



How safety leadership works among owners, contractors and subcontractors in construction projects

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Abstract

Leadership is a key factor impacting construction safety, but previous research merely investigated the single-level relationship between safety leadership and safety performance and ignored the leadership interaction between different project stakeholders. To fill this gap, this paper aims to examine the relationships between safety leaderships of project owners, contractors and subcontractors and discover leadership dimensions which significantly impact construction safety performance. An impacting mechanism involving owner safety leadership, contractor safety leadership and subcontractor safety leadership are hypothetically proposed and empirically tested. The results show that significant relationships exist between safety leaderships of the three key stakeholders. Project safety culture acts as a significant mediator in these relationships. In addition, among all leadership dimensions of owners and contractors, safety influence and role modeling has the widest range of influence on project safety culture and other stakeholders' safety leadership. As such, it is suggested that owners and contractors should cultivate charisma and the ability of being influential about ideals in project managers and require them to behave as role models for others. The results also show that the caring dimension of leadership is more required in the frontline environment. Supervisors need more attention and support from the contractor in their well-being and organizational identification for the project. In conclusion, this paper establishes clear leadership impacting paths from owners to site supervisors of subcontractors in construction projects, which provides insights into effective ways to implement managerial measures and publicize policies and values to construction sites.

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Keywords: Safety leadership; Safety culture; Construction project; Owner; Contractor; Subcontractor

1. Introduction

The construction industry is reported worldwide as having the highest occupational injury rates (Abudayyeh et al., 2006; Fang and Wu, 2013). In 2012, 2437 people died of occupational accidents in Chinese construction industry, which makes construction the most dangerous industry, exceeding any other industry including coal-mining (Chinese State Administration of Work Safety, 2013). Particularly, the rapid development of huge and complex infrastructure projects

like high-speed railways (HSR) in China increased the occupational fatalities in construction. In recent years, increasing emphasis on accident prevention has been exemplified by the introduction of more and more occupational health and safety (OHS) provisions. However, the effects of these provisions have been far from satisfactory. Despite the existence of OHS laws, accident frequency in construction still remains at a high level. As many researchers reported, the continuous unsafe conditions are mainly due to a misalignment of management commitment and subordinates' actions (Suraji et al., 2001; Arquillos et al., 2012; Sunindijo and Zou, 2012; Martin and Lewis, 2014). More specifically, safety has remained a concept held by managers and it is not fully disseminated to its subordinates, and managerial

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measures cannot be fully implemented to take effect on construction sites. These problems are in turn attributed to construction managers' lack of safety leadership (Tam et al., 2004; Martin and Lewis, 2014), which improves safety performance in highly hazardous and complex working environments (Flin and Yule, 2004). Effective leadership plays an important role in ensuring the success of temporary organizations facing a high degree of uncertainty, which corresponds to the characteristics of construction projects (Tyssen et al., 2014). A project team will be either empowered to succeed or condemned to fail largely by the quality of the leadership skills of project managers. Therefore, strong safety leadership should be the key for improvement, especially for those countries whose construction industries are facing significant safety challenges and which need transformational development (Construction Users Roundtable, 2012).

Many empirical studies have demonstrated the importance of leadership to safety (Barling et al., 2002; Zohar, 2002; Griffin and Hu, 2013). Safety leadership is a significant antecedent of safety culture and worker safety behavior (O'Dea and Flin, 2001; Wu et al., 2011; Griffin and Hu, 2013). However, safety leadership research within the construction industry is scarce compared with other industries (Keegan and Den Hartog, 2004; Chan and Chan, 2005; Ofori and Toor, 2012). From a research method perspective, causality between safety leadership, safety culture and safety performance has not been fully validated. The main reason is that conclusions rely largely on cross-sectional studies, and longitudinal studies of safety leadership are few. Cross-sectional studies obtain empirical links or correlations rather than causal relations between variables. Causalities should be validated with time-series data and panel data, both of which are obtained by longitudinal studies (Wooldridge, 2010).

Furthermore, although many researchers argued that senior leadership exerts the most significant influence on organizational performance (Kimmel, 1981; Smallman and John, 2001; Reid et al., 2008), safety leadership research has generally focused on the supervisory level (Lu and Yang, 2010; Martínez-Córcoles et al., 2013; Hoffmeister et al., 2014). The higher the position individuals are, the greater their potential to influence organizational outcomes (Flin and Yule, 2004). In construction projects, owners' commitment and policies are transmitted by contractors and subcontractors to affect the workers' priorities, attitudes and behaviors. However, previous empirical studies tended to solely address the single-level effects of safety leadership (mostly supervisors' leadership) on safety performance (DeChurch et al., 2010; Wu et al., 2011; Martínez-Córcoles et al., 2013), but somewhat ignored the relationships between safety leaderships of different stakeholders in construction projects, like owners and contractors. Details of the underlying mechanisms by which leadership may influence safety are not yet well depicted and understood (Hoffmeister et al., 2014). The interactions and combined effects on safety performance of the above three stakeholders' leaderships have to be considered and explored holistically.

This study focuses on three project stakeholders' safety leaderships during the construction phase of projects, i.e. project owners, contractors and subcontractors. These are the three main parties constituting the construction project management team

(Fang and Wu, 2013). Project managers from owners, construction managers from contractors and supervisors from subcontractors are selected as objects of empirical study when analyzing the three stakeholders' safety leaderships because they are representative of the three stakeholders' staff, respectively. Safety leaderships of the above three types of personnel are hereafter called owner project managers' safety leadership (OPSL), contractor construction managers' safety leadership (CCSL) and subcontractor supervisors' safety leadership (SSSL).

Based on the previous studies which validated the impact of SSSL on safety performance of construction projects (Hoffmeister et al., 2014; Fang et al., 2015), this study aims to explore relationships between OPSL, CCSL and SSSL. Three research objectives are specified: (1) develop and validate measurement scales of safety leadership and safety culture of construction projects; (2) depict and validate the exact impacting paths between OPSL, CCSL and SSSL; and (3) discover leadership dimensions which can significantly impact safety leadership of other stakeholders. The above analysis is able to contribute to leadership research by interpreting the role of safety leadership in construction safety improvement in a holistic manner, and by providing a framework for future theory development. From a pragmatic and practical perspective, determining the relative contributions of leadership dimensions to safety can aid practitioners in developing better interventions for safety leadership improvement. If some dimensions are much more important than the others in predicting outcomes, it is logical to allocate resources to the more important dimensions. Empirical data are collected from high-speed railway construction projects in China because they are highly complex construction projects with huge numbers of safety risks. The fulfillment of safety leadership and safety management in HSR construction projects are typical and representative. In addition, owners tend to play a crucial role in safety leadership and safety management of HSR construction projects, which correspond to the research objectives pertaining to exploring how owners' safety leadership works on other stakeholders.

2. Literature review and hypothesis development

This section theoretically determines the dimensions of safety leadership and relationships between the three stakeholders' safety leaderships in construction projects in order to establish the research model.

2.1. Safety leadership and its dimensions

Several previous studies have examined the effects of safety leadership on safety performance (O'Dea and Flin, 2001; Barling et al., 2002; Zohar, 2002; Neal and Griffin, 2006; Griffin and Hu, 2013). Safety leadership is a sub-system of leadership (Pater, 2001), and can be defined as "the process of interaction between leaders and followers, through which leaders can exert their influence on followers to achieve organizational safety goals under the circumstances of organizational and individual factors" (Wu et al., 2008). Leadership is fully implicated in safety, and a majority of previous studies focused on the Full

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