USING THE PSYCHOLOGICAL CONTRACT TO MEASURE SAFETY OUTCOMES ON CONSTRUCTION SITES

Mohammad Tanvi Newaz[1], Marcus Jefferies, Peter Davis and Manikam Pillay

University of Newcastle Australia, University Drive, Callaghan NSW 2308, Australia.

The influence of different level managers on safety management in the workplace has been the subject of interest to many researchers. However, senior managers have little contact with 'workers' at the construction worksite who instead take daily direction from lower-level managers/supervisors. As a result, the mechanisms of managerial influence on organizational safety outcomes are poorly understood and yet the daily interactions between supervisor and workers influences safety outcomes. This research uses the concept of the 'Psychological Contract' (PC) based on perceived mutual obligations between the supervisor-worker. When using this concept to consider safety, it may be termed as 'PC of Safety' and the impact of fulfilment/breach of PC on worker behaviour can be hypothetically compared with the impact of PC of safety on workers safety behaviour. This safety behaviour of workers is shaped by the PC of safety between the supervisor-worker, which ultimately causes safety outcomes, e.g. accident rates. Accordingly, a model is proposed of the PC of safety to measure the safety outcomes mediated by workers safety behaviour. Using the supervisor-worker relationship as a unit of analysis, this model has the potential to reveal the relationship between PC of safety and safety behaviour and its effect on safety outcomes.

Keywords: psychological contract, safety behaviour, safety outcomes, workers' safety.

INTRODUCTION

Regardless of technological developments and the implementation of robust safety management systems, the construction industry's chronic level of fatalities, serious injury and ill-health appears difficult to change. This has led researchers and practitioners to focus on organizational and social factors, including safety climate, to induce positive change to the industry's poor safety performance (Lingard *et al*., 2010). Safety climate is considered as a sub set of organizational climate and is believed to shape workers' behaviour through the expectations they form about an organizations value and reward (Zohar and Luria, 2005). Among the most common themes assessed in safety climate research, 'management commitment' has been found the most important factor (Flin *et al*., 2000). Despite this there is a need to better understand the mechanisms by which management commitment to safety "cascades" to lower tiers of management, to ensure that supervisors' responses remain consistent with organizational commitments (Lingard *et al*., 2012). There are a few ways to address this gap: (1) understanding the dynamics between senior manager-

[1] MohammadTanvi.Newaz@uon.edu.au

Newaz, M T, Jefferies, M, Davis, P and Pillay, M (2016) Using the Psychological Contract to Measure Safety Outcomes on Construction Sites. *In*: P W Chan and C J Neilson (Eds.) *Proceedings of the 32nd Annual ARCOM Conference,* 5-7 September 2016, Manchester, UK, Association of Researchers in Construction Management, Vol 1, 487-496.

supervisor association and its impact on safety behaviour of workers; (2) analysing the relationship between supervisor-workers and its effect on safety behaviour of workers; and/or (3) examining senior manager/supervisor-worker relationship. Considering the nature of the construction project, the significance of the supervisor on construction sites and timeframe of this PhD-based research project, the research adopts item (2) as the way to identify the influence of supervisor-worker relationship on workers' safety behaviour. As a result, the unit of analysis will be the relationship between first-level supervisor and workers at the construction site and not the relationship between senior manager and supervisor.

According to Lingard *et al*., (2012), desired safety values and behaviours should be enacted across different hierarchical levels of an organization, and first-level supervisors play a key role in translating top management commitment to safety into safety values and practices within workgroups. The influence of supervisors on safety performance is likely to be increased in a construction context because construction work is highly decentralized, with productive work undertaken at sites remote from the corporate office (Lingard *et al*., 2012). Although the importance of supervisors to worker safety behaviour has been well-established, the specific behaviours most likely to support subordinate safety performance are less clear, especially in the construction industry (Fang *et al*., 2015). Another area that has received little attention is the influence that organizationally based social exchanges between workers and supervisors may have on safety (Hofmann & Morgeson 1999). Blau (1964), while discussing social exchange theory, argues that when one party acts in ways that provide benefits to the other party, an implied obligation is generated for future reciprocity. Therefore, the 'Psychological Contract' (PC), which is assumed as a consequent of social exchange theory (Blau, 1964), can be introduced to capture the momentum between supervisors and workers to explore their relationships in terms of safety. Psychological Contract of safety (PCSafety) can be conceptualized as the beliefs of individuals about reciprocal safety obligations inferred from implicit or explicit promises (Walker and Hutton, 2006). This research argues that the notion of PCSafety could provide the cognitive basis for the development of workers safety behaviour and proposes the use of PCSafety to examine the impact of supervision on workers behaviour and safety outcomes in a construction setting. While measuring safety outcomes through the lens of PC, the broader research project will identify the factors of safety climate that are strongly related with components of PCSafety and also measure safety climate at both individual and group level in order to observe their impact on safety behaviour. However, the focus at this stage of the research, and that which is reported in this paper, is the development of a model of the PC of safety in order to measure the safety outcomes mediated by workers safety behaviour.

