Change Management in Construction: A Systematic Review

A. Ergin and E. Acar
Istanbul Technical University, Department of Architecture, İstanbul, Turkey
ergin20@itu.edu.tr, acare@itu.edu.tr

Abstract

Change management is a strategic act that supports organizations in achieving their goals in the global marketplace. Construction firms as project-based entities need to manage change in different settings for survival and competitiveness. Managing change efficiently has become a central concern for construction firms in terms of sustaining and improving their position in a fluctuating environment by rapidly adapting and responding to external changes in a flexible manner. Over the years, a considerable amount of study has been conducted relating change management which revealed various causes of change, the implications of change, the factors relating to resistance to change, the change management models, and the relevant systems in the construction industry from different perspectives. While a significant number of research papers relied on case-based approaches, only a few presented a systematic review of the existing body of knowledge. The main objective of this paper is to conduct a systematic review of the existing scholarly work to clarify gaps and highlight possible paths as inputs for in-depth empirical research. Paper presents the classification of methods and outcomes from the change management studies in construction.

Keywords: *Change, change management, construction firms, systematic review.*

Introduction

Increasing global competition, growing scarcity of resources as well as technological developments put great pressure on all organizations to adapt and survive by responding to constant change (Al-Sedairy, 2001). In a global marketplace characterized by ever-increasing competitiveness and customer expectations, change management has emerged as a strategic function that supports organizations in staying ahead of the competition (Erdogan et al., 2005). The unique and dynamic nature of the construction industry necessitates change management in all phases of the construction projects (Mohammed & Karri, 2020), since scope changes are inevitable over their lifecycles (Padala et al., 2020). Accordingly, a systematic change management system during the construction process is essential to minimize the impact of changes on project targets (Bitamba & An, 2020).

Over the years, a considerable amount of research studies have been conducted relating change management which revealed various causes of change (Wu et al., 2005; Sun & Meng, 2009; Andersen et al., 2011; Oyewobi et al., 2016; Yap et al., 2017; Bitamba & An, 2020; Padala et al., 2020), the factors relating to resistance to change (Davis & Songer, 2003; Davis & Songer, 2009; Lines et al., 2015), the change management models (Price & Chahal, 2006; Ibbs & Chen,

2015; Saoud et al., 2017; Jaaron et al., 2022), the best practices (Zou & Lee, 2009), in addition to various change management systems from different perspectives such as technology adaptation (Maali et al., 2020; Jaaron et al., 2022), and sustainable systems adaptation (Lim et al., 2016). While a significant number of research papers relied on case-based approaches, only a few presented a systematic review of the existing body of knowledge. These studies are mainly based on reviews of change management practices at the project and organizational levels (Erdogan et al., 2005) and the causes and effects of change in construction projects (Sun & Meng, 2009; Padala et al., 2020). Such studies can be seen as a roadmap to review, evaluate and manage changes in projects (Sun & Meng, 2009). However, available literature mostly focused on specific aspects of change management in the construction industry, which indicates the need for a systematic investigation to review the current change management practices and trends in the construction industry.

As a part of an ongoing research study, authors aim to conduct a systematic review of the existing scholarly work on change management. Paper presents the classification of the methods of and outcomes from the change management studies in construction, based on the analysis of publications which shows patterns of changes within a discipline, thus enabling the assessment of the impact of contributions, detecting existing topics related to the research scope, and setting research gaps for future search.

Change Management in Construction Industry

Any extensions, deletions, or alterations to project objective and scope are regarded as change that result in increase or decrease of schedule or cost of a project (Ibbs et al., 2001). For construction firms to achieve a desirable status in the future, there is a need for a structured approach to change. According to Managing Change in Organizations: A Practice Guide (Project Management Institute, 2013), change management refers to *"a comprehensive, cyclic, and structured approach for transitioning individuals, groups, and organizations from a current state to a future state with intended business benefits."* Change management contributes organizations to incorporate stakeholders, structures, processes, business strategy as well as culture (Project Management Institute, 2013). To sustain organizational growth according to business needs, construction organizations should adapt to change in the market (Ozorhon & Demirkesen, 2014). According to Project Management Institute (PMI) (2021), changes may arise from a consequence of project risks or environmental factors, the need for a deeper understanding of project needs, or client requirements. Shipton et al. (2014) argued that changes in construction occur due to the needs of clients, while the availability of construction material or unpredictable ground conditions also lead to various changes. According to Padala et al. (2020), the maximum number of changes occur in the execution stage of the projects which result in time and cost overruns. Bitamba and An (2020) classified causes of changes in construction under various categories: design-related, contractor-related, owner-related, organizational and management-related, project-related, changes related to environment and site conditions, changes related to materials and equipment, changes related to economy and governmental regulations.

