achievable. |
| Measurement Performance Benchmarks | The organization established clear **benchmarks** to measure success compared to previous performance. |
| Effective Change Agents | The "**change agents**" (or transition team) responsible for managing the change within the organization were effective. |
| Workload Adjustments | The organization leadership had appropriately **adjusted the workloads** to increase capacity for staff to focus on the implementation of the change. |

| APDM Adoption Measures Abbreviation | Definition |
|---|---|
| Adopted as Intended | The organizational change was successfully **adopted** as intended. |
| Achieved Beneficial Impacts | The organization achieved the beneficial impacts and performance **gains** that were desired from the change initiative. |
| Sustained Long-Term | The organization **sustained** the change into its long-term operations (or is currently on track to sustain the change). |

The survey was tested in February 2019 by five pilot participants who were experienced in this research area. These participants recommended minor changes to the clarity of questions and terminology, and then the survey was revised accordingly. Once the survey was finalized, an invitation email was created to provide potential participants with information about the survey and the study's objectives. The survey was conducted between March and April of 2019. The survey is provided in Appendix A.

The data sample involved in this study included AEC owner organizations across the United States. A wide range of AEC representatives were targeted to participate in the

survey. Email addresses were collected by browsing the websites of private, public organizations, and multiple professional groups. A total of 2,211 email addresses from 712 organizations were gathered. In all, 140 individuals from 98 organizations completed the survey, for a response rate of 13.8%. The data were screened and then analyzed to answer the research questions. Table 12 presents data regarding the survey respondents and their organizations. According to the data, 87.9% of the respondents had worked in the public sector, whereas 12.1% had worked in the private sector. Further, 44.3% of the respondents worked in second-level supervisory positions, such as that of regional manager and director. Additionally, 73.6% of the respondents had 20 or more years of professional experience.

**Table 12. Data regarding survey respondents and their organizations**

| Organization Type | Frequency | Percentage (%) |
|---|---|---|
| Public | 123 | 87.9 |
| Private | 17 | 12.1 |

| Organization's Total Construction Spent Per Year | Frequency | Percentage (%) |
|---|---|---|
| Less than $10M | 15 | 10.7 |
| $10–30M | 15 | 10.7 |
| $30–49M | 8 | 5.7 |
| $50–99M | 20 | 14.3 |
| $100–499M | 29 | 20.7 |
| $500M+ | 50 | 35.7 |
| Unknown | 3 | 2.1 |

| Full-Time Employees | Frequency | Percentage (%) |
|---|---|---|
| Less than 10 | 17 | 12.1 |
| 10–19 | 14 | 10 |
| 20–49 | 26 | 18.6 |
| 50–99 | 12 | 8.6 |
| 100–499 | 21 | 15 |
| 500+ | 49 | 35 |
| Unknown | 1 | 0.7 |

| Work Experience | Frequency | Percentage (%) |
|---|---|---|
| Less than 5 years | 3 | 2.1 |
| 5–9 years | 10 | 7.1 |
| 10–19 years | 24 | 17.1 |
| 20–29 years | 50 | 35.7 |
| 30–39 years | 41 | 29.3 |
| 40+ years | 12 | 8.6 |

| Work Group | Frequency | Percentage (%) |
|---|---|---|
| Design & planning | 44 | 31.4 |
| Construction | 30 | 21.4 |
| Facilities operation & maintenance | 13 | 9.3 |
| Contracts & procurement | 29 | 20.7 |
| Other | 24 | 17.1 |

| Job Position | Frequency | Percentage (%) |
|---|---|---|
| Non-supervisory (front line / project team member) | 9 | 6.4 |
| First-tier supervisor (project manager, crew lead) | 37 | 26.4 |
| Second-tier supervisor (regional manager, director, etc.) | 62 | 44.3 |
| Senior executive (AVP, VP, C-suite) | 30 | 21.4 |
| Unknown | 2 | 1.4 |

Table 13 summarizes the APDMs that were adopted at the respondents'

organizations. The most commonly adopted APDM was DB (35.8%), followed by CMAR

(31.9%), PPP (18.4%), and IPD (5.0%). An additional 8.9% of participants selected other project delivery methods, such as the job-order contracting method.

**Table 13. Summary of adopted APDMs**

| Project Delivery Method | Responses | |
| --- | --- | --- |
| | Frequency (N) | Percent (%) |
| DB | 101 | 35.80 |
| CMAR | 90 | 31.90 |
| IPD | 14 | 5.00 |
| PPPs | 52 | 18.40 |
| Other | 25 | 8.90 |

## 3.6 Methods of Survey Analysis

### 3.6.1 Reliability and Principal Component Analysis

First, Cronbach's alpha was used to measure the internal reliability for the seven independent variables related to OCM practices (senior-leadership commitment, sufficient change-related training, effective communication about change, realistic timeframe, measurement of performance benchmarks, effective change agents, workload adjustments) and for the three dependent variables related to APDM adoption measures (adopted as intended, achieved beneficial impacts, and sustained long-term). After that, principal component analysis (PCA) was performed to establish a composite measure (called APDM adoption drivers) of the OCM practices. Likewise, PCA was performed to establish a composite measure (called change adoption construct) of the three APDM adoption measures. The change adoption construct was used to measure the success of adopting APDMs.

Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy were conducted to determine the appropriateness of the data for the

factor analysis. Tabachnick et al. (2007) indicated that if Bartlett's test of sphericity is significant ($p$-value $< 0.05$) and the KMO value is above 0.6, then the data is appropriate and factor analysis should be used.

*3.6.2 Spectrum of Employee Reactions to APDM Adoption*

The study participants selected up to three employee reactions that were most prevalent regarding APDM adoption. Eight types of reactions were measured, as shown in Table 14 These types of reactions were selected and categorized based on definitions in the literature (Bovey & Hede, 2001a, 2001b; Emiliani & Stec, 2004; Giangreco & Peccei, 2005; Fiedler, 2010; Lines et al., 2015).

**Table 14. Definitions of employee reactions**

| Region | Definition of Employee Reactions |
|--------|----------------------------------|
| **Favorable Reactions** | Initiating, Embracing, **Championing** the change |
| | **Actively Supporting** and Cooperating with the change |
| | **Passively Agreeing** with and Accepting the change |
| | **Reluctantly Complying** with the change |
| **Unfavorable Reactions** | Ignoring, Withdrawing, Avoiding the change (**covertly not participating**) |
| | Refraining, Waiting, Observing the change (**openly not participating**) |
| | Stalling, Dismantling, Undermining (**covertly opposing** the change) |
| | Obstructing, Opposing, Arguing (**openly opposing** the change) |

The data included in the analysis were categorized based on the level of success in adopting the APDM change (as measured by the change adoption construct). The three categories were beginner, intermediate, and expert. Beginners were defined as the bottom one-third of cases that had the least successful APDM adoption rates (change adoption

construct from 0 to 2.33). Intermediates were the middle one-third of APDM adoption cases (change adoption construct from 2.34 to 4.66). Experts were the top one-third of cases, which had the most successful APDM adoption rates (change adoption construct from 4.67 to 7). Beginner and expert groups were only analyzed when the differences could be significant. Bar charts were created to compare the average employee reactions to APDM adoption among the least successful APDM adoption (bottom 33%), the average, and the most successful APDM adoption (Top 33%) cases. The further investigation focused on finding the mean of employees' resistance to change based on the organization's characteristics, including organization type, size, and hiring OCM consultant to assist with adopting APDMs.

*3.6.3 Mediation Effect of Overall Employee Reactions to APDM Adoption*

Indirect mediation analysis was performed on the data using Hayes's (2013) process tool in SPSS to test whether the effect of the APDM adoption drivers (independent variables) on the change adoption construct (dependent variables) is mediated by the overall employee reactions to change (mediator variable). The mediation model of this study is illustrated in Figure 1. Reactions were measured on an 8-point Likert-type scale, ranging from 1 = "Initiating, Embracing, Championing the Change" to 8 = "Obstructing, Opposing, Arguing (Openly Opposing) the Change," (see Table 14). The average score for the top-three employee reactions was calculated.

Total Effect (c)= Direct effect ($c^1$) + Indirect Effect (a*b)
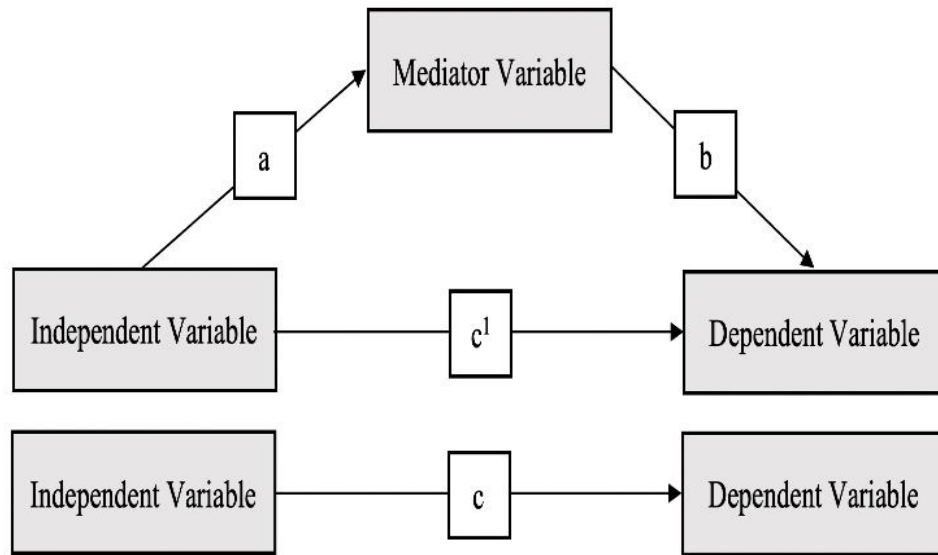


**Figure 1. The mediation model**

The direct effect ($c^1$) is the effect of an independent variable directly on a dependent variable after adjusting for the mediator. The indirect effect is the product of path coefficients "a" and "b," where "a" is the effect of the independent variable on the mediator and "b" is the effect of the mediator on the dependent variable. The indirect effect can also be estimated by calculating the difference between the total and direct effects ($c - c^1$). In the indirect or mediation effect, the effect of the independent variable on the dependent variable goes indirectly through the mediating variable as seen in the top diagram in Figure 1. The total mediation effect (c) is the total effect of the independent variables on the dependent variables without controlling for a mediator, as seen in the bottom diagram in Figure 1. The total effect is equal to the sum of the direct and indirect effects.

