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Towards an Exploration of Safe Work Method Statements as a Safety Management Strategy in Construction: Background and Theory

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Abstract

Construction is one of the largest industries in the world, hence is an important contributor to the social and economic fabric of our society. However, it is also the most dangerous because of the high number of fatalities and incidents experienced by construction workers. Compared to manufacturing, however, construction is generally a more complex industry to work in, and this creates additional challenges for policy makers, researchers and practitioners. There is no doubt that more innovation solutions for managing safety in the industry are needed. Regulators in Australia, however, have continued to rely on contemporary approaches for managing safety in the industry. This paper briefly discusses the state of construction safety in Australia and some of the complexities that characterizes construction. Next one contemporary approach, safe work method statements is introduced, followed by a discussion of four myths around its use as a safety management strategy. Resilience engineering is then introduced as an innovation in safety management, and a proposal put forward for researching resilience engineering using SWMS. The paper concludes with a discussion on two organizational theories upon which such research can be advanced.

Keywords

Construction Safety, Safe Work Method Statements, Systems Theory, Resilience Engineering, Social Construction.

1. Safety and the Australian Construction Industry

Construction is one of the world's largest industries (Bust, Gibb et al. 2008) accounting for 10% of the gross domestic product (GDP) and employing over 180 million people (Murie 2007). In Australia the industry is dominated by small and medium-sized business which employs 86% of the construction workforce, contributes over 76% of the income and over 90% of the operating profits in the industry, and is the fourth largest contributor to Australia's GDP employer (Australian Bureau of Statistics 2011). Construction is therefore an important contributor to the economic and social fabric of Australian society. However, construction is also one of the most dangerous industries for workers (Zolfagharian, Ressang et al. 2011), because of its relatively poor safety performance. For example, over 100 000 workers are killed annually on construction sites, with the fatality rates being five times greater than the average workforce (Murie 2007). In Australia at least one construction worker continues to die every fortnight (Fisher 2008), with the industry experiencing a fatality rate of 4.5 fatalities per 100 000 employees, which is significantly more than that experienced by manufacturing (2.5), wholesale trade (2.0) and electricity, gas, water and waste services (2.2) (Australian Safety and Compensation Council 2010). Figure 1 illustrates one set of trends, incidence rates, experienced by the industry over a ten year period.

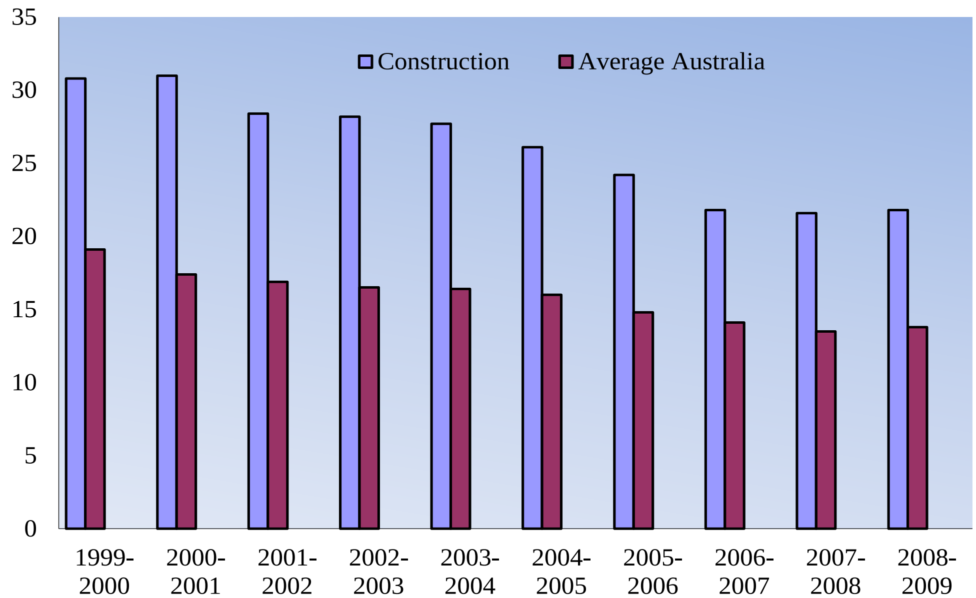

Figure 1: Incidence Rates of the Australian Construction Industry 1999-2009 (Pillay 2013)

A cursory glance at Figure 1 would suggest that safety performance is improving. However, a closer examination would suggest there has been no significant improvement in the last 5 years. In fact there is more of a plateauing effect, with the incidence rate remaining very high at 21.8 per 1000 employees making it one of the most dangerous for workers (Australian Safety and Compensation Council 2010). These are telling signs that existing strategies failing to meet their mark in driving safety improvements.

