

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

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Abstract: In today's rapidly evolving market, effective organizational change adoption has become a core competency of architecture, engineering, and construction (AEC) firms to maintain their competitive advantage. Firms that more effectively manage organizational change adoption can position themselves as early adopters and are able to expend fewer resources in making the transition. The objective of this study was to collect a global sample of organizational change initiatives across the AEC industry to identify whether specific change management practices have a direct relationship with successful change adoption. On the basis of 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 presented in this study is a meaningful contribution to the AEC literature, which consists primarily of case-based studies limited to a single type of organizational change event. Furthermore, this study contributes practical action steps for industry professionals to manage the adoption of new technologies, management strategies, and business practices within their organizations more effectively. DOI: [10.1061/\(ASCE\)ME.1943-5479.0000548](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000548). © 2017 American Society of Civil Engineers.

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 for remaining 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 advances in management strategies, including the industrialization of construction operations, modular techniques, preconstruction 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 (Hallencrutz 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 manage the transition more efficiently, and thereby potentially reduce resource expenditures and accelerate the pace of change where feasible. The result is that successful organizational change management enables firms to respond better to

evolving market conditions and differentiate themselves from their competitors. However, organizational change adoption is inconsistent across the industry, which raises a fundamental research question: How are some companies able to implement organizational changes more effectively while others are less successful?

The objective of this study was to establish industrywide relationships between certain change management practices and the adoption of organizational change. Leading change management practices were identified from organizational behavior literature. Although these practices have been investigated within the AEC literature, existing studies have typically been restricted to limited data samples (typically comprising only a few companies) and focused on the adoption of a single type of change. To address this gap in the literature, the objective of this study was to conduct an international survey to establish more broadly 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 adopt company-level change initiatives more successfully.

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), largely credited as one of the early founders of organizational change research, characterized change implementation into three phases called *unfreezing*, *moving*, and *freezing* (or *refreezing*). This paper focuses on the moving phase of change initiative; in other words, the literature review emphasizes the mechanics of how the organization accomplishes 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 refreezing (institutionalization or posttransition

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normalization of new practices), are therefore beyond the scope of this study.

Change management practices from the organizational behavior literature were coupled with examples of documentation 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 presented literature review.

Visible Commitment of Senior Leadership

Within the organizational behavior literature, secured executive sponsorship is widely credited as a driver of successful change adoption. 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 to build credibility Armenakis et al. (1999). Without demonstrated commitment from leadership, 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, AEC 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 United States 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 U.K. 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 2004).

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 that a change will bring, organizations are sure to encounter resistance because of 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 company employees. Case studies of several U.K. architectural firms implementing BIM and lean practices revealed that resistance to change often stemmed from the inability of personnel to understand the benefits over 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. Through 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 so union members clearly understand the benefits of it.

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 because change agents are expected to be actively and directly involved in all aspects of change implementation (Self and Schraeder 2009). Organizations should 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 use of the software. In an earlier study of total quality management practices within 17 AEC firms, Burati and Oswald (1993) specified the need for active involvement of middle management in addition to senior leadership commitment. According to six BIM experts interviewed by Won and Lee (2013), recent trends in BIM adoption have revealed that establishing a *master BIM manager* is a priority.

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 desired results and then clearly document progress throughout the organization's transition. In a famous eight-step process for leading change, Kotter (1995) recommended that change managers systematically plan for, create, and celebrate short-term wins, which both recognize and reward employees who actively participate in the change. Cameron and Quinn (1999) explained that public communication of successful results not only demonstrates visible performance improvement but it also builds confidence among the organization's personnel. Other organizational behavior experts have suggested 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 United Kingdom revealed that many firms struggle with lack of immediate benefits from the initial projects delivered (Eadie et al. 2013). Another study found the top barrier of BIM implementation was 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 they support the vision for change, organizational personnel may still resist the transition if they feel management is expecting an unrealistic pace (Smollan 2011). Organizational behavior experts have explained the benefit of planning for longer strategic time horizons rather than hoping for a quick fix approach to change adoption (Garrott 1999; Tatum 1989).