Change management in construction requires the consideration of not only the causes of change but also the critical change effects that have critical impact on project outputs in a positive or negative way. Ibbs et al. (2001) argued that change actions cover two significant typologies including beneficial and detrimental ones, while the former should be encouraged, the latter should be avoided, authors argued. Beneficial changes are the output of value management

operations, which help to reduce the degree of difficulty, schedule as well as the cost of the project. Detrimental changes, in contrast, have negative influence on project so they should be minimized carefully (Ibbs et al., 2001). Bitamba and An (2020) argued that detrimental changes can cause uncertainties as well as interfaces which lead to production of non-viable movements. Hwang and Low (2012) pointed out the criticality of the timely description and understanding of project changes' impacts to minimize their adverse effects. Some primary adverse effects of changes were identified by Hwang and Low (2012) as the increase in project cost, recruitment of new professionals, increase in overhead expenses, quality degradation, decrease in labor productivity, delay in procurement process, rework and demolition, safety conditions, and delay in completion schedule.

Construction management literature has focused on both the causes and effects of change (Sun & Meng, 2009; Padala et al., 2020). Sun and Meng (2009) proposed three levels of classification for the construction projects. Level 1 consists of three dimensions including external, organizational and project internal causes. External causes cover environmental, political, social, economic and technological factors. Organizational causes consist of process, people and technology related factors. Lastly, project internal causes are identified as generated by client, design consultant, contractor/subcontractor, and other (such as poor communication, instability of project team and unsuitable organizational structure). Taxonomy for the effects consists of three different levels. Level 1 includes time, cost, and relationship and people effects. Time effects consist of time extension, loss of productivity, and increased risk. Cost effects cover direct and indirect cost increases. Also, relationship, working conditions, staff, as well as quality related factors include the dimensions of relationships and people effects. In a similar vein, Padala et al. (2020) identified 85 causes and 45 effects of change from the literature, and they investigated 3951 changes from 19 projects to define causes and effects in construction projects. Padala et al. (2020)'s taxonomy covers three levels. Level 1 consists of client-related, design, interfere, construction, external, and performance dimensions related to *causes of change.* The identified Level 1 for the *effects of the change* covers time, cost, and others (including site conditions, quality, delays in procurement, and relationships among the project team).

Change management typically arises in construction at two levels including the *project* and *organization* (Erdogan et al., 2005). Project level covers mostly design changes and those prior to the execution stage. Changes in technology, culture, stakeholders, management (Erdogan et al., 2005), politics and economy (Padala et al., 2020) are the examples of organizational level changes. Table 1 summarizes different types of changes in construction at both levels. It is critical to introduce change to the organization since any misunderstanding, fear for the future, the lack of awareness, and the speed of change implementation can be seen as a threat to stakeholders, thereby causing resistance. The latter is seen as a main challenge to organizational change actions which requires the consideration of project scope, size and duration of change event, organizational expectations of change implementation speed, the establishment of formal change agents, and the level of change agent involvement with implementation activities (Lines et al., 2015).

Table 1. The classification of different types of changes (Taken from Erdogan et al., 2005).