*3.6.4 Communication of Change-Related Training to Employees*

Participants selected up to three main ways that their organizations communicated change-related training to personnel. The main methods of communication were "speeches;" "informational presentations;" "memos and emails;" "instructional videos;" "instructional manuals, checklists, and/or guidebooks;" "interactive workshops and simulations;" "meetings and phone calls;" "on-the-project or on-the-job support;" and "other." Bar charts were created to compare the communication methods in the organizations with the least successful APDM adoption (bottom one-third), the average, and the most successful APDM adoption (top one-third).

**3.7 Results and Discussion**

*3.7.1 Reliability and Principal Component Analysis*

The internal reliability values were 0.922 for the OCM practices and 0.907 for the APDM adoption measures. These values were above the acceptable threshold of 0.7, indicating high data reliability (Cronbach 1951; Kline 2005).

PCA with varimax rotation was performed twice to establish APDM adoption drivers and the change adoption construct. The results (see Table 15) show that the KMO values were above 0.6 and that Bartlett's test of sphericity for both values was significant ($p$-value < 0.05), suggesting that the data were appropriate for factor analysis.

**Table 15. KMO and Bartlett's test results**

| Test | | Variables | |
|---|---|---|---|
| | | **APDM Adoption Drivers** | **Change Adoption Construct** |
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | | 0.895 | 0.721 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 266.643 | 106.437 |
| | df | 21 | 3 |
| | Sig. | 0.000 | 0.000 |

*3.7.2 Spectrum of Employee Reactions to APDM Adoption*

As shown in Figure 2, the analysis results indicate that the top-three employee reactions to APDM adoption were passively agreeing (23.6%), actively supporting (19.4%), and reluctantly complying (19.4%). The other reactions occurred significantly less frequently: championing (8.5%), covertly not participating (7.3%), openly not participating (12.1%), covertly opposing (4.2%), openly opposing (4.2%), and other reactions (1.2%). It is remarkable that approximately 70.9% of employee reactions to APDM adoption were favorable and that only 27.8% of the total employee reactions were unfavorable. These results indicate that most AEC employees reacted positively to changes in their project delivery systems.
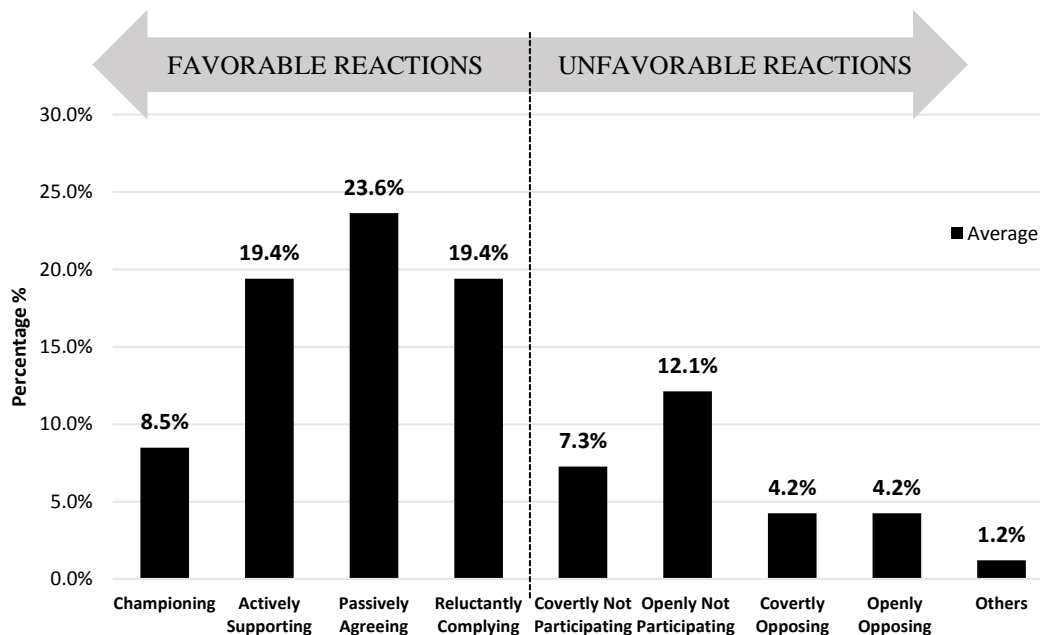


**Figure 2. Average of employee reactions to APDM adoption**

The comparison of employee reactions between expert organizations and beginner organizations to the adoption of APDMs is shown in Figure 3. Employees in beginner organizations had more unfavorable reactions, such as openly not participating, covertly opposing, and openly opposing the change initiative. These organizations did have slightly favorable reactions among employees. Expert organizations did experience some unfavorable reactions but had a much larger percentage of favorable reactions, such as actively supporting, passively agreeing, and reluctantly complying with the change initiative. Additionally, these organizations faced slightly unfavorable reactions. The differing results between beginner and expert organizations indicate that positive employee responses might have a large impact on APDM adoption success.



**Figure 3. Comparison of employee reactions in expert, average, and beginner groups**

The means of employees' resistance to change based on the different organization characteristics were calculated and then summarized in Table 16. The private sector was found to have a lower mean of employees' resistance to APDM adoption than the 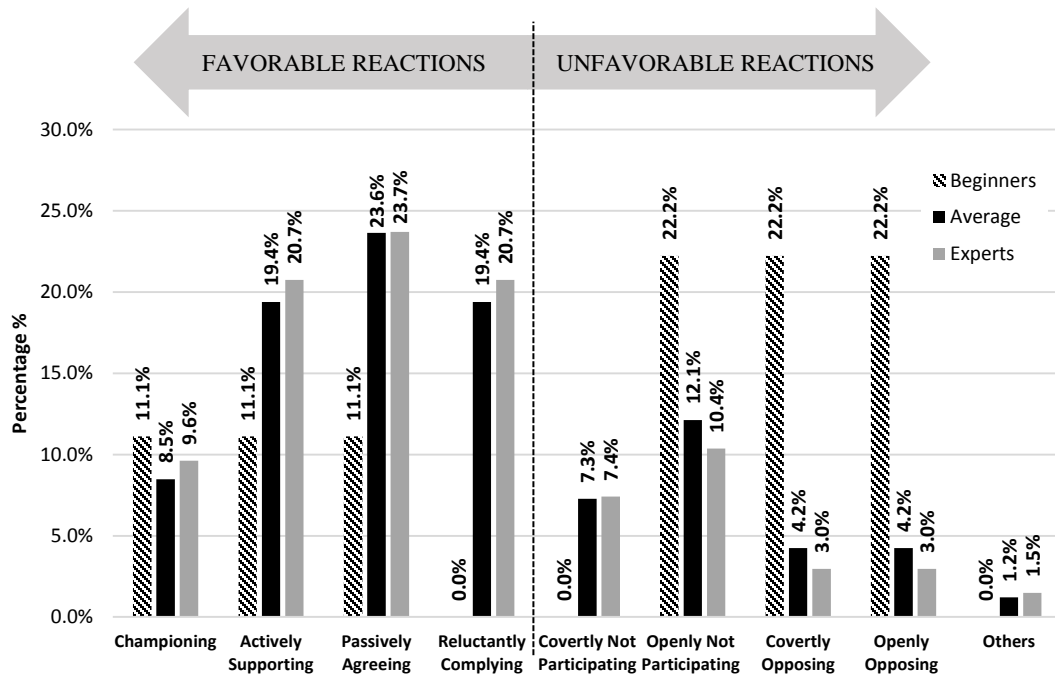public sector. As far as organization size, smaller organizations (Less than $10M spend on construction per year) encountered more resistance from employees than medium and large-sized organizations. Similarly, organizations with full-time employees less than ten employees were found to have the most resistance than other organization sizes. Results in Table 16 also revealed that organizations that hired OCM consultants to assist with implementing the APDMs encountered less resistive behavior than those who did not hire OCM consultants.

**Table 16. Employees' resistance to APDM adoption based on organization characteristics**

| Organization characteristics | | Resistance |
|---|---|---|
| Organization type | Public | 3.2 |
| | Private | 2.7 |
| Organization size (spent on construction) | Less than $10M | 3.5 |
| | $10–30M | 2.9 |
| | $30–49M | 2.8 |
| | $50–99M | 3.3 |
| | $100–499M | 3.2 |
| | $500M+ | 3.0 |
| Organization size (full-time employees) | Less than 10 | 3.4 |
| | 10–19 | 2.8 |
| | 20–49 | 3.3 |
| | 50–99 | 3.1 |
| | 100–499 | 3.0 |
| | 500+ | 3.0 |
| Hired external OCM consultant | No | 3.2 |
| | Yes | 2.9 |