SAFETY CLIMATE, SAFETY BEHAVIOUR AND RESEARCH GAP IN CONSTRUCTION

In the context of the construction industry, a number of notable safety climate studies have been conducted (Dedobbeleer and Béland, (1991); Glendon and Litherland, (2001); Mohamed, (2002); Siu *et al*., (2004); Fang *et al*., (2006); Choudhry *et al*., (2009); (Lingard *et al*., 2009). Consistent with research in other industries, there is empirical evidence to support a positive link between safety climate and the safety performance of construction organizations (Gillen *et al*., 2002). The relationship between safety climate and safety behaviour has been well established in safety research and its consequence are recognized as safety outcomes which are crucial indicators for improved safety on construction sites. However, surprisingly little is

known about the mechanisms by which safety climate influences safety behaviours of individuals in organizations. Furthermore, relatively little is known about the factors that influence safety climate (Neal *et al*., 2000). The analysis of safety climate has been shown to be generally predictive of safety performance in the workplace (Cooper and Phillips, 2004), but more research is needed to identify specific features of safety climate that are associated with the effectiveness of a behavioural safety process (Wirth and Sigurdsson, 2008). This research gap is depicted in Figure 1.

Figure 1: Missing link between safety climate and safety behaviour

The mechanisms of managerial influence on safety performance within organizations is not well understood (Lingard *et al*., 2012). In this context, "leaders create climate" (Lewin *et al*., 1939), and if what supervisors 'say and do' are in alignment, it is very likely that supervisor and employee would have a similar interpretation of safety climate (Huang *et al*., 2014). Such supervisory impact should, in turn, result in the development of shared mental models for both group members and supervisors regarding their experiences in the workplace (Rouse and Morris, 1986). While measuring the influence of the supervisor on the work-group, this project will also measure supervisor's influence on individual worker's safety perception and behaviour. The following section describes the significance of supervisors in a construction setting and their influence on safety behaviour of workers.

INFLUENCE OF THE SUPERVISOR IN WORKERS' SAFETY BEHAVIOUR

Due to multiple levels of organizational structure as well as different roles, responsibilities, and accountabilities at different levels, management behaviours can produce different impacts on workers' behaviour (House *et al*., 1995, Kozlowski and Klein, 2000). Supervisors have the most frequent contact with workers among the three management layers and are directly responsible to guarantee good safety performance on site. Simard and Marchand (1997) state that senior management commitment has no significantly direct impact on safety performance, rather, the relations with safety initiatives and supervisors' involvement as mediating variables have a higher validity (Fang *et al*., 2015). The fact that the relationship between top management commitment to safety and workgroup injury frequency rates was fully mediated by perceptions of supervisors' safety expectations highlights the critical role played by supervisors in the safety management process. Construction work is largely non-routine, necessitating the exercise of supervisory discretion in the interpretation of formal safety policies and procedures. In this context, the role of supervisors in shaping subordinates' safety behaviour is likely to be considerably greater than in stable work contexts characterized by routine production processes (Lingard *et al*., 2012). This paper limits its research scope between the relationship of frontline supervisors and workers in construction sites.

Although the importance of supervisors to worker safety behaviour has been well-established, the specific behaviours most likely to support subordinate safety performance are less clear, especially in the construction industry. Previous studies on supervisors' influence on worker safety behaviour in construction is limited, in the studies undertaken the interpretation of implications of supervisory behaviour on

worker safety behaviour tends to be simplified. Practitioners not only need to know how managers can affect worker safety behaviour but also have to grasp the impact, and what are the implications (Fang *et al*., 2015)?

Sully (2001) argued that to better understand the relationship between safety behaviour and an individual employee, it is important to understand the dynamics underlying the relationship between employees and their organization. Considering the construction setting, the supervisor is the most influential entity to represent the organization. In addition, they have been shown to develop high levels of physical and psychological closeness with their direct subordinates through bonds that begin to develop during their supervision of employees' day-to-day tasks. These bonds noticeably affect employees' perceptions of their psychological contracts [Bass (1991); Krackhardt *et al*., (1981); Lee and Taylor (2014)]. The PC literature has tended to treat immediate managers exclusively as key agents representing the interests of organizations with respect to the PC between employees and organizations [e.g., Conway and Briner (2002); Robinson and Morrison (2000); Lee and Taylor (2014)]. However, the dilemma of the dual role of supervisors presenting themselves as principal and primary agent in front of their sub-ordinates still leads to confusion (Lee and Taylor (2014). It has been suggested that managers should avoid to develop such impression as being the principal agent for long term benefit (Lee and Taylor, 2014), this study does not intend to identify whether managers/supervisors are following this strategy at the construction site as the data will be collected from workers only. In order to address this limitation to some extent, supervisors and senior management will be considered and presented as separate entities while designing the survey questionnaire and analysing the data collected from workers.