AEC firms often underestimate the time and resources required for change, whether 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) suggested that employees will worry that they may not be capable of changing how they personally 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 adopt change successfully.

Training is particularly important in the AEC industry in which companies are highly specialized and each project requires unique technical solutions. When new technology is introduced, it is critical that project teams receive appropriate training to familiarize them with the ways to use the technology during project operations. For example, training has been shown to be critical for BIM integration (Bo and Chan 2012; Jensen and Johannesson 2013; Khosrowshahi and Arayici 2012; Rogers et al. 2015). The importance of training is not limited to technology-focused organizational changes but 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 skill sets to achieve success (Park et al. 2009).

Methodology

Research Objectives and Anticipated Contribution

The objective of this study was to establish industrywide 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 on the basis of AEC industry-demographic groupings. Although a review of previous literature revealed numerous organizational change studies 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 group of companies.

This study contributes to the literature by formally demonstrating the influence of change management strategies across a robust sampling of AEC firms and a wide range of organizational change types. The results verify that there are definitive and learnable

strategies AEC firms can use to increase the success of their organizational change initiatives and are thus relevant to practitioners.

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 in which they had participated and to answer questions regarding the change management methods their company used 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 because of the accessibility of online survey tools and ease of reaching many participants. First, a pilot questionnaire was created and distributed to 23 participants via e-mail. A teleconference discussion was conducted to present a review of the 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 e-mail template was created to provide 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 that measured 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 identified through distributed 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 used through which contacts on the mailing lists were asked to complete the questionnaire and 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 2006). E-mail distribution of surveys occurred over a 2-week period with a 3-week cut-off period for responses.

Definitions of Variables

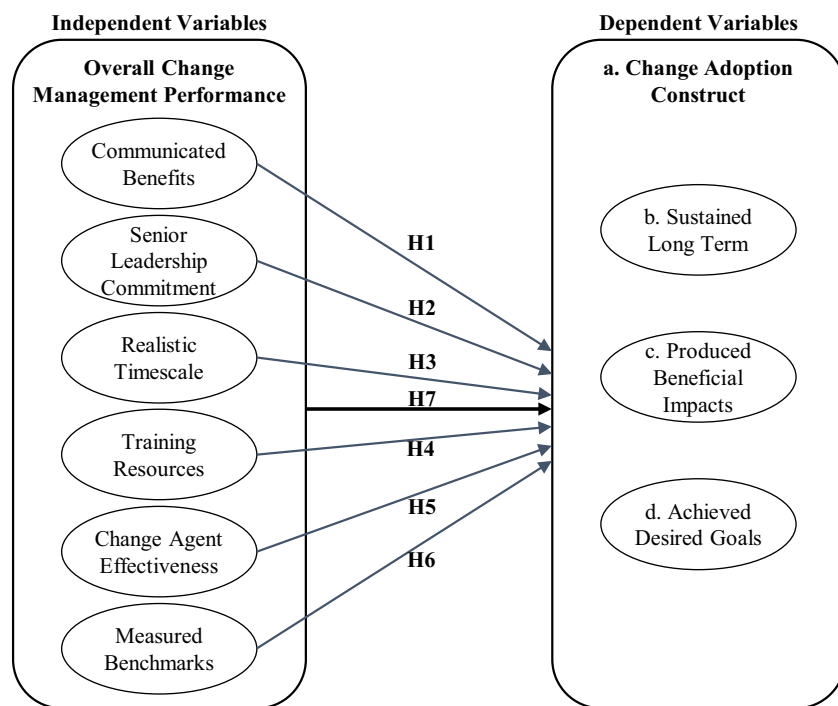
Leading change management practices were identified on the basis of their prevalence within the organizational behavior literature as well as their relevance to case studies of AEC organizational change. The specific definitions of each change management practice that were studied are included in Table 1 along with multiple measures for the dependent variable of change adoption. Change adoption measures were focused on quantifying the extent to which an organizational change was successfully executed by the company. Variables were measured on 7-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).

