

# Drivers of Organizational Change within the AEC Industry: *Linking Change Management Practices with Successful Change Adoption*

by  
*Simplar Institute*

## Abstract

In today's rapidly evolving market, effective organizational change adoption has become a core competency of architecture, engineering, and construction (AEC) firms in order to maintain their competitive advantage. Firms that more effectively manage organizational change adoption can position themselves as early adopters and are able to expend less resources in making the transition. The objective of this study was to collect a global sample of organizational change initiatives across the AEC industry in order to identify whether specific change management practices have a direct relationship with successful change adoption. Based on a data sample of 237 organization-level change initiatives, the results of this study establish that there are definitive – and learnable – change management practices that AEC firms can implement to increase the success of their change initiatives. The global data sample within this study is a meaningful contribution to the AEC literature, which is primarily consists of case-based studies that are limited to a single type of organizational change event. Further, this study contributes practical action steps for industry professionals to more effectively manage the adoption of new technologies, management strategies, and business practices within their organizations

## Research Details

### INTRODUCTION

In today's rapidly evolving market, the ability of architecture, engineering, and construction (AEC) firms to adopt organizational change has become a core competency to remain competitive. There are many forms of organizational change within the industry; for example, the continual evolution of information technology has had vast impacts on AEC firms, such as the integration of Building Information Modeling (BIM), smart products, mobile technology, safety monitoring equipment, building scanning technology, virtual design and construction, and e-document management. Other changes include advancements in management strategies, including the industrialization of construction operations, modular techniques, pre-construction services, design and construction integration, supply chain management, advanced work packaging, and evolving project delivery methods. Within the context of this study, organizational change is defined as a planned alteration of a firm's traditional practices with the intent of changing the company's long-term operating protocols (Hallencreutz and Turner 2011, Helms Mills *et al.* 2009)

Regardless of which particular change an AEC company may consider, firms with effective change management protocols can position themselves to more efficiently manage the transition, thereby

potentially reducing resource expenditures and accelerating the pace of change where feasible. The result is that successful organizational change management enables firms to better respond to evolving market conditions and differentiate themselves from their competitors. Yet organizational change adoption is inconsistent across the industry, which raises a fundamental research question: how are some companies able to more effectively implement organizational changes while others are less successful?

The objective of this study was to establish industry-wide relationships between certain change management practices and the adoption of organizational change. Leading change management practices were identified from the organizational behavior literature. Although these practices have been investigated within the AEC literature, existing studies have typically been restricted to limited data samples (typically comprised of only a few companies) and focused on the adoption of a single type of change. In order to address this gap in the literature, the objective of this study was to conduct an international survey to more broadly establish the influence of key change management practices on the facilitation of successful organizational change adoption within AEC firms. The results of this study are intended to confirm that there are certain change management strategies that AEC firms can use to more successfully adopt company-level change initiatives.

### LITERATURE REVIEW

The literature review was conducted with an interdisciplinary focus by examining key change management practices from the field of organizational behavior. Lewin (1947) is largely credited as one of the early founders of organizational change research, where he characterized change implementation into three phases called unfreezing, moving, and freezing (or re-freezing). The scope of this paper was to focus on the “moving” phase of change initiative; in other words, the literature review emphasized the mechanics of *how* the organization accomplished the transition from one operational state to the next. Key practices within Lewin’s other phases of unfreezing (antecedent conditions necessary for fostering change such as the initial decision to make the change and creating a sense of urgency to create motivation for the transition) and re-freezing (institutionalization or post-transition normalization of the new practices) were therefore beyond the scope of this study. Change management practices from the organizational behavior literature were then coupled with examples of where they have been documented within the AEC literature. As stated previously, it should be noted that the AEC literature is primarily limited to case studies and relatively small data sets focused on a singular organizational change initiative, which further motivated the interdisciplinary approach to the literature review.

#### ***Visible Commitment of Senior Leadership***

Securing executive sponsorship is widely credited as being a driver of successful change adoption within the organizational behavior literature. Beer and Eisenstat (1996) suggested that before a change is implemented, senior leadership’s role is to demonstrate that the proposed change is pertinent and suitable to the organization’s position in the marketplace. Visible commitment from senior leaders is also required for the duration of change implementation in order to build credibility Armenakis *et al.* (1999). Otherwise, employees may perceive that the change initiative is merely a passing “fad” that will eventually be abandoned (Emiliani and Stec 2004).

---

Senior leadership commitment has also been noted as a key factor within the AEC industry; however, studies have focused on a range of organizational change types and are often limited to data sets of several organizational cases, isolated geographic locations, or particular industry sectors. In a study of construction projects within the U.S. and Singapore, management commitment was identified as a major barrier to adopting human resource practices for safety management (Lai *et al.* 2011). Shehu and Akintoye (2010) found a lack of commitment from senior leaders to be the single largest barrier to the successful implementation of program management among organizations in the UK construction environment. BIM adoption has been linked to consistent support from top management within design firms (Ding *et al.* 2015, Son *et al.* 2015). Management-focused changes, such as the adaptation of Six Sigma within construction, have also been shown to benefit immensely from active senior leadership support (Pheng and Hui 2005).

### ***Extensively Communicate the Benefits for Employees***

The field of organizational behavior has long credited communication of the change message as a driver of change readiness among employees (Armenakis *et al.* 1993). Research has focused on the aspects that comprise an effective change message, much of which boils down to answering the question of “What’s in it for me?” for each employee (Armenakis *et al.* 1999, Holt *et al.* 2007, Self and Schraeder 2009). Cameron and Quinn (1999) noted the change message must emphasize the disadvantages of remaining with the status quo. Without extensive communication of the benefits a change will bring, organizations are sure to encounter resistance due to employees’ uncertainty with the new process and fear of unknown consequences (Bourne, *et al.* 2002).

In a case study inquiry of three large Australian construction companies, Peansupap and Walker (2006) found that a leading factor affecting the diffusion of information and communication technologies was the lack of clear benefits communicated to the companies’ employees. Case studies of several UK architectural firms implementing BIM and lean practices revealed that overcoming resistance to the change often stemmed from the inability for personnel to understand the benefits compared to their traditional drafting practices (Arayici, *et al.* 2011). The influence of unionized labor forces—although not exclusive to the AEC industry—is a complicating factor that must be considered during organizational change initiatives. In their interviews with firms that implemented cooperative partnering procurement procedures, Eriksson *et al.* (2009) identified that labor unions must be included in discussions surrounding any change in order to clearly understand the benefits to their membership.

