UNIVERSITY OF CAMBRIDGE
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CONSTRUCTION ENGINEERING MASTERS DISSERTATION ABSTRACT

Perception of Risk During Lifting Operations

The complex, dynamic and continually changing nature of construction work has been recognised as an important contributor to the high rates of injuries and fatalities experienced throughout the global industry. Historical incident data confirms that a high proportion of all such events are directly associated with the omnipresent tool of the modern construction industry: the crane.

Commonplace on most major construction projects and regularly utilised where stringent spatial constraints force the requirement for innovative lifting solutions, the operation of cranes constitutes a critical component in the range of elements that make construction work essentially hazardous (Shapira and Lyachin, 2009, Swuste, 2013, Neitzel et al., 2001). Notwithstanding the importance of lifting equipment to the efficiency of construction operations, their use is mirrored by a disproportionately high frequency of dangerous occurrences and fatal events – more recently catalysing concern over 'two decades of deadly crane accidents' (Van Hampton and Lewis, 2008, Munich RE, 2005). The unintended physical interaction between humans and mechanical equipment (HSE, 2015b) – collectively defined as 'human-equipment interaction' events, introduces risk for those directly and indirectly involved with lifting operations (Health and Safety Executive, 2015, Neitzel et al., 2001).

Research interested in the aetiology of crane-related risk has received only moderate attention in academic and industrial literature, commonly being addressed partially and indirectly within the broader treatment of construction site safety (Shapira and Lyachin, 2009); the majority of existing research projects have focussed on the immediate causes or relied upon post-accident data and statistical analyses of crane-related incidents, as opposed to understanding the contributing factors leading to such events (Beavers et al., 2006).

This research is interested in understanding perceptions of risk during lifting operations on construction projects in the United Kingdom, bridging an important gap in existing knowledge. Following the work of Shapira and Lyachin (2009), the use of statistical accident data was eliminated as a source of information from the outset of the project, predominantly due to the unknown aspect of incidents that go unreported; the common inability of statistics to provide root causes; and the questionability of statistics as a leading indicator for safety incidents. Therefore, a bespoke three-staged mixed-methods research approach was developed that involved the real-time identification of risk factors through the application of camera technologies on a reference construction project; a comprehensive industry-wide survey to establish disparities and correlations in perceptions of risk during lifting operations throughout the construction supply chain; and thereafter, consultation with an expert panel of leading practitioners from the construction and lifting industries to triangulate and corroborate the research findings.

The current study highlights significant disparities in the perceived importance of individual risk factors between the various members of the construction supply chain involved with planning and delivery of lifting operations. The study also shows that, with some exceptions, participants with indirect exposure to the risks of lifting operations—those largely responsible for ensuring the overall safety of construction work involving cranes, perceived all risk factors rather differently and to a large extent more influential than participants with direct exposure—those primarily responsible for abiding by the safe systems of work designed to reduce risk exposure during lifting operations.

This paper is written primarily for the consumption of the construction industry; however, the research outcomes provide pertinent findings for several parallel industries interested in improving the safety of human-equipment interaction on construction projects. It is hoped that the findings from this research project can contribute to the wider field of ongoing academic and industrial research interested in developing a new generation of technologies and systems focusing on the proactive management of risk on construction projects.

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