According to	**Project Changes (PCs)**	
Type of Impact (Construction Industry Institute (CII), 1994)	*Beneficial Changes*	*Detrimental Changes*
	Reduce cost, schedule or degree of difficulty.	Reduce owner value, have negative impact on the project.
Need for Change (CII, 1994)	*Required Changes*	*Elective Changes*
	Implemented to meet the objectives or regulatory/ legal/ safety/ engineering requirements/standards.	Enhance the project, but are not required to meet the original objectives.
Initiation Nature/Responsiveness of change (Burnes, 1996)	*Emergent/ Reactive Changes*	*Anticipated/ Proactive Changes*
	Unplanned, unexpected. The response is after the occurrence.	Expected before it occurs, therefore necessary actions are taken.
According to	**Organizational Changes (OCs)**	
The difference in the organization due to change (Tichy, 1982)	*Strategic Changes*	*Non-strategic Changes*
	Nonroutine, nonincremental and discontinuous, alter the overall orientation of the organization.	Do not affect the overall orientation of the company, do not result in a drastic difference.
Speed of the transformation in the organization (Cao et al 2000; Cummings and Worley, 1997)	*Incremental/ Gradual/ Fine Tuning*	*Radical/ Quantum Changes*
	Routinely necessary for any organization to adapt to its environment.	Necessitates a thoroughgoing reexamination of all facets of an organization
Initiation Nature (Burnes, 1996)	*Emergent Changes*	*Planned Changes*
	Driven from bottom up and is an open-ended and continuous process of adaptation to changing conditions.	Result of an action research& an analysis of the social and organizational problems in question.
Initiation Nature (Burnes, 1996)	*Emergent Changes*	*Anticipated Changes*
	Same as above.	Not planned by the organization but it's happening is expected.

According to the PMI's PMBOK 7th Edition, the ability to implement new strategic initiatives and change has rapidly become a key differentiator (Project Management Institute, 2021). Effective and efficient management of change supports the achievement of desired project goals, improve the construction firm reputation, and reduce the cost, and schedule of the project. Change management in construction firms requires strong leadership skills, an effective change management plan that establishes the change control board (Project Management Institute, 2017), the involvement of proper project stakeholders (Lines et al., 2015), adapting the speed of change, and benefits and impacts of change communicated to all levels of the organization (Project Management Institute, 2021).

Change Management Models

Numerous change management models have been proposed in the literature which considers the technical (e.g., procedures) and non-technical (e.g., culture and habits) aspects of change. Table 2 shows the commonly cited change management models, in depth explanation of which is beyond the scope of this paper due to space limitations.

Table 2. The classification of change management models (Adapted from Project Management Institute, 2021).

Change Management Models	*Steps*	*Consideration*	*References*
Lewin's Three Step Model	Unfreeze Moving Refreezing	One of the most influential approaches in the change management discipline that indicate the stages of organizational change.	(Lewin, 1947)
William Bridge's Transition Model	Endings Neutral zone New beginnings	Provides an understanding of what occurs to individuals psychologically when an organizational change takes place.	(Bridges, 1991)
Virginia Satir Change Model	Late status quo The foreign element Chaos The transforming idea Practice and integration New status quo	Mainly based on how people experience and cope with change.	(Satir et al., 1991)
Principles of Effective Change Management	Promote a balanced change culture Recognize change (when it occurs) Evaluate change Implement change Continuously improve from lessons learned	Assist project managers to manage change more effectively.	(CII,1994)
The 8-Step Process for Leading Change	Create urgency Form a powerful coalition Create a vision for change Communicate the vision Remove obstacles. Create short-term wins Build on the change. Anchor the changes in corporate culture	Outlines how to systematically and effectively implement change in an organization.	(Kotter, 1996)
ADKAR Model	Awareness Desire Knowledge Ability Reinforcement	Provides a tool for change that is effective on an individual level.	(Hiatt, 2006)
Managing Change in Organizations: A Practice Guide	Formulate change Plan change Implement change Manage transition Sustain change	It is a complementary document to Project Management Institute's (PMI) foundational standard and provides guidance on implementing change management.	(PMI, 2013)

