



Investigating the multi-causal and complex nature of the accident causal influence of construction project features

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ABSTRACT

Construction project features (CPFs) are organisational, physical and operational attributes that characterise construction projects. Although previous studies have examined the accident causal influence of CPFs, the multi-causal attribute of this causal phenomenon still remain elusive and thus requires further investigation. Aiming to shed light on this facet of the accident causal phenomenon of CPFs, this study examines relevant literature and crystallises the attained insight of the multi-causal attribute by a graphical model which is subsequently operationalised by a derived mathematical risk expression that offers a systematic approach for evaluating the potential of CPFs to cause harm and consequently their health and safety (H&S) risk implications. The graphical model and the risk expression put forth by the study thus advance current understanding of the accident causal phenomenon of CPFs and they present an opportunity for project participants to manage the H&S risk associated with CPFs from the early stages of project procurement.

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1. Introduction

An accident is any unplanned event that results in injury or ill-health of people, or damage or loss to property, plant, materials or the environment or a loss of a business opportunity (Hughes and Ferrett, 2008). Accidents are thus associated with adverse outcomes which have dire cost implications for the construction industry and society as a whole (cf. Darshi De Saram and Tang, 2005; Imriyas et al., 2008; Hughes and Ferrett, 2008). The adverse outcomes of accidents have created the need for accident prevention which requires knowledge of accident causal factors, how the causal factors contribute to accident causation, the extent to which causal factors contribute to accident causation, and the risk posed by these factors (Suraji et al., 2001; Hughes and Ferrett, 2008). The quest to acquire this knowledge has resulted in accident causation studies pioneered by Heinrich (1936). Beyond the unique contributions made by various accident causation studies to the understanding of accidents, they also generally demonstrate the complex and multi-causal nature of accidents (cf. Behm, 2005; Elvik, 2006; Shapira and Lyachin, 2009) and as such the need to fully appreciate the complexity and multi-causality of any accident phenomenon in order to be able to adequately address accidents.

Construction project features (CPFs) are organisational, physical and operational characteristics of construction projects and until quite recently the accident causal phenomenon of these project characteristics has not been examined in greater depth despite their persistent mention in literature. In spite of the significant examination of the accident causal influence of CPFs (cf. Manu et al., 2010a) the multi-causal attribute of this phenomenon still remain elusive and thus require further investigation. In an effort to shed light on this facet, this study begins with a review of some past accident causation models to highlight the multi-causality of accidents and also to provide a sound theoretical underpinning for the study. The study proceeds to examine how CPFs contribute to accident causation to bring out the multi-causal dimension of the causal phenomenon of CPFs. Through the examination, the study finally proposes a risk expression which captures the multi-causal attribute of the causal influence of CPFs. It is argued that such a risk expression provides a systematic approach for assessing the potential of CPFs to cause harm and consequently their risk implications right from the outset of project procurement, thus providing a forward looking framework for accident prevention.

2. Accident causation models: a review

Following the seminal work by Heinrich (1936) there have been considerable efforts towards investigating causes of accidents, how accidents occur and why they occur. These have resulted in several accident causation models, generally with the overall aim of

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