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. Each hypothesis was subdivided into four components to establish relationships of change management

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

Variable type	Abbreviated variable	Definition
Change management practice	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 was 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 for evaluating the success of the change initiative (in relation to previous performance).
Change adoption	Sustained long-term	Organizational change adoption was sustained long-term within the company's operations (3 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 was measured as the linear composite of optimally weighted change adoption variables.

**Fig. 1.** Graphical representation of study hypotheses

practices with each measure of change adoption, including (a) the change adoption construction, (b) sustained long term, (c) produced beneficial impacts, and (d) achieved desired goals.

Methods of Analysis

First, Spearman's rank-order correlation was used to establish bivariate relationships between individual change management practices and change adoption measures. Spearman's rank-order correlation is a nonparametric test and a common analytical approach for use with ordinal data measures (McClure 2005;

Spearman 1904). Second, a 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 on the basis of the demographic subsections of the study sample.

Study Sample

The questionnaire was designed such that each response represented an organizationwide 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 captured from the survey. A sample of the types of initiatives is listed in Table 2. On the basis of size and variety, the sample was considered to be a fairly accurate representation of the AEC industry. Respondent characteristics are presented in Table 3, which shows that a range of AEC organization types and sizes were represented in the data sample and that the majority of respondents had more than 20 years of experience.

Results

Reliability of the Change Adoption Construct

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; DeVellis 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 that all variables had at least one correlation coefficient greater than the 0.3 threshold. The overall Kaiser-Meyer-Olkin (KMO) measure was 0.653, which is classified as mediocre according to Kaiser (1974). The individual values of the KMO measure of each variable were greater than 0.6, and Bartlett's test of sphericity was statistically significant ($p < 0.001$), indicating that the data were likely factorable. A single factor was extracted on the basis of visual inspection of the scree plot, which revealed only a single point above the inflection point; this finding was supported by results of 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 used to assess bivariate relationships between change management practices and various measures of change adoption. The 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 ($r_s = 0.714$, $p < 0.01$), and moderate positive relationships were found for communicated benefits ($r_s = 0.659$, $p < 0.01$), realistic timescale ($r_s = 0.544$, $p < 0.01$), senior leadership commitment ($r_s = 0.510$, $p < 0.01$), measured benchmarks ($r_s = 0.603$, $p < 0.01$), and training resources ($r_s = 0.476$, $p < 0.01$). 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 the 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.

Ordinal Regression of Change Management Practices and Change Adoption

Ordinal logistic regression tests were conducted to further explore the collected data and validate inferences from correlation results. Separate ordinal logistic regressions were performed between all change management practices and each change adoption measure. Three pseudo- R^2 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, proportional odds were assessed by a full-likelihood ratio test that compared each

Table 3. Respondent Characteristics

Category	Frequency	Percentage (%)
Organization size [gross revenue (US\$ millions)]		
<30	29	12.3
30–99	25	10.6
100–499	29	12.3
>500	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 (years)		
0–10	8	3.4
10–20	26	11.0
20–30	71	30.0
30–40	73	30.8
40+	25	10.5
Unknown/not indicated	34	14.3

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

Organizational change category	Common sample initiatives
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 and 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 4. Spearman's Correlation of Independent and Dependent Variables