Various change management models or frameworks have also been proposed for construction firms. Ibbis et al. (2001) proposed an efficient system for managing change in projects which covers respectively: promoting a balanced change culture, recognizing change, evaluating change, implementing change, as well as improving from lessons learned. Hao et al. (2008) developed a model for change processes containing identify, evaluate and propose, approve, implement and review phases for construction. Sun et al. (2004) described a toolkit for change management for construction projects, supporting the project team related to the prediction and reaction of change with knowledge and procedural perspectives. Gibson et al. (2012) developed

an organizational change model that includes the forces for change, performance outcomes, diagnosis of the problem, selection of appropriate intervention, limiting conditions, implementation of the method, and evaluation of the method. Al-Sedairy (2001) offered a change management model specific to Saudi construction industry that consists of four stages of action plans each catering to the seriousness or depth of the perceived organizational problem. Jaaron et al. (2021) proposed a model that identified two main phases and ADKAR steps for various project team members to execute an accomplished change management process regarding the BIM adaptation by using the ADKAR model.

Method

A systematic and structured literature review was conducted by focusing on selected scholarly works on change management. Data were obtained from the Web of Science (WoS) database (Web of Science, 2022) and Scopus database (Scopus, 2022), since these databases cover inclusive, interdisciplinary (Scopus, 2022) as well as the high-impact publications (Web of Science, 2022). Considering the scope of the study, the search keywords were identified as "change management," "construction industry," and also, "construction sector." The search was conducted with various combinations of these keywords. The selection criteria were limited in that each publication should address either change issues or change management, or both. The searches were done in the topic field (covering title-abstract-author keywords- keywords plus®) in WoS and in the title-abs-key field (covering title-abstract- keywords) in Scopus. The research was limited to a 22-year time span from 2000 to 2022. The language type was limited to English for the selected documents.

As a result, 110 publications from the WoS database and 201 publications from the Scopus database were identified, totalling 311 documents which includes journal articles, conference proceeding papers, book chapters, book reviews, reviews, and early access. Some of the documents selected for this study included at least one of the keywords defined for this study in their titles, abstracts, or keywords. Publications were arranged in alphabetical order and those with the same title were removed and identified as 189 documents. The title, abstracts, and keywords of 189 documents were investigated to reach relevant studies thus after the investigation 177 documents were included. Lastly, the full texts of 177 documents were assessed in terms of their relevance to change management and construction industry and 75 publications were included to this study. Figure 1 shows the selection processes of total publications identified through WoS and Scopus.

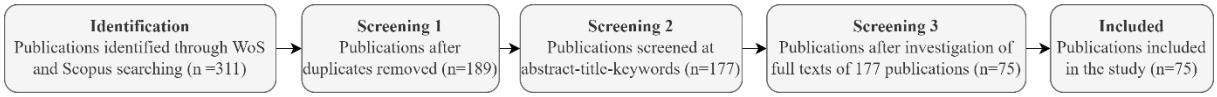


Figure 1: The selection processes of publications for analysis (Search date 22.03.2022).

The second step of the study was a bibliometric analysis by using the VOSviewer software tool (version 1.6.18.) (VOSviewer, 2022) to visualize and create maps by using the network data. The network data consists of 75 scholarly works identified from WoS and Scopus database searches. These 75 publications were added to the reference manager program Zotero, and reference manager files were converted to the RIS format for VOSviewer analysis.

VOSviewer was used to analyze keyword co-occurrence and create network model based on keywords of the identified publications. All duplicating keywords in the network data were

eliminated from the visualization maps using by VOSviewer thesaurus file. The keywords included in VOSviewer were limited to 3 times of repetition.

Findings

Having clarified the need for a systematic investigation of the current change management issues in construction, following parts present the current status, point out the future gaps, and highlight possible paths as inputs for in-depth empirical research, according to the systematic literature review. This section represents the descriptive analysis of selected 75 publications and VOSviewer analysis.

Firstly, the 75 relevant publications were analysed according to the distribution over 22 years period (Figure 2). The maximum number of scholarly works was published in 2009, followed by 2020 and 2017, respectively. Except for the years 2000, 2004, and 2010, at least one study was conducted each year relating change management. Notably, distribution of publications over the years indicates a revival in the field.