### ***Appoint Effective Change Agents to Lead the Transition***

Perhaps the most important role is that of the change agent, defined in the organizational behavior literature as the internal champions of the change who act as an official “transition team” to guide the transition (Hunsucker and Loos 1989, Kanter 1983). This role is understood to be distinct from senior executive support, as change agents are expected to “roll up their sleeves” and be directly involved in all aspects of change implementation (Self and Schraeder 2009). Organizations are recommended to designate individuals to lead the change as part of their work responsibilities, and these change agents should be readily available to assist other employees both before and throughout the change (Covin and Kilmann 1990, Schweiger and DeNisi 1991).

---

In a case study of several U.S. and Japanese contractors who implemented new web-based project management software, Dossick and Sakagami (2008) noted the importance of establishing a leader who took action to facilitate training, deliver communication, and enforce utilization. In an earlier study of total quality management practices within seventeen AEC firms, Burati and Oswald (1993) specified the need for active involvement of middle management in addition to senior leadership commitment. Recent trends in BIM adoption have revealed that establishing a “master BIM manager” is a priority, according to six BIM experts interviewed by Won and Lee (2013).

### ***Establish Clear Performance Benchmarks to Quantify Progress***

An important strategy for organizations to build momentum for a change initiative is to establish clear benchmarks of the desired results and then clearly document progress throughout the organization’s transition. In his famous eight-step process for leading change, John Kotter (1995) recommends that change managers systematically plan for, create, and celebrate short-term wins, which both recognizes and rewards employees who actively participate in the change. Cameron and Quinn (1999) noted that public communication of successful results not only demonstrates visible performance improvement, but also builds confidence among the organization’s personnel. Other organizational behavior experts have noted that measurable successes serve to legitimize the appropriateness of the change for the organization (Walker *et al.* 2007).

The AEC industry’s longstanding tradition of being hyper profit-focused means that executives must deliberately identify how a change initiative will impact the bottom line throughout the transition. For example, a survey regarding BIM implementation within the UK noted that many firms struggled with the lack of immediate benefits from the initial projects delivered (Eadiea, *et al.* 2013). Another study found the top barrier of BIM implementation to be unclear and invalidated performance improvements (Lee *et al.* 2015). Construction firms that have implemented enterprise risk management systems reported a lack of quality data as a barrier to change (Zhao, *et al.* 2015). Within the construction sector specifically, studies have found that workers are more stimulated to participate in innovation efforts when profits are shown to be maximized (Na *et al.* 2006).

### ***Follow a Realistic Implementation Timescale***

Another behavioral aspect of organizational change is the rate of implementation (Rodgers 2003). Even when an organization’s personnel support the vision for change, they may still resist the transition if they feel management is expecting an unrealistic pace (Smollan 2011). Organizational behavior experts have noted the benefit of planning for longer strategic time horizons rather than hoping for a “quick fix” approach to change adoption (Garratt 1999, Tatum 1989).

AEC firms often underestimate the time and resources required for change, whether regarding the implementation of quality management programs (Sullivan 2011), radio-frequency identification (RFID) technology (Li and Becerik-Gerber 2011), risk management systems (Cheung and Loosemore 2015), communication technology (Peansupap and Walker 2006), or knowledge-management systems (Tan *et al.* 2012).

---

### ***Provide Sufficient Training Resources for Employees***

A major cause of resistance to change occurs when organizations do not provide sufficient change-related training to their employees (Alvesson 2002, Schneider *et al.* 1994). The psychological dynamics surrounding the effect of sufficient training resources on change recipients has long been documented by organizational behaviorists. For example, Judson (1991) stated that employees will worry that they personally may not be capable of changing how they operate within their daily job functions, and Galpin (1996) showed that appropriate levels of training become a key factor in building employee confidence in their ability to successfully adopt the change.

This is particularly true in the AEC industry, where companies are highly specialized and each project requires unique technical solutions. When new technology is introduced to project teams, it is critical that they receive appropriate training to familiarize themselves how to utilize the technology during project operations. For example, training has been shown to be critical for BIM integration (Bo and Chan 2012, Jensen *et al.* 2013, Khosrowshahi and Arayici 2012, Rogers *et al.* 2015). The importance of training is not limited to technology-focused organizational changes and extends to all forms of management- or operations-based changes; for example, when companies first gain experience with alternative project delivery systems (such as design-build), they must build their project team's knowledge and skillsets in order to achieve success (Park, *et al.* 2009).

## **METHODOLOGY**

### ***Research Objectives and Anticipated Contribution***

The objective of this study was to establish industry-wide relationships between prominent change management practices from the organizational behavior literature and successful organizational change adoption within the AEC industry. Further investigation focused on trends that may exist based upon AEC industry demographic groupings. A review of previous literature revealed that although numerous organizational change studies are present in the AEC literature, the existing body of knowledge is primarily limited to small data sets, such as case studies of a single organization or small groups of companies.

The contribution of this study is to formally demonstrate the influence of change management strategies across a robust sampling of AEC firms and a wide range of organizational change types. The results are relevant to practitioners by verifying that there are definitive and learnable strategies AEC firms can use to increase the success of their organizational change initiatives.

### ***Questionnaire Design***

The questionnaire was designed to collect feedback from AEC companies regarding a significant organizational change their firm had recently experienced. Respondents were asked to identify a recent organizational change they participated in and answer questions regarding the change management methods their company utilized to facilitate the transition. Respondents also indicated the extent of successful change adoption that their firm was able to achieve.

The questionnaire was created using an online survey tool due to the accessibility of online survey tools and ease of reaching large numbers of participants. First, a pilot questionnaire was created and distributed to 23 participants via email. A teleconference discussion was conducted to present a review of the

---

## RESEARCH STUDY



questions within the pilot survey. Minor changes were suggested by the pilot questionnaire participants and were incorporated to refine the final questionnaire.

Once the questionnaire was finalized, a standard email template was created providing information about the research objectives. The survey questionnaire consisted of two additional sections. The first section was framed around the main research question and captured scales for each change management practice along with three scales measuring the change adoption dependent variable. The second section asked questions regarding the respondent's demographics.