*3.7.3 Mediation Effect of Overall Employee Reactions to APDM Adoption*

The impact of employee reactions was analyzed to assess the mediation effect in order to determine whether employee reactions mediate the effect between APDM Adoption Drivers and the Change Adoption Construct, as shown in Figure 4.
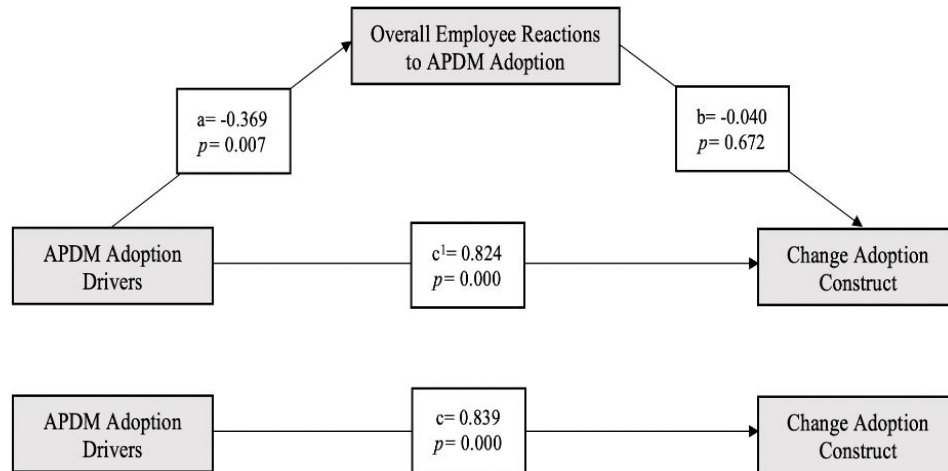


**Figure 4. The mediation effect of overall employee reactions to APDM adoption**

The indirect or mediation effect (a * b) is the effect of APDM adoption drivers on the change adoption construct through the mediator overall employee reactions to APDM adoption. The coefficient "a" (the effect of APDM adoption drivers on the mediator) was -0.369, with a statistically significant *p*-value of 0.007, meaning that APDM adoption drivers affect how employees react to APDM adoption. The coefficient "b" (the effect of the mediator on the change adoption construct) was -0.040 and non-statistically-significant *p*-value of 0.672, meaning that employee reactions to APDM adoption did not affect the success rate of APDM adoption (see Figure 4). This result indicates APDM changes can be successfully adopted without favorable employee reactions. The indirect or mediation effect was estimated as the product a * b, or -0.369 * -0.040 = 0.0150, with a 95%

confidence interval (-0.0621, 0.1572). Because the interval includes 0, the mediation effect of employee reactions on APDM adoption was not statistically significant at a $p$-value of 0.05. The direct effect of APDM adoption drivers on the change adoption construct after accounting for the mediator was very strong ($c^1 = 0.824$) and statistically significant ($p$-value = 0.000). The total effect of APDM adoption drivers on the change adoption construct, ignoring the mediator, was very strong ($c = 0.839$) and statistically significant ($p$-value = 0.000).

*3.7.4 Communication of Change-Related Training to Employees*

As Figure 5 shows, the top-three methods that the AEC organizations used to communicate change messages were informational presentations (20.5%), meetings and phone calls (19.3%), and on-the-project or on-the-job support (18.6%). Less commonly used methods include instructional manuals, checklists, and/or guidebooks (14.4%); memos and emails (13.6%); speeches (3%); and instructional videos (0.8%).
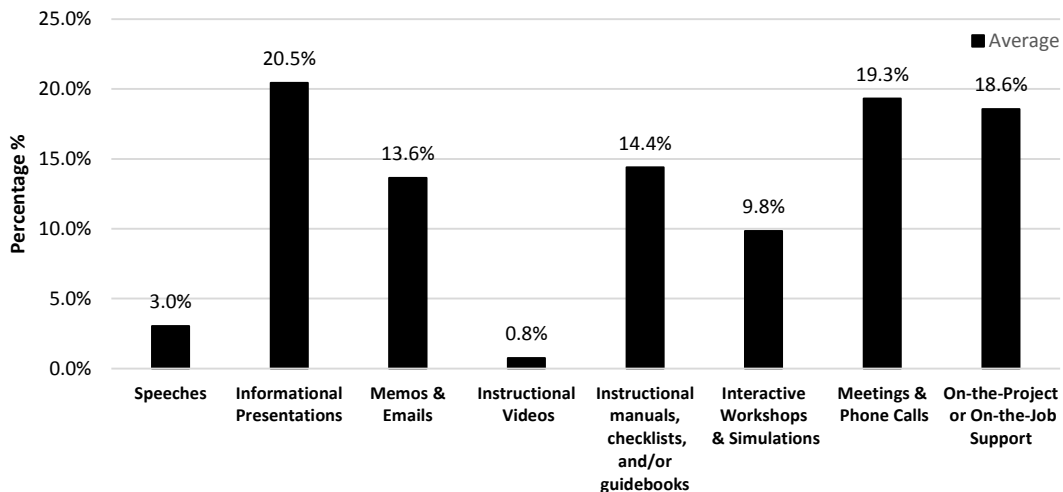


**Figure 5. Communication types used by AEC organizations**

Perhaps one reason the informational presentation was the most widely used method is that the method is easy to implement. Further, this method and the next two include face-to-face communication, enabling the leader and employees to discuss in real-time the benefits and issues related to adopting the change.

Figure 6 shows the communication methods used in expert and beginner organizations. Organizations with the lowest rates of successfully adopting APDMs most frequently used meetings and phone calls (33.3%) and informational presentations (33.3%) to communicate information about adopting an APDM. The next most widely used methods were speeches (22.2%) and memos and emails (11.1%). Beginner organizations did not use the other communication methods (on-the-project or one-the-job support; interactive workshops and simulations; instructional manuals, checklists, and/or guidebooks; and instructional videos).

Organizations with the highest rates of successfully adopting APDMs most frequently used informational presentations (20.3%), followed by on-the-project or one-the-job support and meetings and phone calls (19%). The next most commonly used methods were instructional manuals, checklists, and/or guidebooks (15.2%), memos and emails (13.9%) and interactive workshops and simulations (10%), The least used methods were speeches (2.2%) and instructional videos (0.4%).
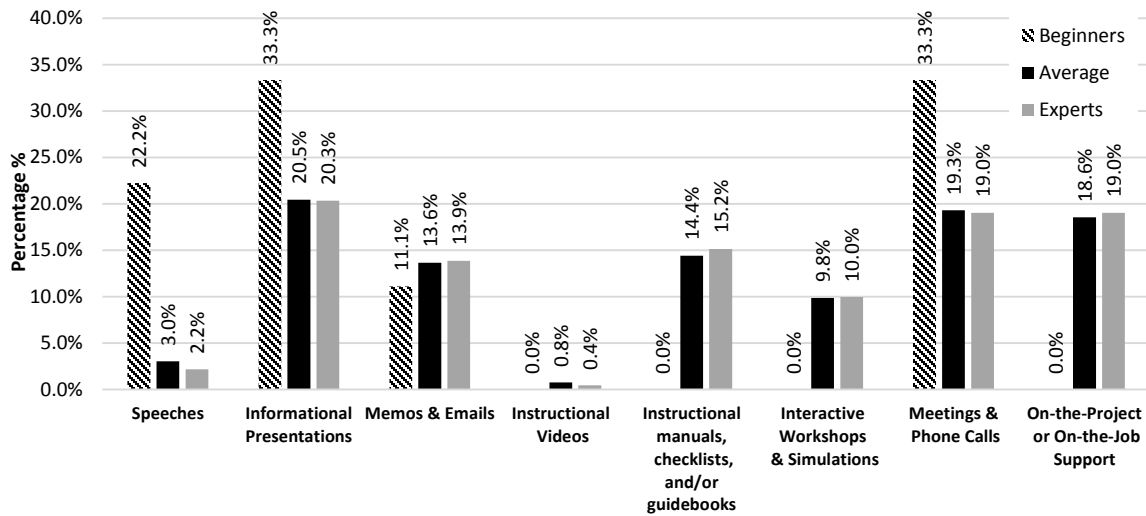
**Figure 6. Comparison of communication types used in expert, average, and beginner groups**

Figure 6 shows that whereas the expert organizations used on-the-project or one-the-job support; instructional manuals, checklists, and/or guidebooks; and interactive workshops and simulation, the beginner organizations did not. This finding suggests that beginner organizations should use more on-the-project and on-the-job training, instructional manuals, and workshops and simulations as ways to efficiently communicate change initiatives to all employees; doing so could lead to higher APDM adoption rates.

**3.8 Conclusion**

AEC owner organizations encounter a spectrum of employee reactions when new project delivery methods are being implemented. This study aimed to understand the relationship between AEC employees' reaction and the level of success in adopting APDMs. The findings indicate that two-thirds of employee reactions are favorable. Further, the findings reveal that OCM practices (APDM adoption drivers) are related to how

employees react. A similar conclusion was reached by Lines et al. (2015); they found that certain OCM practices are associated with less resistance during change implementation.

The most important finding is that employee reactions to APDM adoption do not mediate between the OCM practices and APDM adoption. AEC organizations can successfully adopt APDMs even when the majority of employees' reactions are not positive. Employees who resist the change may nevertheless adopt it because they are forced to by top-level managers (Hassan & Mouakket, 2016). Top-level managers are unlikely to resist APDM adoption because they are the ones who decided to implement the change. This finding indicated that successful APDM adoption does not depend solely on creating favorable reactions among organizational members. Therefore, other aspects of change management are also needed to successfully adopt APDMs; for example, organizations should provide sufficient resources, appoint effective change agents to lead the adoption, and obtain support from politicians or government entities.

The study results indicate that presentations, on-the-job support, and meetings are the most effective ways of communicating change initiatives to employees. These methods of communication should be implemented before the adoption starts, thereby facilitating a successful APDM adoption process. Organizations should appoint effective change agents to provide change-related training and should use as many methods as possible to articulate the change message to organizational personnel (Lines et al., 2015).

**3.9 Contribution of This Study**

Very little research has been conducted on employees' reactions to organizational change initiatives in the AEC industry. This study may be beneficial for organizational

change practitioners who are implementing new project delivery systems for the first time. Practitioners need to be aware of ways to efficiently communicate information about the change to employees. This study also provides practitioners with information about employees' behavior that may obstruct efforts to implement new APDMs. Change practitioners need to understand how employees perceive APDM adoption; this understanding can help change practitioners implement processes that increase employees' acceptance of the change.