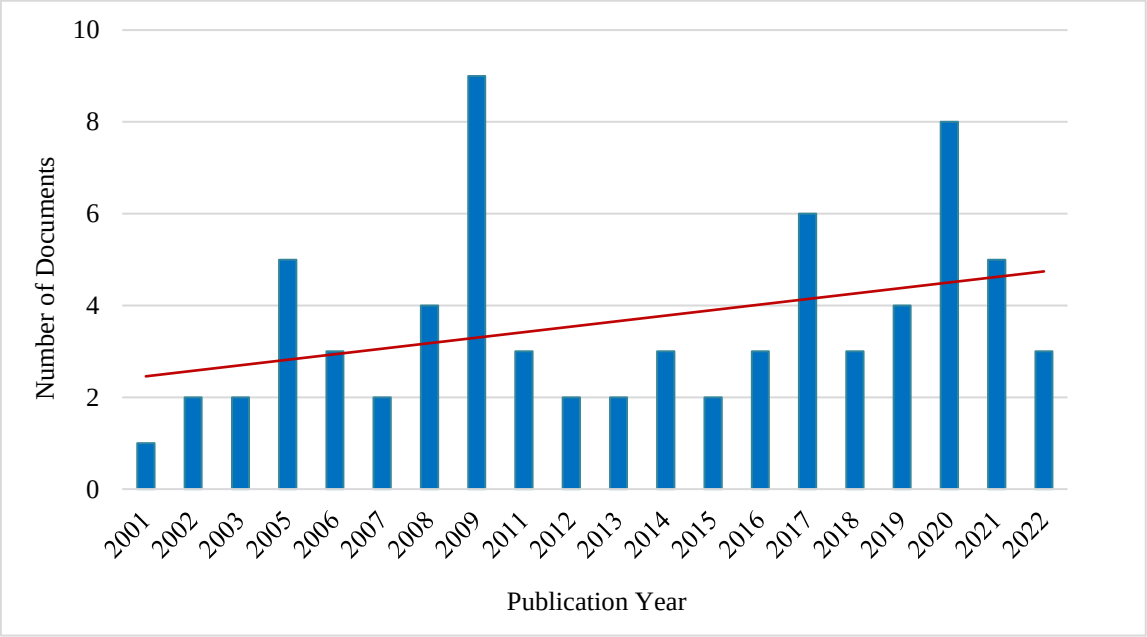


Figure 2: Distribution of publications between 2001 and 2022.

Next, the distribution of publications was analyzed geographically (Figure 3). The USA has the most scholarly works with 15 followed by the UK with 14, demonstrating that change management studies in the construction industry during the period of interest concentrated in these two countries. Figure 3 also shows that research interest in change management has been growing in the Australia and China.