Number	Variable abbreviation	1	2	3	4	5	6	A	B	C	D
1	Communicated benefits	1.000	—	—	—	—	—	—	—	—	—
2	Senior leadership commitment	0.439	1.000	—	—	—	—	—	—	—	—
3	Realistic timescale	0.544	0.474	1.000	—	—	—	—	—	—	—
4	Training resources	0.620	0.317	0.547	1.000	—	—	—	—	—	—
5	Change agent effectiveness	0.628	0.491	0.627	0.566	1.000	—	—	—	—	—
6	Measured benchmarks	0.518	0.450	0.472	0.490	0.565	1.000	—	—	—	—
A	Sustained long-term	0.384 ^a	0.405 ^b	0.330 ^c	0.283 ^d	0.380 ^e	0.353 ^f	1.000	—	—	—
B	Achieved goals	0.634 ^a	0.450 ^b	0.580 ^c	0.442 ^d	0.687 ^e	0.547 ^f	0.509	1.000	—	—
C	Produced beneficial impacts	0.634 ^a	0.467 ^b	0.487 ^c	0.515 ^d	0.691 ^e	0.603 ^f	0.462	0.741	1.000	—
D	Change adoption construct	0.659 ^a	0.510 ^b	0.544 ^c	0.476 ^d	0.714 ^e	0.603 ^f	0.685	0.913	0.887	1.000

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

^aBivariate association with Hypothesis 1.

^bBivariate association with Hypothesis 2.

^cBivariate association with Hypothesis 3.

^dBivariate association with Hypothesis 4.

^eBivariate association with Hypothesis 5.

^fBivariate association with Hypothesis 6.

Table 5. Summary Results of Ordinal Logistic Regression Tests

Test(s)	Sustained long-term	Achieved desired goals	Produced beneficial impacts	Change adoption construct
Cox and Snell pseudo- R^2	0.179	0.438	0.417	0.516
Nagelkerke pseudo- R^2	0.289	0.569	0.535	0.581
McFadden pseudo- R^2	0.205	0.393	0.357	0.331
Deviance goodness of fit ^a	83.096 ($p = 0.999$)	106.32 ($p = 0.919$)	119.802 ($p = 0.685$)	81.219 ($p = 0.997$)
Likelihood-ratio ^b	42.437 ($p < 0.05$)	123.184 ($p < 0.05$)	39.518 ($p < 0.05$)	135.229 ($p < 0.05$)

^a $p > 0.05$ indicates model is a good fit.

^b $p < 0.05$ indicates better fit than the intercept-only model.

model with varying location parameters. The deviance goodness-of-fit test indicated that each model was 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 for each ordinal regression with emphasis on differences between change adoption results achieved by organizations that agreed versus 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 20 times more likely when the benefits of the change were thoroughly explained ($p = 0.001$). Establishing quantifiable performance metrics improved the odds of successful organizational change adoption 7 fold. When effective change agents were present to manage the change effort, the organization was 7 times more likely to adopt the change ($p = 0.001$). When the organization established clear benchmarks to evaluate the success of the change initiative, the organization was 7 times more likely to achieve successful change adoption ($p = 0.000$). Organizations that followed a realistic implementation plan were 4 times more likely to successfully adopt the change. Organizations with visible senior leadership commitment throughout the change were 4 times more likely to be successful ($p = 0.020$).

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 organiza-

tions that established clear measurements of change initiative were nearly 4 times more likely to adopt the change in their long-term operations ($p = 0.017$). For the measure of achieved desired goals, senior leadership commitment was the greatest odds ratio, resulting in a rate of successful goal achievement 11 times larger ($p = 0.001$) than organizations without visible senior leadership commitment. Furthermore, the second-greatest odds ratio for achieved desired goals was the presence of effective change agents ($p = 0.022$), which highlights the importance of leadership skills in managing change. For the dependent variable produced beneficial impacts, organizations with senior leadership commitment had nearly a 6-times greater change adoption rate ($p = 0.008$). Organizations that established clear benchmarks were 4 times more successful ($p = 0.001$). The presence of effective change enabled organizations to be 4 times more likely to achieve their desired performance improvements.