To meet the study objectives, it was necessary to gather data from a broad section of the AEC industry. Survey respondents were contacted by distributing via the mailing lists of multiple professional organizations, including Fiatech, Process Industry Practices (PIP), Mechanical Contractors Association of America (MCAA), In Eight, and Engineering News-Record (ENR). The snowball approach to sampling was utilized, where recipients were requested to forward the survey to colleagues; therefore, the exact number of survey questionnaires distributed cannot be established and the traditional response rate cannot be calculated (Muller and Turner 2007). Email distribution occurred over a two-week period with a three-week cutoff period for responses.

---

**Definition of Variables**

Leading change management practices were identified based their prevalence within the organizational behavior literature as well as their relevance to case studies of AEC organizational change. The specific definitions of each change management practice that were studied are included in Table 1, along with multiple measures for the dependent variable of change adoption. The change adoption measures were focused on quantifying the extent to which an organizational change was successfully executed by the company. Variables were measured on seven-point Likert-like scales within the survey questionnaire (1=strongly agree, 2=agree, 3=somewhat agree, 4=neutral, 5=somewhat disagree, 6=disagree, 7=strongly disagree).

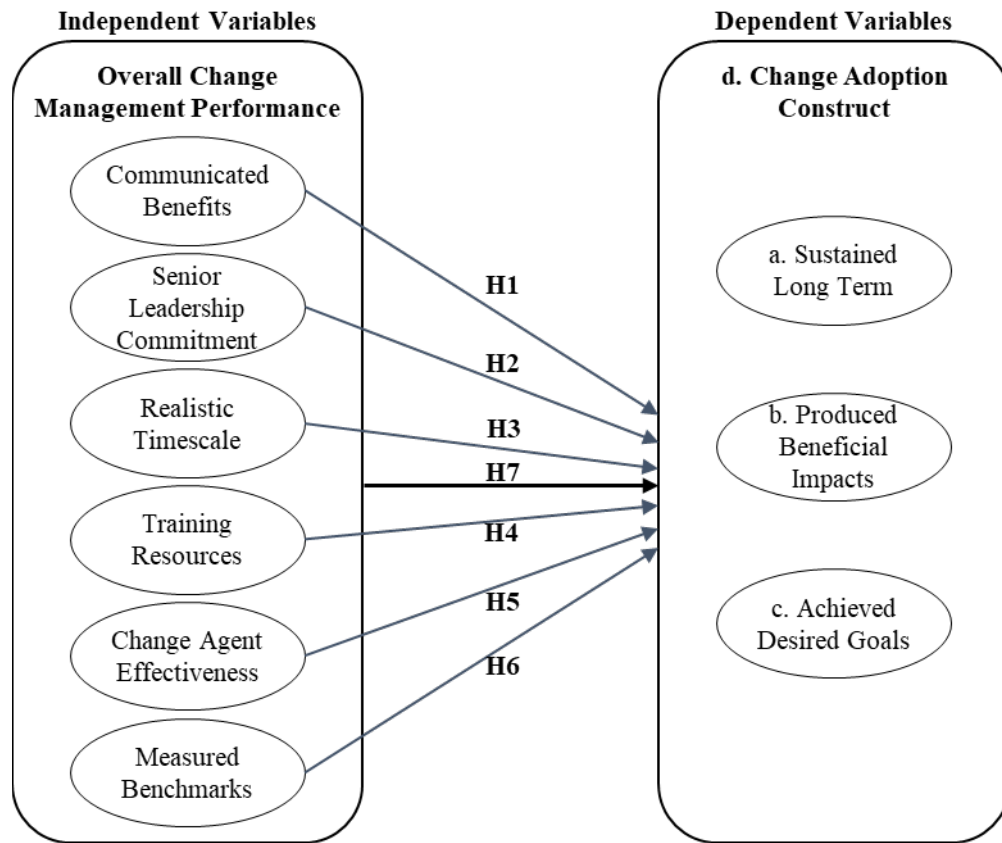
**Table 1.** Summary of Change Management Practices and Organizational Change Adoption Measures

Variable Type	Abbreviation Variable	Definition
<b>Change Management Practice</b>	Communicated Benefits	Employees had a clear understanding of how the organizational change benefited them personally within their specific job function.
	Senior Leadership Commitment	The organization’s senior leadership were committed to the organizational change initiative (“walked the talk”).
	Realistic Timescale	The speed at which the organization implemented the change was appropriate and achievable.
	Training Resources	Employees had a clear understanding of the action steps necessary to implement the change within their specific job function.
	Change Agent Effectiveness	The change agents responsible for leading and managing the change initiative were effective.
	Measured Benchmarks	The organization established clear benchmarks to evaluate the success of the change initiative (in relation to previous performance).
<b>Change Adoption</b>	Sustained Long Term	Organizational change adoption was sustained long term within the company’s operations (three or more years).
	Produced Beneficial Impacts	Organizational change adoption resulted in a positive or beneficial impact on the organization.
	Achieved Desired Goals	Organizational change adoption achieved the desired outcomes within the organization’s operations.
	Change Adoption Construct	Overall organizational change adoption, measured as the linear composite of the optimally weighted change adoption variables.



**Hypothesis Statements**

Hypotheses are graphically summarized in Fig. 1. Each of the change management practices was hypothesized to have a positive relationship with change adoption. Note that each hypothesis was subdivided into four components to establish relationships of change management practices with each measure of change adoption, including (a) Sustained Long Term, (b) Produced Beneficial Impacts, (c) Achieved Desired Goals, and (d) the Change Adoption Construct.



**Figure 1.** Graphical Representation of Study Hypotheses

**Method of Analysis**

First, Spearman’s rank order correlation was used to establish the bivariate relationships between individual change management practices and change adoption measures. Spearman’s rank order correlation is a non-parametric test and common analytical approach for ordinal data measures (McClure 2005, Spearman 1904). Second, multiple ordinal logistic regression was performed to investigate the total variance in change adoption that was explained by the change management practices used in collaboration. Third, a more refined correlation analysis was performed based upon demographic subsections of the study sample.



### Study Sample

The questionnaire was designed such that each response represented an organization-wide change initiative. This unit of measure was purposely selected to establish change management relationships across a broad sample that included numerous types of organizational change initiatives. A total of 237 organizational change initiatives were collected. A sample of the types of initiatives are listed in Table 2. Based on its size and variety, the sample was considered to be a fairly accurate representation of the AEC industry. Respondent characteristics are summarized in Table 3, which shows that a range of AEC organization types and sizes were represented in the data sample and the majority of respondents held more than twenty years of experience.