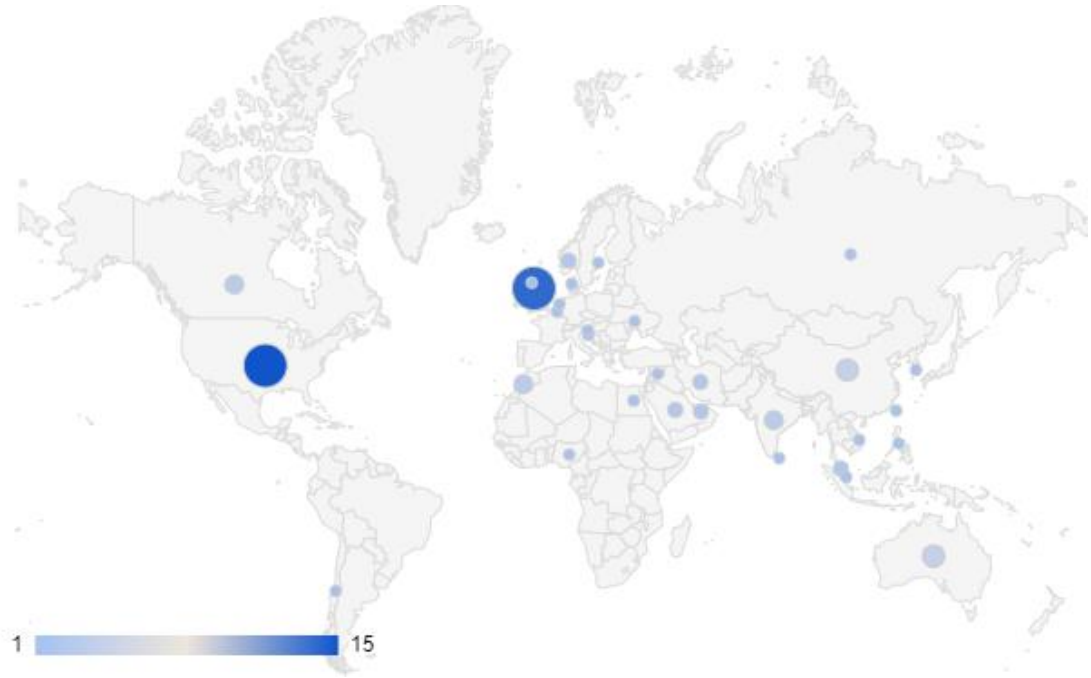


Figure 3: Distribution of publications according to countries (2000-2022).

Selected studies were analysed by considering the main objectives of the studies to summarize the prominent change management themes (Figure 4). In a 22-year period, technological changes like Building Information Modeling (BIM) or sustainability and their adoption into construction organizations and projects were the predominant themes in the construction management field. The management of such technological changes can have positive or negative impacts on project success. In terms of negative influence, resistance to technological change is one of the prominent considerations among technological change, as construction firms face high resistance to change due to lack of communication (Jafari et al., 2020; Maali et al., 2020), lack of understanding of new technology solutions (Maali et al., 2020), lack of establishment of a realistic timeframe for change adoption (Maali et al., 2020), lack of knowledge management and learning (Senaratne & Sexton, 2009), lack of effective change agents and lack of setting clear milestones for change implementation (Maali et al., 2020). Accordingly, the number of publications and citations relating technological change, innovation, BIM and adoption has been growing steadily.

Developing and proposing “change management systems or models or frameworks” were the other prominent themes in the construction management field. To achieve project and company goals and gain a competitive advantage in the industry, proposing roadmaps for effective and efficient change management was a central theme for many scholars. The investigation and classification of “causes or impacts of change management” in construction firms was another area of concentration, since the proper understanding of causes and impacts assist project participants in managing changes proactively (Padala et al., 2020).