**3.10 Limitations and Recommendations for Future Research**

Though the study's objectives were accomplished, the study has several limitations. First, this study was limited to AEC owner organizations. Future research could examine the reactions of employees in other AEC stakeholder organizations that are affected by a change in the project delivery strategy. Such research could also compare employee reactions in AEC owner organizations with employee reactions in other stakeholder organizations. Second, this study sought to uncover which reactions to APDM adoption were most prevalent among employees. Future research could investigate the underlying factors that affect employees' reactions and how to overcome resistance to change. Third, the survey sought to collect the primary or most common reactions to the change initiative. A more in-depth longitudinal study would be required to measure the reactions to a change initiative at pre-determined points in time. Furthermore, deeper analyses of the relationship between communication strategies and delivery methods with level of adoption are needed for future research. Fourth, the number of responses in the beginner group (the least successful APDM adoption cases) was relatively small. In future studies, equal sample

sizes could be used to balance the dataset. Fifth, this study was conducted in the United States, and APDM adoption in other countries may be different. Lastly, future studies could examine the relationships between different participant demographics (e.g., workgroup, job position, and APDM understanding and experience) and the degree of resistance to APDM adoption.

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# CHAPTER 4: ALTERNATIVE PROJECT DELIVERY METHOD ADOPTION IN THE AEC INDUSTRY: AN ORGANIZATIONAL CHANGE PERSPECTIVE

## 4.1 Abstract

In the last two decades, an increasing number of organizations have shifted from using design-bid-build delivery method (DBB) to alternative project delivery methods (APDMs). This shift requires changes for both the organizations and the individuals involved. This paper provides guidelines detailing how to lead APDM adoption at the organizational level through using a change management perspective. The guidelines were developed based on analyzing the results of semistructured interviews with nine individuals. The participants were industry professionals who were selected because their organizations had successfully adopted APDMs. The findings from the interviews indicate that the best opportunity to successfully implement APDMs is available through using four phases. The phases are preparing and planning, pilot project testing the project, expanding to the intended scale and sustaining and evaluating. The phases include specific organizational change management (OCM) practices that increase the probability of successful APDM adoption. This study contributes to organizational change in the AEC industry by explaining how OCM practices are used to successfully implement APDMs. This study also contributes to the existing body of knowledge by providing guidelines that can help owner organizations as they consider adopting APDMs for the first time.

## 4.2 Introduction

Achieving organizational change is complex and challenging because organizations have lacked a research-based process for planning, leading, and sustaining change. Most

change initiatives fall short of their desired outcomes, and eventually they fail (By, 2005; Cameron & Quinn, 1999). Organizational change management (OCM) has been defined as the structured approach and sequential steps to planning, managing, and transitioning individuals, teams, and organizations from a current state to a desired future state (Burnes, 2009). Although leaders know the importance of organizational change, many do not understand how to effectively implement change (Rosenberg & Mosca, 2011). Organizational change is usually driven by internal factors, such as a change in organizational structure, goals, or values, or by external factors, such as a change in legislation, standards or the adoption of new technology (Erdogan et al., 2014).

In response to changes in the architecture, engineering, and construction (AEC) industry, owner organizations have adopted alternative project delivery methods (APDMs). These methods can reduce the length of the project schedule, reduce project costs, and improve project quality (Lines, et al., 2014). However, successfully adopting these methods can be extremely difficult and requires significant organizational change efforts (Migliaccio, et al., 2008). Literature in the field of OCM indicates that in around 70% of organizational change initiatives, the objectives are not fully achieved (Ahn, et al., 2004; Beer & Nohria, 2000; Maurer, 2010). This high percentage may indicate a lack of a valid framework for successfully adopting and managing organizational change (By, 2005).

This paper focuses on the organizational change of AEC owner organizations switching from only using the design-bid-build (DBB) and low-bid systems to also using APDMs, such as design-build (DB) and construction manager at risk (CMAR). Within the

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context of this study, the AEC owner organizations considered organizations that have made the decision to adopt an APDM to procure services for the delivery of AEC projects. Although APDMs have been used for many years, research indicates that for APDMs to be effectively implemented, an organizational change process is needed (Migliaccio et al., 2008; Minchin et al., 2014). This paper presents research-based guidelines for successful APDM adoption in AEC owner organizations.

## 4.3 Literature Review

This review of the literature begins with a review of studies on organizational change in general and then reviews studies focused on the AEC industry. A number of organizational change models have been developed to assist organizations in successfully adopting change initiatives. In this study, exploring the literature on organizational change was an important first step in developing guidelines for leading the adoption of APDM change.

### 4.3.1 Organizational Change Models

Lewin (1947) provided one of the earliest fundamental models of planned change. His model for the change process contains three steps: unfreezing the current process of the organization, moving to the desired state, and refreezing the state when the change has been achieved (Lewin, 1947). Several change researchers have attempted to elaborate on Lewin's model. For example, Bullock and Batten (1985) reviewed more than 30 models of planned change and then developed a four-phase model that includes exploration, planning, action, and integration. Judson (1991) proposed a five-phase model of change management: analyze the organizational process and plan for change, communicate the

change to stakeholders, gain acceptance of the new behaviors required, change from the status quo to the desired state, and consolidate and institutionalize the change. A number of other researchers subsequently have also developed step-based models for the organizational change process. For instance, Kanter et al. (1992) developed a comprehensive model for implementing change. The model comprises ten phases: analyze the current situation of the organization, create a vision and a common direction, separate from the past, create a sense of urgency, support a strong leadership role, establish political sponsorship, craft an implementation plan, develop enabling structures, communicate with and involve people, and reinforce and institutionalize the change. Kotter's (1996) model focuses more on people than on the change itself. This model consists of eight steps: create a sense of urgency, build a core coalition, create a vision and strategy, communicate the vision, empower people to act on the vision, plan for and create short-term wins to build momentum, consolidate gains and produce more change, and institutionalize the change. Kotter recommended following the eight steps sequentially to avoid failure.

In a review of existing models, Fernandez and Rainey (2006) noted eight common elements in organizational change models. These elements are ensuring change is needed, developing a plan, building internal support and overcoming resistance to change, ensuring the commitment of top management, building external support, providing resources, institutionalizing the change, and pursuing comprehensive change. Likewise, Sullivan et al. (2011) reviewed prominent models and then consolidated eleven change models into a new model of organizational change. This model includes three phases: planning and initiation, implementation, and institutionalization. Change leaders can increase the

likelihood of successful change implementation by using the aforementioned models (Self & Schraeder, 2009). However, the use of these models in the AEC industry is limited because these models are not specifically designed for particular industry sectors.

### 4.3.2 Organizational Change Models Discussed the AEC Literature

The purpose of this section is to review common models of organizational change adoption and explain the key components of these models. Over the last few decades, only a few studies have been conducted on organizational change in the AEC industry. In a study on implementing total quality management, Burati and Oswald (1993) interviewed 17 engineering and construction companies and identified four phases for successfully implementing total quality management. These phases are exploring and committing, planning and preparing, implementing, and sustaining. In a similar study, Attaran (2000) proposed a six-phase framework for successfully designing and constructing reengineering projects. The phases were preparing, assessing, solving, benchmarking, developing, and transforming. Price and Chahal (2006) conducted interviews with three managers from Crown House Engineering, Aluminum Company of America, and British Telecom. Based on the results, the researchers proposed a six-step model for change management: preparing the organization, developing the vision and implementation plan, checking all the documents and plans, communicating with and fostering engagement in the workforce, implementing, and evaluating. Erdogan et al. (2014) developed a framework for introducing a new collaboration environment. The framework consists of five primary stages: initiating change, defining the change vision, developing the change management plan, implementing the change, and evaluating the change. In another study, Lines and

Smithwick (2019) interviewed 11 participants and identified four phases typically used in electrical contractors' organizational change efforts. These phases are preparing and planning, pilot testing, expanding the change throughout the company, and ongoing operation.

A few studies in the AEC literature have explored how owner organizations have implemented changes in the project delivery approach. For example, Migliaccio et al. (2008) examined how transportation agencies adopt the DB method. Based on the results, the researchers developed a framework with three processes (implementation, knowledge building, and assessment) and four phases (preparation, planning, contract procurement, and contract execution). The four phases can be used to regulate the execution of the three processes at both the project level and the organization level.

This review of the research on organizational change, especially in the AEC industry, revealed several gaps in the previous research. First, previous studies have primarily focused on the adoption of a change at the project level; little emphasis has been placed on how to introduce changes at the organizational level. Second, most studies have focused on adopting technology and other certain types of initiatives, such as total quality management programs and Six Sigma. Little information is available on adopting a change in project delivery methods. Third, although much research has been conducted on the technical aspects of each change, little research is available on how to transition from the current state to the desired state. This study helps fill these gaps by presenting guidelines for implementing change in AEC organizations.

**4.4 Research Methodology**

Shifting away from an existing paradigm is best achieved by understanding how other organizations have implemented a similar change. Therefore, data in this study were collected through interviewing industry professionals who had previously participated in a survey ((Aldossari, et al., 2020). The nine individuals who completed interviews described their experiences adopting APDMs and discussed the lessons they learned. The interviewees were selected because their organizations had successfully adopted APDMs. All nine interviewees were involved in implementing the APDMs. The interviewee profiles are listed in Table 17. The majority of the interviewees had more than 20 years of work experience.

