A FRAMEWORK TO ASSESS AND REFINE SAFETY PERFORMANCE MEASUREMENT SYSTEMS FOR CONSTRUCTION PROJECTS BASED ON THE R.E. PERSPECTIVE

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Abstract

Construction projects are by nature temporary installations which accounts for a high number of occupational/personal fatalities when compared with other industries (Hinze et al., 2013). Also, it has been affected by growing sources of complexity, such as larger number of stakeholders in the supply chain, increasing number of sub-systems and regulations, new technological alternatives involving off-site production and a wider range of procurement approaches (Bakhshi et al., 2016; Qazi et al., 2016). Safety Performance Measurement System (SPMS), both in construction and other domains, are based on the developers' theoretical perspective and beliefs regarding what is safety and how it can be obtained (i.e. a safety paradigm). Since SPMSs embodies a continuous improvement cycle, the assumptions about the cause-effect relationship between the working environment and safety performance has implications in all SPMS steps, such as: the design and/or selection of indicators; collection, processing, and analysis of data related to the indicators; the selection of events through which learning is generated; the dissemination of information; and the re-design of the work system, if necessary. A common underlying assumption of SMPSs from several industrial sectors is that safety can be described, and therefore measured, in terms of a particular state or condition where nothing goes wrong, and there is "freedom from unacceptable risk" (ANSI/ASSE Z590.3, 2011; ISO/IEC Guide 51, 2014; AHRQ, 2016). Safety is thus measured by the absence of undesired events, instead of by the presence of something (Hollnagel, 2017). In this sense, the main role played by a SPMS is that of monitoring, reporting and learning from undesired outcomes and past failures, in order to find and fix problems (Hollnagel, 2017; Rae and Provan, 2019). Most of the SPMS used in construction projects are in line with this reactive view, despite the limited predictive value, especially for those accidents that arise from complex interactions between multiple contributing factors (Carder and Ragan, 2003; Sgourou et al., 2010). In order to be proactive, the aim of this study is to assess and refine SPMSs for construction projects by using the lens of Resilience Engineering (RE). A SPMS based on RE can play a role in helping to understand how outcomes are achieved and how construction workers cope with emergent threats and opportunities in every day work.

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This may enable to improve, for example, the safety management processes before deficiencies have resulted in incidents as well as to appreciate the positive contribution of human adjustments and trade-offs decisions to carry out safe operations. Also, it may support the use of a combined approach, by measuring and learning from what goes wrong (reactive perspective) and from what goes well (proactive/RE perspective).