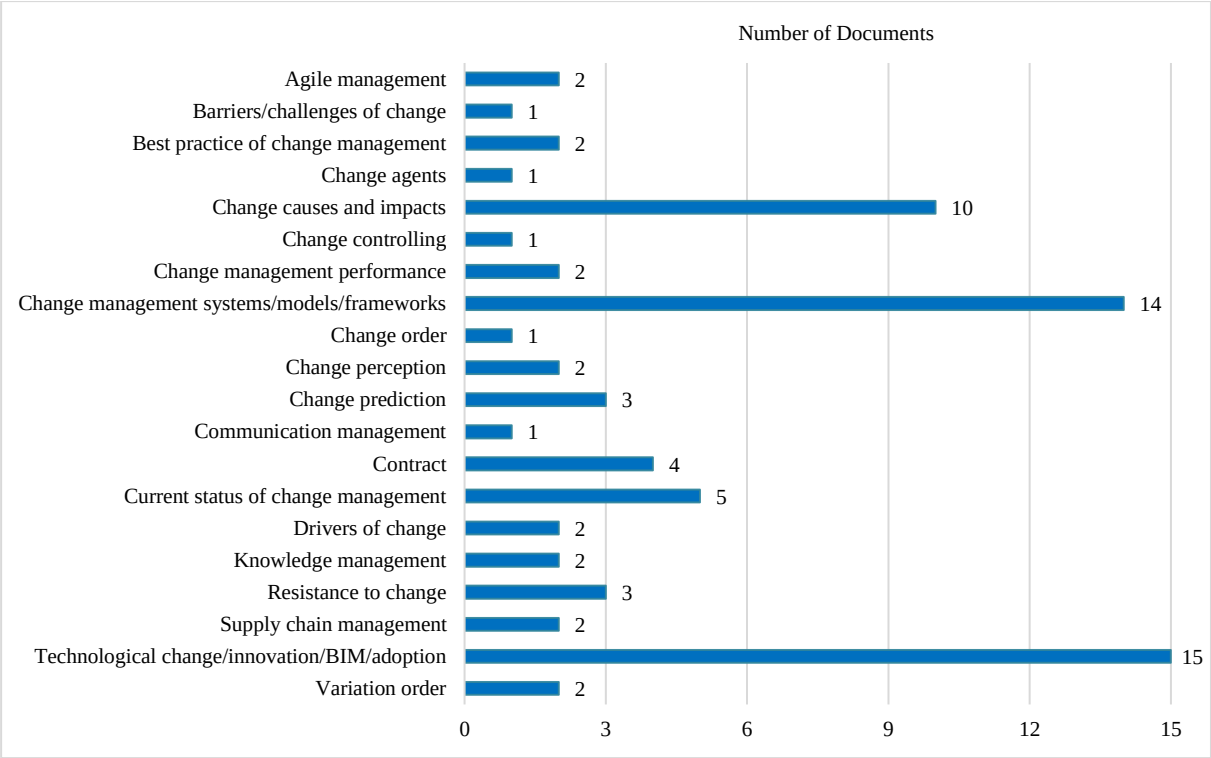


Figure 4: Change management themes in construction management research (2000-2022).

Lastly, to clarify relationships and tendencies based on "change management" and "construction industry" keywords over the period of interest, a network model was created by using VOSviewer. According to VOSviewer analysis, 275 of 1380 keywords meet the threshold. The network maps include various colorful groups known as clusters (McAllister et al., 2021) and each colour represents different clusters. Notably, the clusters in the network map consists of node, labels and links. The nodes are connected with each other by links. The co-occurrence of keywords and the strongness of links impact the size of the nodes and labels (McAllister et al., 2021). Keyword co-occurrence analysis shows that "project management," "change models," "construction management," "management," "knowledge management," "construction," "BIM," "cost management" and "innovation," have larger labels and circles. The aforementioned keywords demonstrate the most preferred research themes under the "change management in the construction industry." Notably, the closer the keywords are to each other, the stronger the relationship between them (Van Eck & Waltman, 2022). The keywords *innovation*, *adoption*, *organizational change*, *communication*, and *information technologies* are located to each other, indicating their strong relatedness. The co-occurrence of knowledge management as a keyword in the publications is high in the VOSviewer, which indicates that knowledge management and organizational learning are seen as essential elements of managing change. However, according to visualization, there is no critical link between "organizational learning" and "change management in the construction industry," this is seen as a possible path for future research.

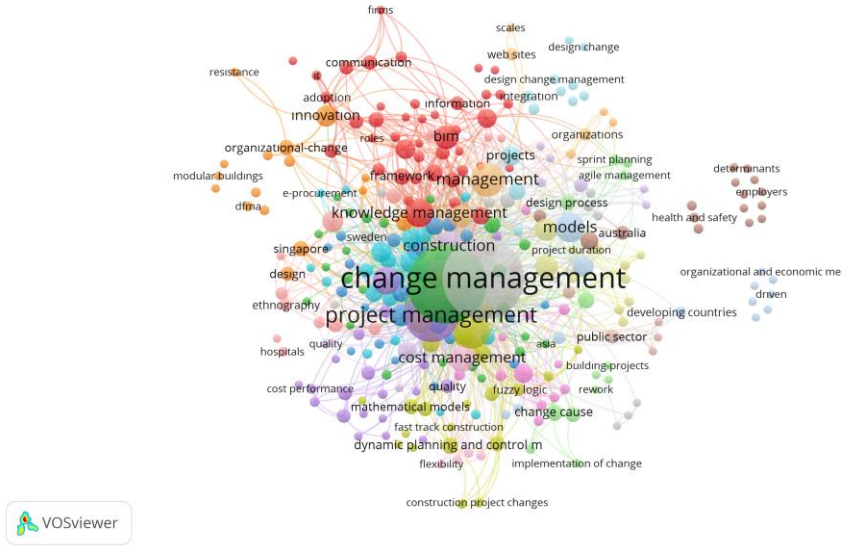


Figure 5: Network visualization of publications keywords.