There are a number of aspects of construction that sets it apart from other industries such as manufacturing. For example, construction work can be dispersed physically over several, sometimes distant, locations, with each site representing 'mobile factories' (Bakri, Zin et al. 2006). Upon completion of each project the 'factory' is disassembled and relocated to the site of a new or different project. However, the conditions at the new site might be completely different from the earlier site (Bakri, Zin et al. 2006). The construction working environments can also be very dynamic with frequent rotations of work teams, changing weather conditions, and a high proportion of unskilled, temporary and transient workers (Rozenfeld, Sacks et al. 2010). As every construction site progresses, new hazards and risks may also develop (Neitzel, Seixas et al. 2001). Outdoor operations, working at heights and sophisticated plant and machinery add to the risks faced by construction employees (Choudhry and Fang 2008). The nature of the work, poor attitudes and behaviors, unsafe work practices, ignorance, pressure from budget cuts and time restraints can compound safety risks, making construction a complex industry to work in (Choudhry and Fang 2008).

One consequence of this complexity is that improving safety in construction work can be more difficult than in a manufacturing facility (Wilson 1998). Existing contemporary approaches may not be sufficient in driving safety improvements beyond what has already been achieved. This, according to Hollnagel (2007), is because '[the contemporary approaches] are from 20 to 40 years old' and 'while they may have been adequate for [the time] they were developed, they are inadequate for present day systems'. Buildings and structures under construction continue to collapse even today, and achieving higher levels of safety appears to remain elusive; 'it is difficult to concede that with all the technological advances that have been made in the industry, the number of accidents that occur in construction remains higher…' (Benford Jr 2008). These necessitate the need for more innovative approaches. What is concerning, however, is that the industry and regulators continue to rely heavily on contemporary approaches such as procedures and rules, including Safe Work Method Statements (SWMS) which was recently introduced as part of a set of harmonized safety laws.

2. Safe Work Method Statements

SWMS are a compulsory control strategy for 'high risk construction work' (Safe Work Australia 2012), and were first introduced as part of a National Standard for Construction Work (National Occupational Health and Safety Commission (NOHSC) 2005). Current construction safety laws require (i) SWMS for least 19 activities; (ii) SWMS be prepared before the work commences, (iii) all work be carried out in accordance with the SWMS, and (iv) SWMS be revised when control measures are revised, if changes are made to the way work is done, and following an incident; (v) SWMS be retained at the workplace for the duration of the high risk construction work, and (vii) be available for inspection by review by safety representatives and inspectors (Safe Work Australia 2012). Hence, as a set of rules, SWMSs represent the backbone of high risk construction safety in Australia (Pillay, Borys et al. 2011).

However, despite being legislated there is little published research that suggest they are effective (or otherwise) as a risk control strategy (Pillay, Borys et al. 2011). This raises the concern of whether SWMS are of any benefit in addressing construction safety risks, or merely an attempt by the regulators to burden industry with additional paperwork!

2.1 Assumptions and Myths Regarding SWMS

In suggesting the strategy of rules and SWMS for managing construction safety risks, four key assumptions are being made. The first is that whoever writes them out has the necessary expertise and resources to identify all existent and foreseeable hazards; the second that the identified hazards can be managed through rules and/or procedures; the third that workers will actually read and understand the rules; and the fourth that they will actually follow the rules when doing work! However, as the following discussion will show, each of these assumptions is a myth.

2.1.1 Myth 1: man is the fountain of all knowledge

Looking at the first assumption, this is the myth of man being the fountain of all knowledge! In spite of one's experience and the technology to search for and know all, it is difficult, if not impossible, to identify all hazards, threats and risks. As Woods and Hollnagel (2006) contend, rules as embodied in policies, regulations, procedures are incomplete as models of expertise and success. Because it is not possible to identify all possible hazards and risks, the procedures / rules written to address them will invariably be limited in their application (Reason, Parker et al. 1998). Another way of explaining this from a design point of view is that there will always be gaps or holes in the design process, creating the human opportunity for human error (Rasmussen 1983). In such circumstances it is left up to those using the rules to make up for these gaps!

2.1.2 Myth 2: safety risks can be managed through rules

Turning to the second assumption, the myth of controlling risks through rules! However, even the basic textbooks would suggest the control of risks through rules are a significantly lower level of control after elimination, substitution, and engineering, rating just above personal protective equipment (Fuller and Vassie 2004). Any rules and/or procedures by themselves do not reduce risks, nor do extortions to follow rules more carefully enhance safety (Dekker 2003). In fact, early studies of high-reliability organizations (HROs), which have very good safety performance in spite of operating in hazardous operations all the time, suggest it is the lack of detailed written safety rules which differentiate it from its counterparts (Roberts 1989, Weick, Sutcliffe et al. 1999, Hopkins 2009). Hollnagel (2008) suggests that rules are more of a symbolic barrier which worked directly through their meaning, thus its usefulness was largely dependent upon those who interpreted them. In this regard SWMS, as a set of rules, are not physical or functional but represents symbolic barriers.