**Table 17. Interviewees' and organizations' profiles**

| Interview Indicator | Interviewee Job Title | Work Experience (Years) | Number of Employees | Organization Location | Type of APDM | Year of Adoption |
|---|---|---|---|---|---|---|
| Interviewee A | DB program Manager | 10–19 | 100–449 | Minnesota | DB | 2001 |
| | | | | | CMAR | 2013 |
| Interviewee B | Project Management Chief | 10–19 | 500+ | Nevada | DB | 2009 |
| | | | | | CMAR | 2012 |
| Interviewee C | City Engineer | 20–29 | 100–499 | Arizona | CMAR | 2018 |
| Interviewee D | Assistant County Counsel | 30–39 | 100–499 | Oregon | CMAR | 2008 |
| Interviewee E | DB Director | 30–39 | 500+ | New York | DB | 2012 |
| Interviewee F | Senior Project Manager | 10–19 | 500+ | Arizona | DB | 2000 |
| Interviewee G | Capital Improvement Program Manager | 30–39 | 20–49 | Arizona | CMAR | 2010 |
| Interviewee H | Deputy Director and Chief Engineer | 30–39 | 500+ | Missouri | DB | 2005 |
| Interviewee I | DB Program Supervisor | 30–39 | 500+ | Montana | DB | 2004 |

Interview questions were developed based on the review of extensive organizational change literature. Before conducting the interviews, the interview questions were revised by an advisory group to ensure the questions were suitable and aligned with the research objectives. After the interview questions were revised, the first interview was conducted as a pilot interview to determine whether the interview questions were clear and understandable and to make sure the number of questions was appropriate for a 35-minute interview. The interview questions are presented in Appendix B.

The study's objective and the interview questions were provided to interviewees prior to the interview so that they were able to prepare answers. The interviews were semistructured and the questions were open-ended in order to obtain in-depth information about the entire APDM adoption process and to gather additional information related to the interviewees' experiences (Patton, 2002). The interviews were conducted via phone call and lasted 30–40 minutes. All interview conversations were audio recorded, and then the recordings were transcribed. The interview transcriptions were then analyzed using qualitative thematic analysis (Braun & Clarke, 2006). Each transcription was analyzed by highlighting important ideas and categorizing the ideas into themes. This step helped reduce the amount of data and made the data analysis process more manageable.

## 4.5 Results and Discussion

The results provide a better understanding of the OCM practices and organizational change phases that organizations have used to successfully adopt APDMs. The findings from analyzing the interview data are divided into two subsections: (a) general information about the APDMs implemented at the interviewees' organizations and (b) specific

experiences and insights regarding the main phases of the APDM implementation process and OCM practices used in each phase.

### 4.5.1 Background Information about the Adoption

*The changes in organizations' process*

The interviewees were asked to describe what changed in their organizations' process as a result of implementing APDMs. Regarding the design process, Interviewee A commented, "we used, in the DBB, to direct the designer to design a project in our way, but in the DB projects, if the DB team's designs meet the specifications, we are hands-off." Interviewee A elaborated on this statement by explaining that "we were involved from starting until the end of the design in the DBB process, but in the DB we complete the layout (about 30% of design), and we go away for a while." Similarly, Interviewee F further explained the process of the DB by saying that "organization prepared 15% of the project plan and then hired a DB team, who was responsible for taking that 15% plan along with the requirements that had been written in the contract to develop the project to 100% plan and construct it." Interviewees C and D indicated that after implementing CMAR, their organizations held more design meetings with designers and contractors. Interviewee G stated that "when we structure a contract for a CMAR project, we give ourselves a lot of authority to make changes during the design." The time at which the contractor is engaged during the design phase is important in the CMAR process. Interviewee D responded by saying that the organization hired a designer and then immediately hired a construction manager to advise on construction techniques that were available and economical.

In terms of the contracting process, Interviewee A noticed that "the public advertisement for bids became longer in the DB process. It was twelve weeks compared to a four-week advertisement in the DBB process." Interviewee D stated that in CMAR projects, the contingency was managed by the group of the architect, the owner, and the contractor. However, the owner maintained control of using the contingency. Interviewee E explained that "we put a contingency item in the contract as a fixed price lump sum that we should compensate the DB team if some risks materialized." Interviewee C said that "getting a good guaranteed maximum price (GMP), which includes everything, was the most difficult part in the CMAR process because it is many iterations back and forth to have a good GMP."

Regarding the approval process, including invoicing and tracking, most interviewees mentioned that pay applications were very similar to what was used for DBB projects. Interviewees A and F said that with the DBB method, the contractor was paid based on the in-place quantity and that all items were broken individually by a unit. In contrast, in DB projects, everything was paid each month as a percentage of the lump sum. Interviewee G noted that "on a CMAR contract, we have the right to dig deeper into the subcontractors' invoices and the materials invoices."

*Methodology followed to implement APDMs*

New-start organizations should investigate the approaches that other organizations use to help them succeed with APDM adoption. Interviewee D said that "we relied heavily on Project Management Institute documentation at the beginning to develop our road map." Interviewee H noted that a team conducted considerable research on how other

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organizations were doing with DB adoption. Then, the team picked some of the good pieces out of their methodologies and created our own methodology. Interviewee I admitted that if "we had to repeat the DB process again, we would do more research on how other organizations implemented DB successfully." Interviewee C argued that "we did not follow a specific methodology; we used the seat-of-the-pants approach, and we learn as we go with each project that we complete."

**4.5.2 Implementation Process**

Based on the results of analyzing the interview data, guidelines were developed for implementing APDM throughout an AEC organization. The guidelines include four phases, as presented in Figure 7. These phases are preparing and planning, pilot project testing, expanding to the intended scale, and sustaining and evaluating. These phases include specific OCM practices that increase the probability of successfully adopting APDMs. Each phase is discussed below.

| Preparing and Planning | Pilot Project Testing | Expanding to the Intended Scale | Sustaining and Evaluating |
|---|---|---|---|
| • Recognize the need for change | • Start with small projects | • Train more employees | • Sustain the APDMs on a long-term basis |
| • Obtain the commitment of upper management | • Select representative projects | • Select the right projects | • Evaluate the success of APDM adoption |
| • Appoint change agents | • Celebrate early wins | | • Document and share the success of APDM adoption |
| • Hire a consultant | • Assign a specific team | | |
| • Overcome employees' resistance | | | |
| • Define employees' roles and responsibilities | | | |
| • Select the right people | | | |
| • Train employees | | | |

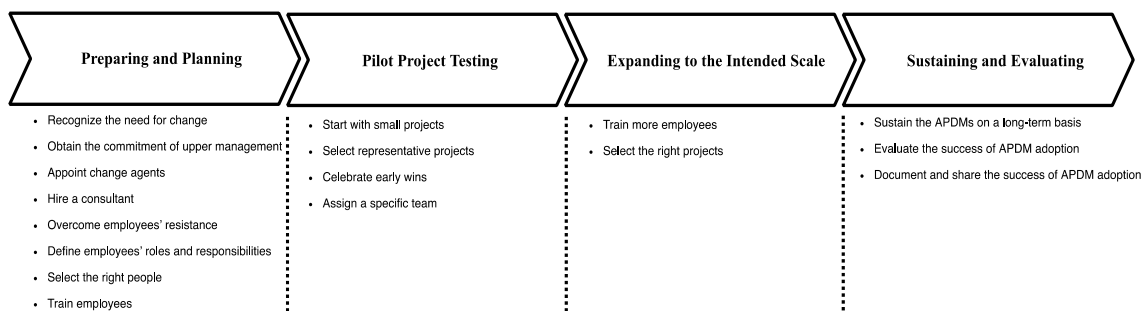**Figure 7**. **The developed guidelines for APDM adoption**

*Phase 1: Preparing and Planning*

The first phase is the most critical phase and comprises overlapping OCM practices, as discussed below.

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*Recognize the need for change*. The first step is to identify why an APDM needs to be implemented. Identifying the need helps organizational stakeholders understand the rationale for the change. Interviewees identified various reasons why their organizations needed to implement APDMs; these reasons included to reducing the project duration, saving money, and improving quality. Interviewee C explained the following:

> Over the past two years, the city transitioned some projects from being DBB to DB or CMAR methods because we had one big project that was DBB. This project was difficult for us and had a lot of change orders, so the city management felt that they did not want to use DBB again.

Interviewee G stated that "DBB projects often end up with litigations with the contractors. Consequently, the agency has utilized APDMs that create a more collaborative environment with the contractor." Interviewee G added that the quality of construction projects has increased since APDMs have been implemented.

Several interviewees explained that the reasons for using APDMs included accelerating the delivery of projects and sharing or transferring risk to the designer and contractor. Interviewee D presented an additional reason: "The existence of experienced CM contractors in the state, due to their working with other public entities, encouraged the company to use the CMAR process."

*Obtain the commitment of upper management.* Successful APDM adoption requires significant commitment and support from top leaders. Many interviewees mentioned that their organizations successfully implemented APDMs because of the managerial level's support to drive the change. For example, Interviewee H said that "the reason why the DB process was successful because the senior leadership supported the new adoption. Their

support was by assigning a high-skilled and motivated team and giving them the authority

to hire consultants and award contracts." Additionally, Interviewee H stated the following:

> The leadership manager did not make the DB project team go through the chain of command of the departments. This helped in making quick decisions, and sometimes the team was given the full authority to make a decision on the ground.

Senior leaders should dedicate resources for APDM adoption over the long-term.

Interviewee B affirmed that "our director's office was 100% supportive, so whatever

resources we needed, we had. For instance, they helped us to get some political support

outside of the agency for using the CMAR process."

Senior leaders' commitment must be visible in order to build the credibility of the

APDM adoption initiative. Interviewee G noted that a director actively participated in all

project meetings to make sure the newly introduced CMAR was being used correctly and

effectively. Interviewee C stated that "we had a mandate from the management that all

projects had to be APDM, and they did not get involved in the process unless there was an

issue."

To support APDM adoption, leaders must be convinced of the benefits of APDMs.

Interviewee D pointed out that "our management was hands-off during implementation and

they were convinced to do the CMAR method after the organization had a DBB low bid

project that wound up with a big dispute."

*Appoint change agents.* Change agents are individuals or groups that are responsible for

managing and leading the day-to-day change process in an organization (Radzi, Bokhari,

Rahman, & Ayer, 2019). Interviewee B explained the following:

> Their department created a dedicated division to manage and oversee the APDM program. The responsibilities of the division were to develop the procedures and

implementing the change for the CMAR process and to dedicate the resources to do the change.

Interviewee A said that "we have a small core team that had some charisma and intelligence. They were selected because using DB was their idea from the start. The small team was enough to initiate the first group of DB projects."