According to the years, a color scale was created by VOSviewer from the oldest to the newest. The blue color shows the themes considered in previous years, while the yellow color shows the themes that have been considered in recent years. Overlay visualization shows that "agile management," "construction project changes," "information technologies," "adoption of new technologies," "implementation of change" and "BIM" are seen as recent research trends related to change management in the construction industry.

Furthermore, the findings of the systematic review and VOSviewer analysis show that studies with agile management perspectives are limited but agility is a critical consideration in change management since it assists the change in terms of rapid and flexible change reactions. Recent studies in the literature focusing on agile management show that the research gap on the topic has been recognized, although the number of relevant studies is yet limited, and further research effort is needed to address the issues of change and agile management approaches.

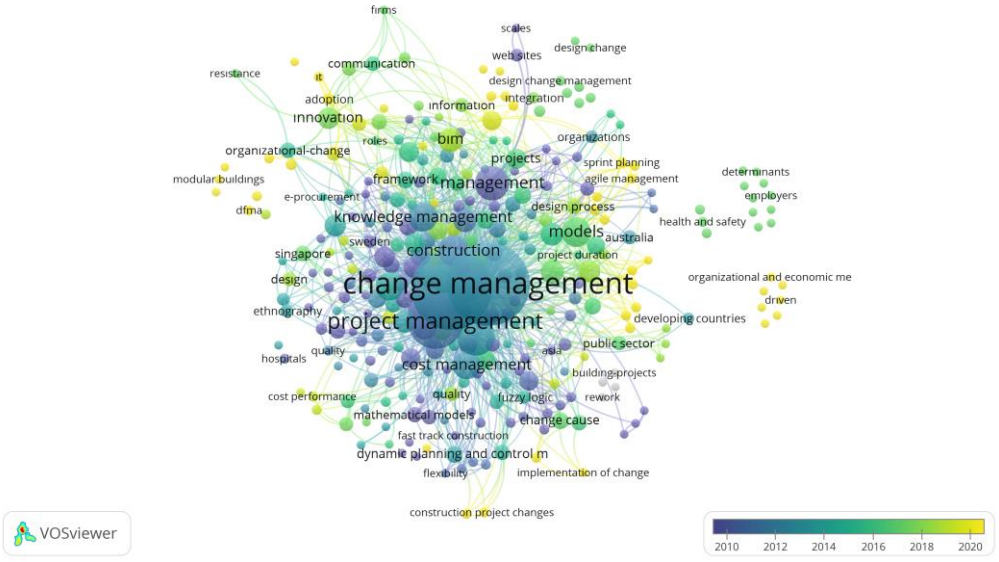


Figure 6: Overlay visualization of publication keywords according to year wise.

Conclusion

Managing change is a strategic competence for construction firms, not only because each project is subject to various changes over its life cycle, but also translating lessons learnt from different projects into company level actions require change management skills to respond to environmental turbulence. Findings of the systematic literature review reveal that the most productive countries identified as USA and UK which have change management studies in construction industry. Outputs of the systematic literature review also indicate that while *technological change/ innovation/ BIM/ adoption, change management systems/ models/ frameworks* and *change causes and impacts* were the predominant focus of interest over the period of interest, there are yet significant research gaps in the construction management literature regarding the implementation of proposed change management systems/models/frameworks and the investigation of the methodological approaches for a better understanding of change management practices in construction. Keyword co-occurrence map signifies that change management in the construction industry is highly related the *management issues (project, construction, knowledge, and cost), change models*, *BIM*, and *innovation.* Overlay visualization indicates that *agile management, construction project changes, information technologies, adoption of new technologies, implementation of change,* and *BIM* have a critical influence and attention over the last years. Overview of the VOSviewer analysis and the systematic literature review show, for example, that further research efforts are needed to explore the potential of agile management approaches to develop rapid and flexible responses to change, as well as the linkage between knowledge management, organizational learning and change. In particular, approaching change management from a learning perspective might be quite fruitful considering that each change is a learning experience for any organization.

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