**Table 2.** Examples of the Organizational Change Initiatives Captured within the Data Sample

Organizational Change Category	Common Sample Initiatives from the Data Sample
Software	BIM, Project Controls, Project Management, Document Management Systems, Paperless Systems
Technology Application	Mobile Technology, Radio Frequency Identification (RFID), Materials Tracking Upgrades
Supply Chain Reorganization	Industrialized Construction, Supplier Relation Management, Customer Relationship Management System
Management & Operations	Lean, Alternative Project Delivery, Formal Project Management Systems, Alternative Procurement, Knowledge Management, Safety Management
Business Strategy	Enterprise Risk Management, Business Structure Reorganization, Entering a New Market, Change in Marketing Strategy

**Table 3.** Respondent Characteristics

Category	Subcategory	Frequency	Percentage
Organization Size (gross revenue)	<30 Million	29	12.3%
	30 Million – 99 Million	25	10.6%
	100 Million – 499 Million	29	12.3%
	>500 Million	81	34.3%
	Unknown / Not Indicated	72	30.5%
Organization Type	Owner	109	46%
	Contractor	45	19%
	Architecture / Engineering	35	14.8%
	Unknown / Not Indicated	48	20.2%
Hierarchical Position	Project Team	24	10.1%
	Project Leader	51	21.5%
	Manager / Director	71	30.0%
	Senior Executive	46	19.4%
	Unknown / Not Indicated	45	19.0%
Years of Professional AEC Experience	0 – 10 years	8	3.4%
	10 – 20 years	26	11.0%
	20 – 30 years	71	30.0%
	30 – 40 years	73	30.8%
	40+ years	25	10.5%
	Unknown / Not Indicated	34	14.3%

## RESULTS

### ***Reliability of the Change Adoption Construct***

The internal reliability was investigated for the Change Adoption Construct. Cronbach's alpha, which is a commonly accepted measure of scale reliability, was above the acceptable threshold of 0.7 (Cronbach 1951, DeVillis 2003, Kline 2005). A principal component analysis (PCA) with varimax rotation was performed to establish the Change Adoption Construct. Inspection of the correlation matrix showed all variables had at least one correlation coefficient greater than the 0.3 threshold. The overall Kaiser-Meyer-Olkin measure was 0.653, which is classified as "mediocre" according to Kaiser (1974). The individual values of KMO measure of each variable were greater than 0.6, and Bartlett's test of sphericity was statistically significant ( $p < .001$ ), indicating that the data was likely factorable. A single factor was extracted based upon visual inspection of the scree plot, which revealed only a single point above the inflection point, which was supported by results of the varimax orthogonal rotation. The Change Adoption Construct was established as the linear composite of the optimally-weighted original variables (Sustained Long Term, Produced Beneficial Impacts, and Achieved Desired Goals).

### ***Bivariate Relationships between Change Management Practices and Change Adoption***

Spearman's rank-order correlation was utilized to assess the bivariate relationships between the change management practices and the various measures of change adoption. Preliminary analysis showed the relationships to be monotonic, as assessed by visual inspection of scatter plots. Results of the correlation matrix are shown in Table 4. Statistically significant relationships were found at the 99% confidence interval, which supported all hypotheses.

Focusing on the Change Adoption Construct, a strong positive correlation existed with Change Agent Effectiveness ( $r_s = .714$ ,  $p < .01$ ) and moderate positive relationships were found for Communicated Benefits ( $r_s = .659$ ,  $p < .01$ ), Realistic Timescale ( $r_s = .544$ ,  $p < .01$ ), Senior Leadership Commitment ( $r_s = .510$ ,  $p < .01$ ), Measured Benchmarks ( $r_s = .603$ ,  $p < .01$ ), and Training Resources ( $r_s = .476$ ,  $p < .01$ ). Interpretation of association strength was based on guidelines recommended by Keller and Warrack (2000) and Lehtiranta *et al.* (2012).

Investigation of individual measures of change adoption (Sustained Long Term, Produced Beneficial Impacts, and Achieved Desired Goals) revealed minor changes in relative importance of the independent variables. For example, Senior Leadership Commitment had the strongest relationship with an organization's ability to sustain long term change, whereas it was only the fifth strongest relationship with the overall Change Adoption Construct.

---

**Table 4.** Spearman Correlation of Independent and Dependent Variables

#	Variable Abbreviation	1	2	3	4	5	6	A	B	C	D
1	Communicated Benefits	1.000									
2	Senior Leadership Commitment	.439	1.000								
3	Realistic Timescale	.544	.474	1.000							
4	Training Resources	.620	.317	.547	1.000						
5	Change Agent Effectiveness	.628	.491	.627	.566	1.000					
6	Measured Benchmarks	.518	.450	.472	.490	.565	1.000				
A	Sustained Long-term	.384 <sup>1a</sup>	.405 <sup>2a</sup>	.330 <sup>3a</sup>	.283 <sup>4a</sup>	.380 <sup>5a</sup>	.353 <sup>6a</sup>	1.000			
B	Achieved Goals	.634 <sup>1b</sup>	.450 <sup>2b</sup>	.580 <sup>3b</sup>	.442 <sup>4b</sup>	.687 <sup>5b</sup>	.547 <sup>6b</sup>	.509	1.000		
C	Produced Beneficial Impacts	.634 <sup>1c</sup>	.467 <sup>2c</sup>	.487 <sup>3c</sup>	.515 <sup>4c</sup>	.691 <sup>5c</sup>	.603 <sup>6c</sup>	.462	.741	1.000	
D	Change Adoption Construct	.659 <sup>1d</sup>	.510 <sup>2d</sup>	.544 <sup>3d</sup>	.476 <sup>4d</sup>	.714 <sup>5d</sup>	.603 <sup>6d</sup>	.685	.913	.887	1.000

Notes: Correlation was significant at the 0.01 (2-tailed) level for all variables

Bivariate association with specific study hypotheses shown below:

<sup>1a, 1b, 1c, 1d</sup> Hypothesis 1

<sup>2a, 2b, 2c, 2d</sup> Hypothesis 2

<sup>3a, 3b, 3c, 3d</sup> Hypothesis 3

<sup>4a, 4b, 4c, 4d</sup> Hypothesis 4

<sup>5a, 5b, 5c, 5d</sup> Hypothesis 5

<sup>6a, 6b, 6c, 6d</sup> Hypothesis 6

### ***Ordinal Regression of Change Management Practices and Change Adoption***

Ordinal logistic regression tests were conducted to further explore the collected data and validate inferences gained from correlation results. Separate ordinal logistic regressions were performed between all change management practices and each of change adoption measure. Three pseudo-R<sup>2</sup> measures were assessed for each model to identify the variance explained, revealing that the change management practices collectively defined between

17.9% and 58.1% of the variance in change adoption (Table 5). For each regression, there were proportional odds as assessed by a full-likelihood ratio test comparing each model with varying location parameters. The deviance goodness-of-fit test indicated each models to be a good fit for the observed data, and all models were statistically significant over the intercept-only models as shown by the likelihood-ratio test.