The number of change agents varied in the interviewees' organizations that implemented APDMs. Interviewee D stated that "the change agent team consisted of a project manager who worked on CMAR projects in the private sector and an attorney who advised the project manager." The change agents' group could also be external to the organization. Interviewee C said that his organization hired someone who brought the knowledge of the CMAR process from his previous company that experienced CMAR implementation. Interviewee I indicated that his organization hired a DB coordinator who had worked for state agencies on DB projects to start the DB program. This individual developed DB guidelines for Interviewee I's organization.

Organizations need to select appropriate personnel as change agents who can initiate change and manage change effectively. Interviewee B pointed out that "our organization wanted a group of employees that had the right mindset to work with others, be very task and deliverable-driven, know how to effectively make the change and know the rules." Interviewee E suggested that a change agent needs to be intelligent, highly experienced and open-minded and also needs to be a problem solver who realizes there is more than one way to solve a problem. Interviewee F noted that change agents need strong leadership skills, strong communication skills, and the ability to adapt to change.

*Hire a consultant.* Many organizations use consultants to facilitate the adoption process.

Interviewee B commented as follows:

> Since the CMAR was new to us, we hired a consultant who had experience with CMAR processes with other organizations to bring that processing and knowledge to our organization. The major deliverables were that the consultant wrote for us a manual for the CMAR process, change forms, template schedules, and procurement documents.

Interviewee A indicated that "we have hired a general engineering consultant (GEC) to not only assist with change management but also to do and run our projects." Interviewee A expanded upon his statement to say that "the consultant helped us establish the design-build program, prepared the RFPs for our projects, and provided expertise on DB contracting." Interviewee F also talked about hiring the GEC, explaining the following:

> As a state agency, our agency did not have the capacity to quickly perform design reviews and provide approvals in the timeframe that is needed for the DB process. Because of that, having the GEC was effective in helping manage the review of the design process and ensure that the design is in conformance with the requirements.

Interviewee G stated that a consultant was hired to educate staff about why APDMs can be effective. The consultant also prepared the legal documents necessary for procurement to be carried out effectively, honestly, and fairly for all project bidders.

*Overcome employees' resistance to the APDM adoption.* When change is introduced in an organization, there will typically be some resistance from employees. Most interviewees indicated that they encountered employee resistance to APDM adoption in their organizations. The employees in Interviewee B's organization "resisted the change at first, and then finally they accepted it because they understood it a lot better." Interviewee G stated the following:

There was some resistance initially based on fear of the CMAR process to be not as effective as the DBB process. Over the years, the CMAR process has proven itself by improving the project performance, and thus employees accepted it.

Interviewee A commented that "until this moment, there are employees who have trouble accepting the DB process because they do not have control over design and construction details." Interviewee A expanded upon this statement by saying that "if we have good specifications, we do not need to direct the DB team." Interviewee E gave another reason for employee resistance: Very high-level unions that represent the engineering resources working in the department were not fully supportive because we took the design work away from their design resources and outsourced it to DB teams. So, they were not happy about the DB method." Interviewee C said that "the city legal team, which our procurement staff depends upon, was the biggest barrier. Once legal was on board, that paved the way to the successful implementation of the CMAR process." Interviewee I stated that members of the state legislature and the contractors' association were initially barriers to DB adoption. Their concern was that the DB delivery method would preclude local contractors from winning projects and would open the opportunity for out-of-state contractors to win the projects. Interviewee G explained that the hardest part of adopting the CMAR method was explaining to county government staff the difference between DBB and CMAR.

Interviewees identified several techniques for addressing employees' resistance to APDM adoption. Interviewee A said that "for employees who are not willing to mentally convert to the new method, the main strategy was not to involve them in the DB projects." Interviewee B mentioned that "in the first year of the APDM implementation, our organization sought out only specific people who were interested in the new method."

Interviewee B elaborated that "if you can clearly communicate each individual's roles and responsibilities on a project and what they need to be doing, that helps calm individuals down because then they know what is expected of them." Interviewee D indicated another technique: "we reassigned one resistive employee to another place, where he would not have to deal with the new change."

*Define employees' roles and responsibilities.* Implementing changes requires organizations to create new roles and responsibilities for employees. Therefore, organizations should clearly define and explain new roles and responsibilities for employees affected by the change; doing so can prevent possible confusion during the adoption. Interviewee G noted that "when the CMAR process was first introduced, existing staff struggled to understand the new responsibilities." Interviewee B explained that "employees were concerned about how these different delivery methods would impact, change, or eliminate their role and authority in projects." To address employees' concerns and confusion, Interviewee D recommended that "training should focus on how employees' roles fit into the new delivery process and also focus on what other employees' roles were so they would know what other people were doing."

*Select the right people.* Organizations should ensure that the right people are in place to carry out the initiative. The implementation will not succeed if the wrong people are involved. Not all employees are suitable for all types of project delivery methods. For example, Interviewee E said that senior staff who are not familiar with DB might not be good candidates for adopting the method. Interviewees A and E cautioned that people who are experts at DBB may not necessarily be experts at the DB delivery method. Interviewee

H said that "because of some employee skepticism about the new process, the organization had to recruit the right people that had an open mind and were highly motivated." Interviewee A recommended selecting employees who are open-minded, willing to do things a different way, and effectively collaborate and communicate with others.

*Train employees.* Training is essential in familiarizing employees with the details of the new delivery method and how it applies to their job functions. Interviewee B recommended "more communication upfront, and make sure everybody in your department, even outside the department, and other stakeholders are involved in the development of CMAR implementation. This may help in gaining people's trust and get them onboard with it." Similarly, Interviewee F stated that more education upfront is important so that all members are committed to the DB process.

Interviewee C said that his company did not provide formal training itself but did have him attend university courses about the APDM. The courses helped him learn how to legally use APDMs. Similarly, Interviewee I's organization did not have formal training. However, the engineers who worked on DB projects were required to attend a 3-day DB workshop and to earn professional certification in the DB delivery method.

Training should cover specific, important topics related to the change. Employees should be trained on the APDM process and they should be aware of the differences between traditional delivery methods and APDMs. For example, Interviewee F said identified the need for "training focused on how a DB project is different from a DBB project." Interviewee B stated that his organization's "training consisted of what the APDM

process is, how APDMs are different from the traditional DBB method, but then it had a

huge focus on roles and responsibility."

*Phase 2: Pilot Project Testing*

The pilot project testing phase helps organizations to implement the APDM on a

pilot basis. This allows organizations to uncover unforeseen issues and to develop solutions

before fully embedding the APDM in the organization's operations. Pilot projects are very

important to the core team and to project-level personnel, including project managers and

contracting officers, because the pilot provides the opportunity for individuals to gain

familiarity with the new project delivery method and to increase their skills in how to use

the delivery method.

*Start with small projects that represent the organization's operations.* Selecting an

appropriate pilot project is essentials in successfully adopting an APDM. The pilot projects

have to be representative of the diverse operations of the organization. Most interviewees

recommended selecting a project that is small and that has a short duration. For example,

Interviewee I commented that three projects—weigh station, bridge rehabilitation, and road

reconstruction projects—were selected to be pilot tests for DB adoption because they

represent the types of projects the organization will complete in the future. Each of these

projects had a timeline of nearly 15 months, and the total budget was less than $20 million

for the three projects. Interviewee B said that "once we established the CMAR process, we

had a small candidate project. It was a reconstruction of an interchange with a $10 million

budget and less than six months of the construction timeline." Likewise, Interviewee D

stated that his organization tested the CMAR process with a small building facility; the

project had a budget of less than $10 million and a timeline of less than one year. In contrast, Interviewee C explained that "we did not do any pilot project. We jumped into actual CMAR projects."

*Celebrate early wins.* Some early wins may be necessary to generate management buy-in and organization-wide support for the APDMs. These wins can help build momentum, which enables the effort to expand in the organization. Interviewee B explained that "because of the pilot project's success, the legislative stakeholders that had concerns about CMAR, now they support us to do more projects with this delivery method." The successful pilot project would serve as a model for future projects to follow. Interviewee C demonstrated that "his organization had a six-phase project. He told the council that we would try the DB method for the first phase; if it goes well, then the following phases would be done with the same method." Interviewee A said that "the first major project we did with the DB method was rebuilding a collapsed bridge in less than a year. Once this project achieved beneficial results, we knew the DB method was going to succeed." Both Interviewees C and D also mentioned that the checkmarks to know the pilot projects achieved the organization's goal were schedule, budget, and value-added.

*Assign a specific team.* Some organizations assigned a specific team to learn the APDM process and carry out the pilot projects. The group members become experts in the APDM process and then trained other employees during the expansion phase. Interviewee D's organization appointed the two people—the most supportive employee and the most resistant employee—to implement the CMAR method. The purpose of selecting these individuals was so that one person would keep the project going and the other person would

get a report on whether the method was going to work. Interviewee H's organization assigned a team to manage two pilot projects; the team included a project director, a deputy director, and seven other employees. The organization also hired a contract expert to be a horsepower to help drive the team's progress. Interviewee A recommended, "try to bring somebody from a different organization to help guide your organization through the first projects, so you do not make mistakes that people have done before."

*Phase 3: Expanding to the Intended Scale*

After pilot projects have achieved success, the APDM implementation is ready to be expanded organization-wide. The organization can expand the participation of project-level personnel in order to continue building employees' skills and experience with the APDM.

*Train more employees.* To expand the APDM to the entire organization, the team members working on pilot projects should begin training other employees so that they understand the new process. Interviewee E commented that one "department does training for employees who will be assigned to a DB project. The organization often asks employees involved with DB delivery to become evaluators." Interviewee E explained that making these individuals evaluators enables them to develop strong skills, understand how the APDM contractually differs from other delivery methods, and observe the procurement process.