2.1.3 Myth 3: all workers are workplace literate

The third assumption is about workers being able to read procedures and rules; the myth of all workers being workplace literate! A large number of unskilled and semi-skilled workers are joining the industry, many of who do not have the basic literacy skills. American studies have shown that between 10-20 percent of workers were either functionally illiterate of marginally literate, 20 percent lacked the necessary literacy skills required to function effectively in work life, nearly 50 percent had literacy levels well below what is needed to be competitive in today's economy, and nearly 38 percent of job applicants did not have the workplace literary skills to do the job they applied for (Bates and Holton III 2004). If the rules are written by people upstream of the day to day operations (such as project managers and contract managers) it is unlikely to be read, or understood by most construction workers operating at the sharp end of risk. The way things are communicated and discussed becomes more paramount. Research suggests construction workers tend to 'learn more from toolbox talks and morning site safety cycles' (Wadick 2010). Early studies of construction safety culture in have demonstrated that knowledge in this industry was gained more through trial and error, with experience playing an important role in developing safe behaviors (Wilson 1998). Learning through trial and error is associated with resilience identified in high reliability organizations (Weick, Sutcliffe et al. 1999, Weick and Sutcliffe 2007).

2.1.4 Myth 4: all workers are obedient

Turning to the fourth assumption, this is the myth of the obedience, of people following rules all (if not most of) the time! However; people do not always follow procedures (Dekker 2003), and violations of procedures and rules are common in industry (Reason 1990). This is one of the most common findings from safety climate and culture studies. Moreover, some violations may actually be necessary for achieving safety (Alper and Karsh 2009); 'workers… learn that no matter how clearly the rules are specified…the world is (to some degree) unpredictable, and one has to be prepared to use one's innovative skills' (Schein 1996). Such learning leads them to adapt; subsequently, these adaptations become part of the organisation's normal ways of working. Moreover, because rules 'always require an interpretation to bridge the gap between assumed and actual conditions, work as actually done is always different from work as imagined' (Huber, van Wijgerden et al. 2007). Hence there will be always be gaps between work as imagined and work as performed.

What is important about this gap (between work as imagined and work as actually performed) is that it is also an important marker of **resilience engineering** (RE) (Hollnagel and Woods 2006, Nemeth 2006), a recent innovation in safety management. So although SWMS, as a set of rules do represent a form of contemporary approach to managing safety, they do offer an opportunity for conducting empirical research on the gap between 'work as imagined and work as performed.' In the rest of the paper a research question and underlying theories that can be used to explore the research question are discussed.

3. Research Question and Underlying Theories

In order to understand the gap between work as imagined and work as performed in SWMS one of the central research questions that can be asked is '*Do SWMS enhance or impede RE as a safety management strategy in the construction industry?*' In seeking to answer this research question we acknowledge that since SWMS are here to stay, RE offers an opportunity the construction industry should think about embracing in its pursuits of driving safety improvements further through contemporary approaches.

Conducting such empirical research, at least on the academic level, requires the research to be embedded in an appropriate theory. In the author's view the exploration of safety rules such as SWMS involves some level of inquiry into organizational behaviour (Robbins 2003), more specifically those aspects of organizational behaviour which are associated with safety management in organizations. Two useful starting theories include systems and social construction of safety, and these are a good platform for conducting exploratory research on SWMS.

3.1 Systems Theory

Systems theory was first floated by Chester Barnard (Gabor and Mahoney 2010), and early researchers classified organizations into closed and open types (Robbins, Bergman et al. 2006). Closed organisations are mechanistic and characterised by high specialisation, rigid departmentalisation, narrow spans of control, high formalisation, limited information network with limited participation in decision-making by employees; while open ones are more organic, highly adaptive and flexible, (Robbins, Bergman et al. 2006). Earlier on it was argued that construction industry is complex, so ideas from systems theory can be applied for research in this industry. More specifically the socio-technical approach to risk management advocated by Rasmussen (1997) can be drawn upon as a unifying theory. According to the socio-technical theory of risk management, organisations are part of broader socio-technical system comprised of several levels; including government, regulators and associations, company, management, staff and work (Rasmussen 1997). Each of these may play different roles in the system, and they may either influence, or be influenced by, the other levels of the system in question.

3.1.1 Socio-technical system of construction work in Australia

In Australia, SWMS are part a of broader socio-technical system which comprises of at least six levels illustrated in Figure 2.

