

Construction Health and Safety Management – a Methodological Review Towards a Smart and Holistic Approach

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Abstract. Despite the significant efforts working on the improvement of safety performance on construction site, the statistics of injury, illness and fatality occurred still indicate that Health and Safety (H&S) issue remains a serious problem worldwide. Current H&S management approaches are often based on inaccurate and incomplete data, leading to information silos and single objective decision making. Therefore, devising new preventive strategies to manage H&S in an effective and holistic manner is indispensable for construction H&S management. The emerging Building Information Modelling (BIM) promotes life cycle accurate and comprehensive data and information reuse through life cycle standardization across domains. The recent development in knowledge engineering, e.g. ontology modeling, can provide a new way to extract domain knowledge and link different domains together to form up a smart decision making engine. Ontology has been widely used in health care, smart energy, but not yet fully investigated by construction H&S sector. This paper therefore reviews the abovementioned topics with an aim to provide an overall understanding for smart and holistic construction H&S management, hence to propose a roadmap for the future development.

1. Introduction

During the last few decades, construction industry is witnessed a rapid growth all around the world, especially in developing countries (Bryde, Broquetas et al. 2013). Because of the complexity and uncertainties inherent in the nature of the construction site (Malekitabar, Ardeshir et al. 2016), construction industry always has the bad reputation of accidents with high frequency and diverse hazard sources (Zhou, Goh et al. 2015). Therefore, devising new preventive strategies to manage H&S in an effective and holistic manner is indispensable for construction safety management (Koehn and Datta 2003).

However, current construction H&S management are often based on inaccurate and incomplete data, leading to an error-prone process. Experts identify possible risks based on their individual expertise along with design information that is normally provided in 2D construction drawings and schedules. Additionally, H&S is normally managed separately from the construction management (Hare, Cameron et al. 2006).

In summary, current construction H&S management are lack of (1) comprehensive and accurate data sets, information and knowledge that can be dynamically updated throughout life cycle; (2) smart ways to make a holistic decision by leveraging the interconnected relevant sectors.

The emerging Building Information Modelling (BIM) promotes life cycle accurate and comprehensive data and information reuse through life cycle standardization across domains. Examples have been demonstrated on using BIM to improve the information environment for supporting a more effective and proactive H&S management (Ku and Mills 2010). The recent development in knowledge engineering, e.g. ontology modeling, can provide a new way to