Demographic Trends and Change Adoption

Correlation analysis was performed for the change adoption construct and the independent variables that were based on various demographic characteristics of the survey respondents. Results are presented in Table 6 and key findings are described below in the following subsections.

Organizational Size

Firms with revenue greater than US\$30 million agreed that various change management practices were related to their ability to influence adoption positively. However, smaller organizations

Table 6. Summarized Correlation Analysis for Change Adoption Construct by Respondent Demographics

Category	Communicated benefits	Senior leadership commitment	Realistic timescale	Training resources	Change agent effect	Measured benchmarks
Organizational size [gross revenue (US\$ millions)]						
<30	0.796 ^b	0.612 ^b	0.599 ^b	0.549 ^b	0.786 ^b	0.654 ^b
30–99	0.671 ^b	0.502 ^a	0.588 ^b	0.546 ^b	0.742 ^b	0.424 ^a
100–500	0.772 ^b	0.678 ^b	0.693 ^b	0.564 ^b	0.700 ^b	0.596 ^b
500+	0.587 ^b	0.330 ^b	0.338 ^b	0.355 ^b	0.622 ^b	0.569 ^b
Organizational type						
Owner	0.758 ^b	0.511 ^b	0.547 ^b	0.477 ^b	0.764 ^b	0.641 ^b
Contractor	0.559 ^b	0.333 ^a	0.546 ^b	0.379 ^a	0.565 ^b	.482 ^b
Architect/engineer	0.639 ^b	0.403 ^a	0.356 ^a	0.324	0.678 ^b	0.596 ^b
Hierarchical position						
Project team	0.856 ^b	0.634 ^b	0.651 ^b	0.737 ^b	0.717 ^b	0.711 ^b
Project leader	0.630 ^b	0.514 ^b	0.444 ^b	0.344 ^a	0.632 ^b	0.616 ^b
Manager/director	0.722 ^b	0.457 ^b	0.481 ^b	0.387 ^b	0.777 ^b	0.490 ^b
Senior personnel	0.545 ^b	0.410 ^b	0.601 ^b	0.434 ^b	0.653 ^b	0.647 ^b
Professional experience (years)						
0–10	0.759 ^a	0.839 ^a	0.591	0.764 ^a	0.261	0.606
10–20	0.747 ^b	0.489 ^a	0.361	0.522 ^b	0.730 ^b	0.512 ^b
20–30	0.694 ^b	0.353 ^b	0.326 ^b	0.301 ^a	0.514 ^b	0.453 ^b
30–40	0.689 ^b	0.522 ^b	0.646 ^b	0.542 ^b	0.780 ^b	0.677 ^b
40+	0.670 ^b	0.681 ^b	0.649 ^b	0.306	0.810 ^b	0.721 ^b

^aCorrelation is significant at the 0.05 level.^bCorrelation is significant at the 0.01 level.

found a stronger relationship between senior leadership commitment and change agent effectiveness with the successful adoption of organizational change initiatives. The finding might be attributable to small organizations providing individual leaders with greater ability to extend their influence across the organization.

Organizational Type

Correlation results indicated that different organizations within the AEC industry—such as owners, contractors, and designers—showed high consistency in their relationships 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 ($r_s = 0.410$, $p < 0.001$). In a converse result, at low levels of the organizational hierarchy, much greater importance was placed on senior leaders, with project team perspective showing a strong relationship to adopting change ($r_s = 0.634$, $p < 0.001$). Project teams expressed the strong belief that sufficient training resources were critical in adopting change ($r_s = 0.737$, $p < 0.001$), whereas no other members of the organization agreed, perhaps indicating that training of technical skills for change is most critical for employees who will experience the greatest impact of change on their daily job functions.