Notable statistically significant parameter estimates are reported below for each ordinal regression, with emphasis on differences between the change adoption results achieved by organizations that agreed vs. disagreed that their organization effectively performed each change management practice. For the Change Adoption Construct, the odds that an organization achieved a successful change adoption was twenty times more likely when the benefits of the change were thoroughly explained ( $p = .001$ ). Establishing quantifiable performance metrics improved the odds of successful organizational change adoption sevenfold. When effective change agents were present to manage the change effort, the organization was seven times more likely to adopt the change ( $p = .001$ ). When the organization established clear benchmarks to evaluate the change initiative's success, the organization was seven times

more likely to achieve successful change adoption ( $p = .000$ ). Organizations that followed a realistic implementation plan were four times more likely to successfully adopt the change. Organizations with visible senior leadership commitment throughout the change were four times more likely to be successful ( $p=.020$ ).

**Table 5.** Summary Results of Ordinal Logistic Regression Tests

Tests	Sustained Long Term	Achieved Desired Goals	Produced Beneficial Impacts	Change Adoption Construct
Cox and Snell Pseudo-R <sup>2</sup>	.179	.438	.417	.516
Nagelkerke Pseudo-R <sup>2</sup>	.289	.569	.535	.581
McFadden Pseudo-R <sup>2</sup>	.205	.393	.357	.331
Deviance Goodness-of-Fit Test ( $p > .05$ indicates the model is a good fit)	83.096 ( $p = .999$ )	106.32 ( $p = .919$ )	119.802 ( $p = 0.685$ )	81.219 ( $p = .997$ )
Likelihood-Ratio Test ( $p < .05$ indicates fit above intercept-only model)	42.437 ( $p < .05$ )	123.184 ( $p < .05$ )	39.518 ( $p < .05$ )	135.229 ( $p < .05$ )

When considering the effect of change management practices on individual measures of change adoption, parameter estimates from ordinal logistic regressions revealed several notable results. For the dependent variable of Sustained Long Term, the establishment of clear performance benchmarks was found to have the greatest odds ratio among the change management practices, such that organizations that established clear measurements of the change initiative were nearly four times more likely to adopt the change in their long term operations ( $p = .017$ ). For the measure of Achieved Desired Goals, senior leadership commitment was the greatest odds ratio, resulting in a rate of successful goal achievement eleven times larger ( $p = .001$ ) than organizations without visible senior leadership commitment. Furthermore, the second-greatest odds ratio for Achieved Desired goals was the presence of effective change agents ( $p = .022$ ), which highlights the importance of leadership skills in managing change. For the dependent variable Produced Beneficial Impacts, organizations with senior leadership commitment had nearly six times greater change adoption rate ( $p = .008$ ) Organizations established clear benchmarks were four times more successful ( $p = .001$ ). The presence of effective change enabled organizations to be four times more likely to achieve their desired performance improvements.

### ***Demographic Trends and Change Adoption***

Correlation analysis was performed between the Change Adoption Construct and the independent variables based upon the various demographic characteristics of the survey respondents. Results are summarized in Table 6 and key findings are described below.

### ***Organizational Size.***

Firms with revenue above \$30 million agreed on the relationship between the various change management practices and their ability to positively influence adoption. Yet smaller organizations found a stronger relationship between both senior leadership commitment and change agent effectiveness and the successful adoption of organizational change initiatives. This effect can perhaps be explained in the sense that smaller organizational size may provide individual leaders with greater ability to extend their influence across the organization.

**Table 6.** Summarized Correlation Analysis for the Change Adoption Construct based on Respondent Demographics

Category	Subcategory	Comm. Benefits	Sr. Leader. Commitment	Realistic Timescales	Training Resources	Chg. Agent Effect.	Measured Benchmarks
<b>Organizational Size</b>	<30M	.796**	.612**	.599**	.549**	.786**	.654**
	30M – 99 M	.671**	.502*	.588**	.546**	.742**	.424*
	100M – 500M	.772**	.678**	.693**	.564**	.700**	.596**
	500M+	.587**	.330**	.338**	.355**	.622**	.569**
<b>Organizational Type</b>	Owner	.758**	.511**	.547**	.477**	.764**	.641**
	Contractor	.559**	.333*	.546**	.379*	.565**	.482**
	Architect / Engineer	.639**	.403*	.356*	.324	.678**	.596**
<b>Hierarchical Position</b>	Project Team	.856**	.634**	.651**	.737**	.717**	.711**
	Project Leader	.630**	.514**	.444**	.344*	.632**	.616**
	Manager / Director	.722**	.457**	.481**	.387**	.777**	.490**
	Senior Personnel	.545**	.410**	.601**	.434**	.653**	.647**
<b>Years of Professional Experience</b>	0 – 10 years	.759*	.839*	.591	.764*	.261	.606
	10 – 20 years	.747**	.489*	.361	.522**	.730**	.512**
	20 – 30 years	.694**	.353**	.326**	.301*	.514**	.453**
	30 – 40 years	.689**	.522**	.646**	.542**	.780**	.677**
	40+ years	.670**	.681**	.649**	.306	.810**	.721**

\*Correlation is significant at the 0.05 level

\*\*Correlation is significant at the 0.01 level

### **Organizational Type.**

Correlation results appeared to indicate that different organizations within the AEC industry – such as Owners, Contractors, and Designers – were highly consistent in the relationship between change management practices and change adoption.