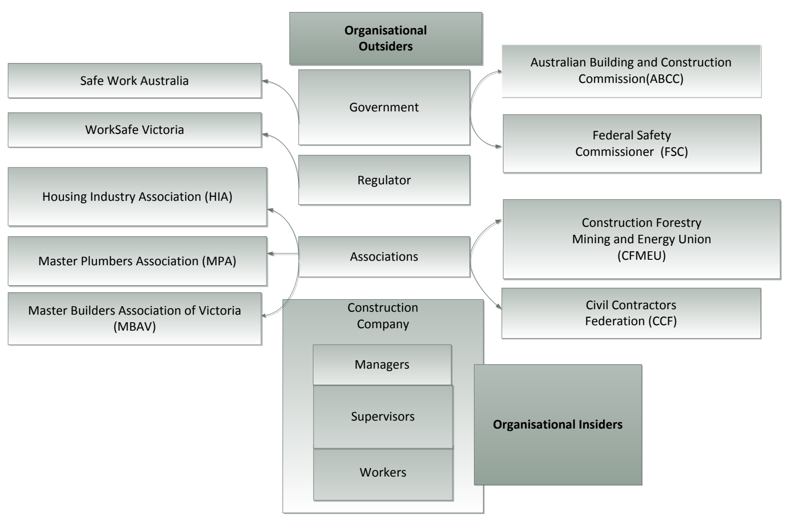

Figure 2: Socio-Technical System of Construction Work (Pillay 2013)

The first three are generally external while the next three are internal to the organisations. The first level includes the government which sets the broad national safety policy based on the political aspirations of the party elected. The next level include state and territory the regulators who translate the government's aspirations into safety law and enforce this in industry. The third level includes Associations of employers and unions, and at is at this level that legal requirements are translated into advisory documents and made available to members. The fourth level includes the company, largely as principal contractors, who oversee development and construction, set broad policies and frameworks for works, operations, and safety; and where senior managers translate the advisory documents into organisational policies, procedures and rules. The fifth level is represented by managers; included in this level are project and / site managers who generally manage a portfolio of construction jobs. They work with a range of building supervisors are generally responsible for establishing and meeting targets for production and safety, and for selecting different sub-contractors. They work hand in hand with safety personnel such as managers, coordinators and advisors in implementing broad-level organisational controls. The sixth level includes supervisors, and is composed of a myriad of building and construction supervisors, subcontractors, and tradesmen. At this level the supervisors play two distinct roles; as a manager for either one specific contract or a number of construction projects, and it is here that they implement organisational policies, procedures and controls, including SWMS. The other is as a worker at the seventh level where they themselves are expected to follow policies, procedures that have been laid down by their organisation. Each level is subjected to pressures and stressors and the interconnectedness between them means these are more than likely to affect the entire system (Rasmussen 1997, Wiig 2008). Hence, how SWMS are perceived, constructed and acted upon at each level is expected to be dependent upon pressures and stressors exerted by others higher up the hierarchy of the socio-technical system.

3.2 Social Construction of Safety

According to the new thinking about safety and accident prevention, safety is a dynamic property that emerges out of the interactions different elements and subunits of a socio-technical system (Cook and Rasmussen 2005, Hollnagel and Woods 2006). This suggests safety is a social construct; a process of discovery (Wildavsky 1988). This notion of safety is derived from in high-reliability theory (Rochlin 1999), and organisational learning theorists such as Gherardi and Nicolini are also proponents of this school of thinking, arguing that safety was an organisational competence arising from a constellation of interconnected practices, was socially constructed, innovated and transmitted to new members (Gherardi and Nicolini 2002). Cook, O'Connor et al. (2004) extended this thinking by suggesting that safety was an emergent (instead of a fixed) state of a system because people continuously created safety; a notion which has also been embraced by proponents of RE such as Woods and Cook who argue that safety is created at the sharp end of risk as practitioners interacted with the hazardous processes inherent in the field of activity (Woods and Cook 2002).

4. Concluding Remarks

The construction industry is a complex one. It has been argued that contemporary approach such as SWMS, as a set of rules, may not be adequate in driving safety management improvement beyond what has been achieved, and more innovations are needed. This paper proposed the suitability of exploring RE, a recent innovation in safety management, using the indicator of ‘the gap between work as imagined and work as performed’ as a way of understanding whether SWMS enhance or hinder RE as a safety management strategy in the industry. This research is expected to break new ground into the application of safety rules in the construction industry by building established theories associated with systems, socio-technical systems and social construction of safety. SWMS, as a set of rules, represent a form of symbols, and the set of 19 activities for which they are required provide a very good starting point upon which research on SWMS and RE can be advanced. The socio-technical system of construction proposed in Figure 2 also provides a useful framework for collecting data at the various levels of the system, enabling a comprehensive research design to be used. Future papers will include a review of the literature on construction safety and resilience engineering, and findings from this study.

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