Because not all employees are suitable for all project delivery methods, only specific employees should receive training on the methods. For example, Interviewee B's organization focused on training each APDM project team. When a group was assigned to

a project, the group engaged in an orientation-type training. Similarly, the training in Interviewee F's organization "is only for a certain group—whoever is selected to be on the DB project." Interviewee D noted that "we created our own in-house team to deliver face-to-face training for only those with roles related to CMAR projects."

*Select the right projects.* Owners must ensure that the chosen projects fit with the APDMs. Interviewee H explained that his "organization tried to identify the right type of projects that fit with the DB delivery method. It did not make sense to use DB on simple projects where there was no room for innovation." Interviewee E stressed that "we need good criteria to select projects that are appropriate for DB delivery." Interviewee F's "organization has an evaluation matrix that helps teams decide if an alternative delivery project is applicable for a certain project based on the scope and other factors."

After successfully completing pilot projects, Interviewee I's organization expanded its use of the DB method to two projects per year. This slow expansion helped ensure that the project team became proficient at managing DB projects before the APDM became a normal part of the organization's operations.

*Phase 4: Sustaining and Evaluating*

After expanding the use of the APDM throughout the organization and achieving the desired results, the process will become solid and the right people will be in the right place. At this point, the APDM is embedded in the organization's operations. Processes are formalized to achieve long-term use of the APDM.

*Sustain the APDM on a long-term basis.* Organizations must ensure that the knowledge and benefits resulting from APDM projects are sustained long-term. Interviewee G stated

that "after pilot projects' success, the organization had sustained the CMAR process by asking the pilot project team to incorporate the process into the department. Then, the organization appointed an individual in charge to keep going and develop the process." Interviewee G reported that "after the success of the CMAR method, the method was permitted by state law and integrated into our county code. Now, it became an option as a project delivery method." Interviewee B explained how his organization ensures that using APDMs continues to lead to project success: "every time we do an APDM project, we track our lessons learned and we always go back to change and update the process."

Interviewee D's organization sustained the effectiveness of using the CMAR method by setting criteria (cost, complexity, and technical knowledge required) for when to using the method. Interviewee E explained the following:

> We make constant improvements to the DB manual; whenever we learn a good practice, we add it to the manual. Also, we constantly communicate with all groups involved in completed projects to get feedback if there were mistakes or weaknesses to be avoided in the next request for proposal documents.

Interviewee F indicated that managers continue to support the use of DB as a practical delivery method by maintaining a team that is knowledgeable about the DB process and by learning from previous projects to make the process better, particularly in terms of refining the contract requirements for the design-builder.

The importance of employee training must not be forgotten once the APDM process has achieved sustained momentum. Interviewee D explained that one to sustain the process in his organization was to train more employees and new hires on how to use the CMAR process.

*Evaluate the success of APDM adoption.* Most metrics that are used to measure the success of a change relate to expected benefits. Traditional DBB projects have been used as a benchmark to measure the success of APDMs. Interviewee D pointed out that "we knew the CMAR method was successful because we had DBB projects with the same complexity, but these projects ended up with claims." Interviewee B noted that "we have goals in terms of cost, schedule, and some project-specific goals. Every time we finish a project, we do a self-evaluation to see if we meet the goals that we want." Interviewee F stated that if DB projects are completed within the original scope of work, the DB process is successful. Similarly, Interviewee G stated that "the metrics used by our organization to define the success of the CMAR method were finishing each project on schedule, within budget, within the scope of work."

*Document and share information about the success of APDM adoption.* Sharing information about the success in adopting an APDM will help the organization obtain internal and even external support. Interviewee C indicated that "we did presentations to some professional associations, talked to local websites and citizen advisory committees about our success with APDMs." Interviewee D said that "we share our success with APDM adoption by presentations to other departments to discuss how the CMAR method works, which projects suit, and what the lessons learned can benefit other projects." Interviewee F reported that "we share the DB success within a small scale, not agency-wide, via presentations." Similarly, Interviewee G stated that success with the CMAR method was shared countywide via a monthly online newspaper.

Communicating the success of APDM projects is important in overcoming employees' fears and concerns related to change. Interviewee H explained that a positive result came "after resistant employees saw the success of the DB method in more than four projects. The success helped overcome employees' doubts about the DB success within their organization." Interviewee I added that comparing the costs of the DBB and DB delivery methods helped address the concerns of resistant employees who said the DB method increased costs.

## 4.6 Conclusion and Contributions

Successfully implementing a new project delivery method in AEC owner organizations can be difficult. Limited research is available on how to successfully adopt a delivery method. This study examined the APDM adoption process at the organizational level through using a change management perspective. Semistructured interviews were conducted with industry professionals who had experience in APDM implementation. The data analysis results were used to developing guidelines for increasing the success of APDM adoption in AEC owner organizations. These phases include preparing and planning, pilot project testing, expanding to the intended scale, and sustaining and evaluating. The guidelines include OCM practices that the study participants' organizations used when adopting APDMs.

This study contributes to the AEC literature and provides insights for industry practitioners. The study may be considered the first on OCM in AEC organizations when implementing APDMs. This study discussed the use of OCM practices from a practitioner perspective. The guidelines presented in this paper can help in guiding senior managers of

construction organizations and OCM consultants to effectively implement APDMs in the construction sector.

**4.7 Limitations and Recommendations**

This study contained several limitations. For example, because of time constraints, only nine individuals were interviewed. In future studies, interviewing a larger number of individuals would be beneficial. In addition, the study sample was limited to industry professionals in the public sector. Future research should include professionals in the private sector in order to gain a broader understanding of APDM implementation. The study sample was also limited to individuals in the United States, meaning that the study's results may not be generalizable to other countries. The guidelines can likely be generalized to other change initiatives in the AEC industry.

Future research could involve validating and testing the application of the guidelines by conducting case studies in construction organizations. Researchers could also ask academics and APDM practitioners to suggest how to improve the guidelines. Other studies could be conducted to establish the ideal time frame for each phase and to measure change progress during each phase of APDM implementation

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# CHAPTER 5: SUMMARY AND CONTRIBUTIONS

The objectives of this research were to (1) identify OCM practices that, when effectively executed, lead to increased success rates of adopting, (2) measure how employees in AEC organizations react to the adoption of APDMs, and (3) provide guidelines detailing how to lead APDM adoption at the organizational level through a change management perspective. The methodology was employed in this research included a literature review, a survey of 140 individuals, and nine interviews with industry professionals.

## 5.1 Summary of Results and Contributions

The first study of this research, chapter 2, provided the best practices of organizational change for adopting APDMs in the AEC industry. The findings of this study included: (1) a rank order of OCM practices that have most associated with achieving successful APDM adoption; and (2) traditional methods of external OCM consultants to help implement organizational change does not have a significant impact on the success of adopting APDMs. This study contributes to the existing body of knowledge by identifying the OCM practices that are the most significantly associated with successfully adopting APDMs.

The second study of this research, chapter 3, measured employees' reactions to the adoption of APDMs within the AEC industry. The findings from this study indicated the following results: (1) employees in AEC organizations react favorably to adopting a change in the project delivery systems; (2) increasing the use of organizational change OCM practices is related to decreased employee resistance to change; (3) employee reactions do

not mediate the relationship between OCM practices and APDM adoption; and (4) the most effective ways to disseminate change messages to employees are presentations, on-the-job support, and meetings. The findings of this study may be useful for change practitioners in which employees' reactions toward the changes in project delivery methods are more supportive than resistive to change. Moreover, this study provided effective methods to communicate change initiatives to all employees; doing so could lead to higher APDM adoption rates.

The third study of this research, chapter 4, provided guidelines detailing how to lead APDM adoption at the organizational level through the change management perspective. The guidelines consisted of four phases: preparing and planning, pilot project testing, expanding to the intended scale, and sustaining and evaluating. The phases of organizational change of implementing APDMs included specific OCM practices that increase the probability of successful APDM adoption. This study contributes to the existing body of knowledge by providing guidelines that can help owner organizations as they consider implementing the change in their project delivery methods for the first time.

The overall contribution of this research is the first to provide on an industry-wide view of OCM practices specifically within the context of the organizational change of APDM adoption. Previous studies focused on specific types of change adoption (e.g., technology, software, and risk management).

## 5.2 Limitations and Recommendations for Future Research

Although the research objectives were achieved, the research has several limitations that can be addressed in future studies. Regarding the survey questionnaire, the sample size

was relatively small (n=140). To reduce the effect of this limitation, a larger sample size can be taken in future research. Furthermore, the numbers of survey respondents from the public sector (n=123) and private sector (n=17) were not equal. Consequently, there may be biases in the results toward the public sector. In future research, more responses could be collected from the private sector to balance the data. Additionally, the questionnaire survey was limited to the United States. In future studies, the survey could be conducted in other countries to find top-ranked OCM practices that helped in the adoption of APDMs in their AEC industries. Another limitation is that only seven OCM practices were considered in this research. In future research, additional best practices could be studied.

Due to time constraints, only nine interviews were conducted with industry professionals from the public sector. Future research can conduct interviews with practitioners from the private sector to gain a wider view of APDM implementation. Another area of future work would be validating and testing the practical applicability of the guidelines by conducting case studies in construction organizations. It is also proposed that future work can seek suggestions for guidelines improvements from academics and practitioners of alternative project delivery methods. Other studies could be conducted to establish the time frame for each phase of APDM implementation and to add more OCM practices to each phase.

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APPENDIX A

SURVEY QUESTIONNAIRE

*Overview*

This study is being conducted to better understand how organizations have changed from only using Design-Bid-Build (DBB) and low-bid systems to also implementing and adopting alternative project delivery methods such as Design-Build (DB), Construction Manager at Risk (CMAR), Integrated Project Delivery (IPD), etc.

This survey will take approximately **4-8 minutes** to complete. If you are unsure of a particular question, please leave it blank.

Your participation in this study is voluntary and very much appreciated. All individual responses are anonymous and will not be shared. Only response averages will be shared in the final research study.

Thank you for taking the time to share your insights and experience with our research team.