### **Hierarchical Position.**

According to executive respondents, Senior Leadership Commitment was found to be a relatively unimportant factor in adopting change within an organization ( $r_s=.410$ ,  $p<0.001$ ). Conversely, results showed that lower levels of the organizational hierarchy placed much greater importance on senior leaders, with project team perspective showing a strong relationship ( $r_s=.634$ ,  $p<0.001$ ). Project teams strongly believed that sufficient training resources were critical in adopting change ( $r_s=.737$ ,  $p<0.001$ ), whereas no other members of the organization agreed, perhaps indicating that training of technical skills within a change is most critical for the employees who will experience the greatest impact on their daily job functions.

### **Years of Professional Experience.**

Several trends were identified based upon respondent experience. Early career professionals believed Senior Leadership ( $r_s=.839$ ,  $p<0.05$ ) and Training Resources ( $r_s=.764$ ,  $p<0.05$ ) to have a strong positive relationship with the Change Adoption Construct. As the experience levels increased, the correlation coefficient for these variables decreased considerably. More experienced personnel most strongly felt that change agent effectiveness was strongly associated with the Change Adoption Construct.

**DISCUSSION**

***Influence of Change Management Practices on Change Adoption***

The positive bivariate correlations between all change management practices and each measure of change adoption are consistent with both the organizational behavior literature as well as the case-based research within the AEC industry. These relationships, coupled with the fact that ordinal logistic regression results explained as much as 58.1% of the variance in change adoption, confirm the study hypotheses. Based upon bivariate statistical relationships, the participation of effective change agents was found to have the strongest relationship with achieving successful change adoption. This was followed closely by communication of the benefits each employee would gain from the change within their specific job function. Somewhat surprisingly, the least important change management practice was the provision of sufficient training resources for employees to gain the necessary technical skills for implementing change (although it still had a moderately statistically significant relationship with change adoption).

The relative importance of the change management practices was largely consistent among several measures of change adoption. However, one notable area of deviation was that senior leadership commitment held the strongest relationship with sustaining the organizational change over the long term, whereas senior leadership was among the least relatively important change management practices in the other change adoption measures. This finding is perhaps a reflection that senior leaders hold a critical role in demonstrating that the change is not simply a “flavor of the month” but rather that the organization is dedicated to making the transition.

**Table 7. Sample of Recommended Change Management Actions based upon Existing Literature**

Change Mgmt. Practice	Recommended Actions for Change Practitioners
Change Agent Effectiveness	<ul style="list-style-type: none"> <li>- Identify change agents who are influential yet distinct from senior executives</li> <li>- Designate time &amp; resources for change agent job responsibilities (i.e. not overburdening the change)</li> <li>- Ensure change agents are active, visible, and available to help employees throughout the change</li> </ul>
Communicated Benefits	<ul style="list-style-type: none"> <li>- Answer the question “What’s in it for me?” for all stakeholder roles within the company</li> <li>- Create urgency by illustrating the disadvantages of the status quo</li> <li>- Celebrate intermediate “wins” with employees to showcase relatable results</li> </ul>
Measured Benchmarks	<ul style="list-style-type: none"> <li>- Clearly identify (and track) the quantifiable performance outputs that will be</li> <li>- Define any new abilities, capabilities, processes, and functions that the company will gain</li> <li>- Ensure accuracy of the performance data and utilize the data to enforce positive accountability</li> </ul>
Realistic Timescale	<ul style="list-style-type: none"> <li>- Develop an implementation plan that accounts for all major change-related transition activities</li> <li>- Avoid the temptation to overly push for a “quick fix” and maintain focus on long-term adoption</li> <li>- Set leadership expectations that patience &amp; forgiveness of minor setbacks will encourage the change</li> </ul>
Senior Leadership Commitment	<ul style="list-style-type: none"> <li>- Provide visible demonstrations of commitment for the duration of the change</li> <li>- Be sure to “walk the talk” wherever possible by participating in the company’s new practices</li> <li>- Illustrate that the change is not a “fad” by showing that leaders are focused on long-term adoption</li> </ul>
Training Resources	<ul style="list-style-type: none"> <li>- Provide up-front training and guides to minimize uncertainty before initiating change processes</li> <li>- Establish avenues to encourage employee questions (thereby reducing uncertainty)</li> <li>- Provide on-the job training within each employee’s job function</li> </ul>

### ***Demographic Implications***

The uniformity of results across various organization types indicates that organizational change dynamics are fairly consistent across the industry. Organizational size was found to be a more important indicator in re-prioritizing the relative importance of change management practices, with smaller organizations experiencing greater influence of senior leaders and change agents.

Demographic trends identified a potential communication breakdown within the AEC organizational hierarchy. Executives placed the least emphasis on the importance of senior leadership commitment, whereas both lower level personnel and less experienced personnel felt it was strongly important for successful change adoption. Perhaps senior leaders feel they are unable to “force” change, whereas project teams and early career professionals look to their executives for leadership during an organizational transition. Another demographically-based finding was that more experienced professionals felt that effective change agents are essential to change adoption, whereas early career professionals yearned for more detailed training of the technical skills and actions steps necessary to enact a change.

## **CONCLUSION**

### ***Contribution***

The study results contribute practical implications for AEC firms. First, the results imply that change management practices are consistent across industries. Second, this study empirically demonstrates that achieving successful change adoption is as much—or even more—dependent on the “soft skills” of change management as the technical skills of learning to implement the change within the organization’s operations. In other words, organizational change adoption is as much about the “hearts and minds” of employees as it is about the “nuts and bolts” of the change itself. Third, effective change management strategies are learnable skills in the sense that each change management practice consists of actionable steps that industry professionals can take to improve their chances of successful change adoption (Table 7).

The global data sample within this study is a meaningful contribution to the AEC literature, which is primarily limited to data sets that include only several organizations (or a single organization) and are often restricted to a single type of organizational change initiative. This study expands upon the existing body of knowledge by utilizing a unit of measure such that each data point (N = 237) in the sample represents a different, organization-wide change within an AEC company. The numerous distinct types of change initiatives captured within the data sample supports broad applicability of the findings across the wide variety of change events experienced in the modern AEC marketplace.

### ***Limitations and Recommendations for Future Research***

Several study limitations were identified along with suggested areas of future research. First, this study was limited to leading change management practices identified within the organizational behavior literature. Although these practices collected explained up to 56.9% of the variance in change adoption, substantial variance was left unexplained. It is therefore acknowledged that other factors are likely to contribute to successful change adoption, such as environmental factors, organizational culture, broader industry trends, global economic conditions, etc. Future research may investigate additional change

---



management practices and perhaps even identify certain change management practices that are unique to the AEC industry that may not have been identified in organizational behavior literature.