Years of Professional Experience

Several trends were identified on the basis of the respondent experience. Early career professionals believed senior leadership ($r_s = 0.839$, $p < 0.05$) and training resources ($r_s = 0.764$, $p < 0.05$) to have strong positive relationships with the change adoption construct. As the experience levels increased, the correlation coefficient for these variables decreased considerably. More

experienced personnel indicated feeling the most strongly 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 and 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. On the basis of bivariate statistical relationships, the participation of effective change agents was found to have the strongest relationship with achieving successful change adoption. This result 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 the change (it had a moderately statistically significant relationship with change adoption).

The relative importance of change management practices was largely consistent among several measures of change adoption. However, one notable area of deviation was that of senior leadership commitment, which held the strongest relationship with sustaining organizational change over the long-term but was among the least relatively important change management practice for the other change adoption measures. Perhaps this finding reflects that senior leaders have a critical role of demonstrating that the change

is not simply a trendy fad but that the organization is dedicated to making the transition.

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 reprioritizing 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 personnel relatively low in the hierarchy and less-experienced personnel felt it was very important for successful change adoption. Perhaps senior leaders feel that they are unable to force change, whereas project teams and newer career professionals look to executives for leadership during an organizational transition. Another demographically based finding was that experienced professionals felt that effective change agents are essential to change adoption, whereas those early in their professional careers 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 more—dependent on the soft skills of change management as on the technical skills of learning to implement the change within the organizational operations. In other words, organizational change adoption is as much about 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 that each change

management practice consists of actionable steps that industry professionals can take to improve the chances of successful change adoption (Table 7).

The global data sample within this study is also 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 using a unit of measure such that each data point ($N = 237$) in the sample represents a different, organizationwide change within an AEC company. The numerous distinct types of change initiatives captured within the data sample support 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 for future research. First, this study was limited to leading change management practices identified within the organizational behavior literature. Although these practices explained up to 56.9% of the variance in change adoption, substantial variance was left unexplained. Therefore, other factors likely contribute to successful change adoption, such as environmental factors, organizational culture, broader industry trends, global economic conditions, and so forth. 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 the organizational behavior literature.

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

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

Table 7. Sample of Recommended Change Management Actions in Existing Literature

Rank ^a	Change management practice	Recommended actions for change practitioners
1	Change agent effectiveness	Identify change agents who are influential yet distinct from senior executives/ Designate time & resources for change agent job responsibilities (i.e., not overburdening for the change). Ensure change agents are active, visible, and available to help employees throughout the change.
2	Communicated benefits	Answer the question, “What’s in it for me?” for all stakeholders within the company. Create urgency by illustrating the disadvantages of the status quo. Celebrate intermediate wins with employees to showcase relatable results.
3	Measured benchmarks	Clearly identify (and track) the quantifiable performance outputs expected. Define any new abilities, capabilities, processes, and functions that the company will acquire. Ensure accuracy of the performance data and use the data to enforce positive accountability.
4	Realistic timescale	Develop an implementation plan that accounts for all major change-related transition activities. Avoid the temptation to push aggressively for a quick fix; rather, maintain focus on long-term adoption. Set leadership expectations for patience and forgiveness of minor setbacks, which will encourage the change.
5	Senior leadership commitment	Provide visible demonstrations of commitment for the duration of the change. Be sure to walk the talk wherever possible by participating in the company’s new practices. Illustrate that the change is not a fad by showing that leaders are focused on long-term adoption.
6	Training resources	Provide up-front training and guides to minimize uncertainty before initiating change processes. Establish avenues to encourage employee questions (thereby reducing uncertainty). Provide on-the-job training for each employee’s job function.

^aRank was based on the strength of association found via Spearman’s rank-order correlation coefficient.

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) and better focus on the change management practices that were undertaken 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. A wide range of motivating factors—reducing costs, improving productivity, fostering growth, integrating new technology, responding to market forces, turning around a crisis situation—reflect only a few possibilities. To address another aspect of motivation, additional study on the way an organization defines urgency or the reason for the change is necessary. Future research is recommended to address key antecedent conditions that lead AEC companies to launch organizational change initiatives.

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