Do you agree to participate in this study?
○ Yes, I agree

In one sentence, describe the alternative project delivery that your organization implemented:

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**Section 1: Check any of the followings that were included in your organization's change (Select all that apply):**
- o Design-Build (DB)
- o Construction Manager at Risk (CMAR) or Construction Manager/General Contractor (CM/GC)
- o Intergraded Project Delivery (IPD)
- o Public-Private Partnerships (PPPs)
- o Other: _____

**Approximately what year did your organization begin implementing alternative delivery/non-low-bid practices?**
- o Before 1990
- o 1990 to 1994
- o 1995 to 1999
- o 2000 to 2004
- o 2005 to 2009
- o 2010 to 2014
- o 2015 to 2019
- o Unknown

**Section 2:**
**A. Organizational Change Management (OCM) Practices:**
Please answer the following questions about the change management practices **during** the implementation of the change in your organization.

Your organization's **senior leadership** was committed to making the change a success ("walked the talk").

- o Strongly Agree
- o Agree
- o Somewhat Agree
- o Neutral
- o Somewhat Disagree
- o Disagree
- o Strongly Disagree

You had a clear **understanding** of the action steps for **how to implement** the change within your job function.

- o Strongly Agree
- o Agree
- o Somewhat Agree
- o Neutral
- o Somewhat Disagree
- o Disagree
- o Strongly Disagree

You had a clear idea of how the change would **benefit** you personally (within your job function).

- o Strongly Agree
- o Agree
- o Somewhat Agree
- o Neutral
- o Somewhat Disagree
- o Disagree
- o Strongly Disagree

The **timescale/speed** that your organization implemented the change was **realistic** and achievable.

- o Strongly Agree
- o Agree
- o Somewhat Agree
- o Neutral
- o Somewhat Disagree
- o Disagree
- o Strongly Disagree

Your organization established clear **benchmarks** to measure success compared to previous performance.

- o Strongly Agree
- o Agree
- o Somewhat Agree
- o Neutral
- o Somewhat Disagree
- o Disagree
- o Strongly Disagree

The "**change agents**" (or transition team) responsible managing the change within your organization were effective.

- o Strongly Agree
- o Agree
- o Somewhat Agree
- o Neutral
- o Somewhat Disagree
- o Disagree
- o Strongly Disagree

Your organization leadership had appropriately **adjusted the workloads** to increase capacity for staff to the focus on the implementation of the change.

- o Strongly Agree
- o Agree
- o Somewhat Agree
- o Neutral
- o Somewhat Disagree
- o Disagree
- o Strongly Disagree

### B. APDM Adoption Measures:

Please answer the following questions about the adoption of the change in your organization.

The organizational change was successfully **adopted as intended**.

- o Strongly Agree
- o Agree
- o Somewhat Agree
- o Neutral
- o Somewhat Disagree
- o Disagree
- o Strongly Disagree

Your organization **achieved the beneficial impacts** and performance gains that were desired from the change initiative.

- o Strongly Agree
- o Agree
- o Somewhat Agree
- o Neutral
- o Somewhat Disagree
- o Disagree

- o Strongly Disagree

Your organization **sustained** the change into its **long-term** operations (or is currently on track to sustain the change)
- o Strongly Agree
- o Agree
- o Somewhat Agree
- o Neutral
- o Somewhat Disagree
- o Disagree
- o Strongly Disagree

**Section 3: Hire an external OCM consultant:**
Did your organization hire an external organizational change management consultant to assist with the implementation of the change?
- o Yes
- o No

**Section 4: Change-Related-Training and Employee's Reactions to Change Implementation:**

During the change, what were the three main ways your organization provided **change-related training** to employees? (Please select at most 3 answers)
- o Speeches
- o Informational Presentations
- o Memos & Emails
- o Instructional Videos
- o Instructional manuals, checklists, and/or guidebooks
- o Interactive Workshops & Simulations
- o Meetings & Phone Calls
- o On-the-Project or On-the-Job Support

o Other: _____

During the change, which **reactions** were most common among the organization's personnel? (Please select at most 3 answers)

- o Initiating, Embracing, Championing the change
- o Actively Supporting and Cooperating with the change
- o Passively Agreeing with and Accepting the change
- o Reluctantly Complying with the change
- o Ignoring, Withdrawing, Avoiding the change (covertly not participating)
- o Refraining, Waiting, Observing the change (openly not participating)
- o Stalling, Dismantling, Undermining (covertly opposing the change)
- o Obstructing, Opposing, Arguing (openly opposing the change)
- o Other: _____

## Section 5: Demographic Questions

Please answer the following questions to provide some additional information about your organization.

Is your organization in the **public** or **private** sector?

- o Public
- o Private

Please estimate your organization's **total construction spend** per year.

- o Less than $10M
- o $10–30M
- o $30–49M
- o $50–99M
- o $100–499M
- o $500M+

Approximately how many **full-time employees** (including field and office staff) does your organization have for design/construction operations?

- o Less than 10
- o 10–19
- o 20–49
- o 50–99
- o 100–499
- o 500+

How many years of **professional experience** do you have?

- o Less than 5 years
- o 5–9 years
- o 10–19 years
- o 20–29 years
- o 30–39 years
- o 40+ years

Which of the following most closely describes your **work group**?

- o Design and planning
- o Construction
- o Facilities operation and maintenance
- o Contracts and procurement
- o Other: [            ]

Which of the following best describes your current **job position**?

- o Non-supervisory (frontline/project team member)
- o First-Tier supervisor (project manager, crew lead)
- o Second-Tier supervisor (regional manager, director, etc.)
- o Senior Executive (AVP, VP, C-suite)

What is your **generational affiliation**?

- o Traditionalist (born prior to 1946)
- o Baby Boomer (born 1946–1964)
- o Generation X (born 1965–1980s)
- o Millennial / Generation Y (born 1980s to early 2000s)
- o Generation Z (born in early 2000s)

Are you willing to participate in a follow-up interview?

- o Yes
- o No

**End of Survey**

APPENDIX B

INTERVIEW QUESTIONS

*Background about the APDM Adoption*

The purpose of these questions is to gain general info about the new project delivery methods your organization implemented.

1. What alternative project delivery method(s) (Design-Build, Construction Manager at Risk, Integrated Project Delivery, and Public-Private Partnerships) did your organization implement? (If you've been a part of more than one, let's talk about the one that you had more experience in implementing)

2. When did your organization implement the APDM?

3. Why did your organization implement the APDM?

4. What was your specific role or involvement during APDM adoption? (for example, were you in a leadership role or part of the core team implementing, were you the first to use the new method, etc.)

5. For the next group of questions, we are looking to understand what changed within your organization's *existing processes*. In other words, what did your people have to *do differently* than they were used to doing in the past (with your existing processes)?

    a. Design process—what changed regarding typical the design process for this specific project, how the designer interacted with your team, design review, collaboration, etc.?

    b. Contracting process—what changed regarding how the vendors were contracted? (GMP, how was contingency handled and how was that different from low-bid, was the contingency left over shared or withheld)

    c. Approval process—what changed from your typical approval process (invoicing, tracking, etc.)?

    d. Construction management process—what changed from your typical construction management process (were the CMs brought into the project at the same time/earlier, what was their involvement in prison/design, during construction what were the top 3 differences that you don't normally see in DBB)?

    e. Were there any other internal processes that changed? (Please describe)

6. What new practices/processes that you used were the most effective?

7. What was the most difficult part/aspect to change? Why?

8. Which groups struggled (e.g., procurement, legal, engineering, capital, etc.)?

9. Was there any specified methodology or process map your organization followed for APDM adoption? Please, could you share it with us?

*Implementation Process*

Please walk through the process of implementing the APDM.

1. How did upper management support or commit APDM adoption (e.g., allocate resources, etc.)?

   a. How were they convinced to support or commit to APDM adoption?

2. Did your organization appoint change agents responsible for leading and managing the APDM adoption within your organization? If yes:

   a. Who were the change agents? And how were they selected?

   b. What were their roles or tasks?

   c. What were the personality characteristics and skills required for a change agent?

3. Based on your survey response, your organization did hire a consultant to assist with change management. What did the consultant assist with?

   a. What were their major deliverables?

   b. Did they provide assistance during the project execution?

4. Who were the most important active players in implementing the APDM adoption?

5. How did employees react to the APDM adoption within your organization over the lifetime of the change (resistance, supporting, etc.)?

   a. Were the reactions consistent over time?

   b. Did the reactions become more accepting or less accepting over time?

   c. What do you think were some of the reasons why the reactions changed over time?

   d. How did your organization overcome and manage employees' resistance?

6. How did your organization train employees about the APDM process (e.g., a consultant trained everyone, in-house training a consultant trained everyone, online training/videos, etc.)?

   a. Did the training include all employees inside your organization?

   b. If not, which employees or groups were trained?

   c. What did the training focus on (e.g., what were the topics, areas covered, etc.)?

The next questions focus on pilot testing. As a reminder, the definition of "pilot" is…

7. Did your organization pilot the new method? If yes:

   a. What was the *type* of project (e.g., building, highways, etc.)?

   b. What was the *size* of the project (e.g., less than $1M, $1M–$3M, etc.)?

   c. What was the *timeline* of the project (e.g., less than a year, 1–3, etc.)?

   d. Why did your organization select the above project for the pilot?

   e. How many projects did your organization use to pilot the new method?

   f. Did your organization assign a *specific team* to deliver the first projects?

   g. How did the first projects go?

   h. How did your organization know the pilot projects achieved the goal(s)?

The next questions are about how your organization did sustain and evaluate the APDM adoption for long-term operation.

8. How did your organization sustain the adoption?

9. How did your organization know the adoption was successful (e.g., goal achieved)?

   a. How did your organization define the success of APDM adoption?

   b. What metrics are being used for evaluating the success of APDM adoption?

   c. How did your organization document and share the success within the organization?

*Lessons Learned*

10. If you had to repeat this process over, what role, involvement, or activity do you think would further help improve APDM adoption?

**End of the Interview**