Second, this study was based upon self-report responses, which may be affected by participant biases or inability to accurately recall a past situation's attributes. Future research may be designed to collect multiple responses from each organization in order to more accurately and thoroughly capture perspectives from across the organization.

Another limitation was that the sampling technique allowed respondents to choose whether they reported a successful or unsuccessful organizational change initiative. Analysis of the study sample revealed that respondents more frequently chose to report successful change initiatives by a slight margin. Future studies may consider a sampling design whereby each participating organization is required to submit both a successful and unsuccessful change. This would enable the researchers to better control for environmental variables (such as organizational culture, geographic region, type of business, organizational size, etc.) and better focus on the change management practices that were taken during each change initiative.

The study was also limited in the sense that it did not assess the motivation of each AEC company for initiating organizational change. There are obviously a wide range of motivating factors – reducing costs, improving productivity, fostering growth, integrating new technology, responding to market forces, turning around a crisis situation – to name but a few. Another aspect of this is for the organization to define the urgency or reason for why the change is necessary. Future research is recommended to address key antecedent conditions that lead AEC companies to launch organizational change initiatives.

## REFERENCES

1. Alvesson, M., (2002). *Understanding Organizational Culture*. Sage Publications Ltd., London.
  2. Arayici, Y., Coates, P., Koskela, L. J., Kagioglou, M., Usher, C., and O'Reilly, K. (2011). "Technology adoption in the BIM implementation for lean architectural practice." *Automation in Construction*, 20(2), 189-195.
  3. Armenakis, A. A., Harris, S., and Feild, H., (1999). "Making change permanent: a model for institutionalizing change interventions." *Research in Organizational Change Development*, 12, 97–128.
  4. Armenakis, A. A., Harris, S., and Mossholder, K. W. (1993). "Creating readiness for organizational change." *Human Relations*, 46(6), 681-703.
  5. Beer, M., and Eisenstat, R. (1996). "Developing an organization capable of implementing strategy and learning." *Human Relations*, 49(5), 597-619.
  6. Bo, X., and Chan, A. (2012). "Investigation of Barriers to Entry into the Design-Build Market in the People's Republic of China." *Journal of Construction Engineering and Management*, 138(1), 120-127.
  7. Bourne, M., Neely, A., Platts, K., and Mills, J. (2002). "The success and failure of performance measurement initiatives – Perceptions of participating managers." *International Journal of Operations & Production Management*, 22(11), 1288–1310.
  8. Burati, J. L., and Oswald, T. H. (1993). "Implementing TQM in Engineering and Construction." *Journal of Management in Engineering*, 9(4), 456-470.
-

9. Cameron, K. S., and Quinn, R. E. (1999). *Diagnosing and changing organizational culture: Based on the competing values framework*. Addison-Wesley, Reading, MA.
  10. Carrie, S. D., and Amkoti, S. (2008). "Implementing Web-Based Project Management Systems in the United States and Japan." *Journal of Construction Engineering and Management*, 134(3), 189-196.
  11. Cheung, M., and Loosemore, E. (2015). "Implementing systems thinking to manage risk in public private partnership projects." *International Journal of Project Management*. 33(6), 1325-1334.
  12. Covin, T. J., and Kilmann, R. H. (1990). "Participant perceptions of positive and negative influences on large-scale change." *Group Organizational Studies*, 15(2), 233-248.
  13. Cronbach, L. J. (1951). "Coefficient alpha and the internal structure of the tests." *Psychometrika*, 16, 297-334.
  14. Ding, Z., Zuo, J., Wu, J., and Wang, J. Y. (2015). "Key factors for the BIM adoption by architects: a China study." *Engineering, Construction and Architectural Management*, 22(6), 732-748.
  15. Dossick, C., and Sakagami, M. (2008). "Implementing Web-Based Project Management Systems in the United States and Japan." *Journal of Construction Engineering and Management*, 134(3), 189-196.
  16. DeVellis, R. F. (2003). *Scale development: Theory and applications (2nd ed.)*. Sage Publications, Thousand Oaks, CA.
  17. Eadie, R., Browne, M., Odeyinka, H., McKeown, C., and McNiff, S. (2013). "BIM implementation throughout the UK construction project lifecycle: An Analysis." *Automation in Construction*, 36, 145-151.
  18. Emiliani, M. L., and Stec, D. J. (2004). "Leaders lost in translation." *Leadership & Organization Development Journal*, 26(5), 370-387.
  19. Eriksson, P. E., Atkin, B., and Nilsson T. (2009). "Overcoming barriers to partnering through cooperative procurement procedures." *Engineering, Construction and Architectural Management*, 16(6), 598-611.
  20. Farzad, K., and Arayici, Y. (2012). "Roadmap for implementation of BIM in UK Construction Industry." *Engineering Construction and Architectural Management*, 19(6), 610-635.
  21. Galpin, T. (1996). *The human side of change: A practical guide to organizational redesign*. Jossey Bass, San Francisco, CA.
  22. Garratt, B. (1999). "The learning organization 15 years on: Some personal Organization." *The Learning Organization*, 6(5), 202-207.
  23. Giangreco, A., and Peccei, R. (2005). "The nature and antecedents of middle manager resistance to change: evidence from an Italian context." *International Journal of Human Resource Management*, 16(10), 1812-1829.
  24. Hallencreutz, J. and Turner, D. (2011). "Exploring organizational change best practice: are there any clear-cut models and definitions?" *International Journal of Quality and Service Sciences*, 3(1), 60-68.
  25. Helms Mills, J., Dye, K., and Mills, A.J. (2009). *Understanding Organizational Change*, Routledge, London.
  26. Holt, D., Armenakis, A. A., Field, H., and Harris, S. (2007). "Readiness for organizational change: The systematic development of a scale." *The Journal of Applied Behavioural Sciences*, 43(2), 232-255.
  27. Hunsucker, J., and Loos, D. (1989). "Transition management—An analysis of strategic considerations for effective implementation." *Engineering Management International*, 5(3), 167-178.
  28. Jensen, P. A., and Johannesson, E. I. (2013). "Building information modelling in Denmark and Iceland." *Engineering, Construction and Architectural Management*, 20(1), 99-110.
  29. Judson, A. (1991). *Changing behavior in organizations: Minimizing resistance to change*. Basil Blackwell, Cambridge.
  30. Kaiser, H. F. (1974). "An index of factorial simplicity." *Psychometrika*, 39, 32-36.
  31. Kanter, R. (1983). *The Change Masters: Innovation for Productivity in the American Corporation*. Simon and Schuster, New York.
  32. Keller G., and Warrack, B. (2000). *Statistics for management and economics (5th ed.)*. Thomson Learning, Duxbury, CA.
-

33. Kline, R. B. (2005). *Principles and practice of structural equation modeling (2nd ed.)*. Guildford, New York.
  34. Kotter, J. (1995). Leading change: why transformation efforts fail. *Harvard Business Review*, 59-67.
  35. Lai, D. N. C., Liu, M., and Ling, Y. Y. F. (2011). "Comparative study on adopting human resource practices for safety management on construction projects in the United States and Singapore." *International Journal of Project Management*, 29(8), 1018-1032.
  36. Lee, S., Yu, J., and Jeong, D. (2015). "BIM Acceptance Model in Construction Organizations." *Journal of Management in Engineering*, 31(3), 10.1061/(ASCE)ME.1943-5479.0000252.
  37. Lehtiranta, L., Karna, S., Junnonen, J. M., and Julin, P. (2012). "The role of multi-firm satisfaction in construction project success." *Construction Management and Economics*, 30 (6), 463-475.
  38. Lewin, K. (1947). "Frontiers in group dynamics." *Human Relations*, 1, 5-41.
  39. Li, N., and Becerik-Gerber, B. (2011). "Life-Cycle Approach for Implementing RFID Technology in Construction: Learning from Academic and Industry Use Cases." *Journal of Construction Engineering and Management*. 137(12), 1089-1098.
  40. McClure, P. (2005). "Correlation Statistics: Review of the Basics and Some Common Pitfalls." *Journal of Hand Therapy*, 378-380, doi:10.1197/j.jht.2005.04.015.
  41. Na, L. J., Ofori, G., and Park, M. (2006). "Stimulating Construction Innovation in Singapore through the National System of Innovation." *Journal of Construction Engineering and Management*, 132(10), 1069-1082.
  42. Oreg, S., Vakola, M., and Armenakis, A. (2011). "Change Recipients' Reactions to Organizational Change: a 60-Year Review of Quantitative Studies." *The Journal of Applied Behavioural Science*, 47(4), 461-524.
  43. Park, M., Ji, S., Lee, H., and Kim, W. (2009). "Strategies for Design-Build in Korea Using System Dynamics Modeling." *Journal of Construction Engineering and Management*, 135(11), 1125-1137.
  44. Peansupap, V., and Walker, D. H. T. (2006). "Information communication technology (ICT) implementation constraints: A construction industry perspective." *Engineering, Construction and Architectural Management*, 13(4), 364-379.
  45. Pheng, L. S., and Hui M. S. (2005). "Implementing and Applying Six Sigma in Construction." *Journal of Construction Engineering and Management*, 130(4), 482-489.
  46. Powell Jr, W. R. (2002). "Organizational Change Models." *Futurics*, 26(3&4), 20-45.
  47. Rodgers, E. (2003). *Diffusion of innovations*, Free Press, New York.
  48. Rogers, J., Chong, H., and Preece, C. (2015). "Adoption of Building Information Modelling System (BIM) - Perspectives from Malaysian engineering consulting service firms." *Engineering, Construction and Architectural Management*, 22(4), 424-445.
  49. Schneider, B., Gunnarson, S. K., and Niles-Jolly, K. (1994). "Creating the Climate and Culture of Success." *Organizational Dynamics*, 23(1), 17-29.
  50. Schweiger D. M., and DeNisi, A. S. (1991). "Communication with employees following a merger: A longitudinal field experiment." *The Academy of Management Journal*, 34(1), 110-135.
  51. Self, D., and Schraeder, M. (2009). "Enhancing the Success of Organizational Change: Matching Readiness Strategies with Sources of Resistance." *Leadership & Organization Development Journal*, 30(2), 167 - 182.
  52. Shehu, Z., and Akintoye, A. (2010). "Major challenges to the successful implementation and practice of programme management in the construction environment: A critical analysis." *International Journal of Project Management*, 28(1), 26-39.
  53. Smollan, R. (2011). "The multi-dimensional nature of resistance to change." *Journal of Management*, 17(6), 828-849.
  54. Son, H., Lee, S., and Kim, C. (2015). "What drives the adoption of building information modeling in design organizations? An empirical investigation of the antecedents affecting architects' behavioral intentions." *Automation in Construction*, 49(A), 92-99.
  55. Spearman, C. (1904). "The proof and measurement of association between two things." *The American Journal of Psychology*, 15(1), 72-101.
-

## RESEARCH STUDY



56. Sullivan, K. (2011). "Quality Management Programs in the Construction Industry: Best Value Compared with Other Methodologies." *Journal of Management in Engineering*, 27(4), 10.1061/(ASCE)ME.1943-5479.0000054.
  57. Tan, H., Carrillo, P., and Anumba, C. (2012). "Case Study of Knowledge Management Implementation in a Medium-Sized Construction Sector Firm." *Journal of Management in Engineering*, 28(3), 10.1061/(ASCE)ME.1943-5479.0000109.
  58. Tatum, C. B. (1989). "Organising to increase innovation in construction firms." *Journal of Construction Engineering and Management*, 155(4), 602-617.
  59. Walker, J., Armenakis, A. A., and Bernerth, J. (2007). "Factors influencing organizational change efforts: An integrative investigation of change content, context, process and individual differences." *Journal of Organizational Change Management*, 20(6), 761-773.
  60. Won, J., and Lee, G. (2013). "Where to Focus for Successful Adoption of Building Information Modeling within Organization." *Journal of Construction Engineering and Management*, 139(11), 10.1061/(ASCE)CO.1943-7862.0000731.
  61. Zhao, X, Hwang, B., Low, S. P., and Wu, P. (2015). "Reducing Hindrances to Enterprise Risk Management Implementation in Construction Firms." *Journal of Construction Engineering and Management*, 141 (3), 10.1061/(ASCE)CO.1943-7862.0000945
-