Noteworthy to this context, Sully (2001) proposed the PC as means of exploring this relationship, arguing that safety was already based on reciprocity involving a duty of care on the part of the employer and a reciprocal obligation to uphold safety standards on the part of the employee. Since safety climate is based on the perception of workers (Zohar, 1980) and PC is also developed from perceived obligations through the relationship with the supervisor (Rousseau, 1990), it can be expected that PC of safety is developed from safety climate and it influences worker's behaviour in the same way that psychological contract influences behaviour of the employees in an organization setting (Walker, 2013). This hypothetical relationship is shown in Figure 2.

Figure 2: Mediated relationship of psychological contract of safety between safety climate and safety behaviour

Psychological contract of safety

Blau (1964) while explaining social exchange theory, argued that if employees perceive that the organization is concerned for their well-being they will develop an implicit obligation to reciprocate by carrying out behaviours that benefit the organization. Evidence suggests that employees may reciprocate the positive experiences they have in an employment relationship by carrying out their core tasks at a high standard and by carrying out citizenship activities (Tsui *et al*., 1997). In addition, Hofmann and Morgeson (1999) argued that when employees work in an environment in which safety is a concern, they reciprocate by complying with

established safety procedures. Considering the distinctive nature of construction and recognising the influence of supervisors and their reciprocal relationship with workers, this research proposes to use psychological contract of safety (PCSafety), instead of using safety knowledge and safety motivation as determinants of safety performance, as used in Griffin and Andrew (2000) model, since PCSafety is based on the reciprocal relationship between worker and supervisor in terms of safety. It is suggested that the concept of psychological contract of safety inherently endorses safety knowledge and safety motivation since psychological contract of safety is based on a mutual obligated relationship between the supervisor and workers. Accordingly it is assumed that if supervisors cannot develop the mutual and obligated relationship with workers in general then it would be difficult for them to improve safety knowledge among workers nor can they motivate employees to promote safe behaviour on construction sites. As a result this research tests the concept of PCSafety to address the gap between safety climate and safety behaviour and endeavours to develop a model that explains the mechanism by which safety climate factors influence safety behaviour and safety outcomes in a construction setting.

The PCSafety is defined as the beliefs of individuals concerning reciprocal safety obligations between employer and employee, inferred from implicit or explicit promises (Walker and Hutton, 2006). Employees form expectations about workplace safety that then lead them to believe that certain actions will be reciprocated. These expectations constitute a PC when employees believe that perceived employer safety obligations and perceived employee safety obligations are contingent on each other (Walker, 2013). The seminal work of Rousseau (1990) on PCs found two underlying contract dimensions characterized by the type of employment relationship perceived between the two parties: transactional and relational. Transactional contracts are short-term contracts that have an economic focus and are observable and explicit in nature. Characteristic of transactional type contracts are performance-related pay and career development in exchange for longer working hours and multiple work roles. Relational contracts, on the other hand, are longer-term contracts with a socio-emotional focus. These types of contracts are subjective and implicit in nature, with traits such as hard work and loyalty being exchanged for job security (Walker, 2010). Figure 3 illustrates the two elements of PC of safety: employer safety obligations and employee's safety obligations and two aspects of obligations: relational and transactional.

Figure 3: Model of Psychological Contract of Safety adapted from Walker (2010)

The impact of breach and fulfilment of the PCSafety on employee safety behaviour has not been specifically researched in construction. Nevertheless, it is expected that this relationship will be similar to the relationship between the PC and employee attitudes and behaviour established in the organizational literature (Walker, 2013).

SAFETY BEHAVIOUR (PERFORMANCE) OR SAFETY OUTCOMES

From the perspective of accident investigation, construction workers' unsafe behaviours are often the primary cause of accidents on construction sites (Reason, 1990). Suraji *et al*. (2001) identified that 88% of the accidents in construction projects involved unsafe behaviours. Work behaviours relevant to safety can be conceptualized in the same way as other work behaviours that constitute work performance (Griffin and Andrew, 2000). However, the term *safety performance* may be used to refer to two different concepts. At times, safety performance might refer to an organizational metric for safety outcomes, such as number of injuries per year (Burke *et al*. (2002), conversely, safety performance may refer to a metric for safety-related behaviours of individuals (Neal and Griffin (2004). Distinguishing safety-related behaviours from the outcomes of those behaviours is important, because each might have differential relationships with antecedents. Thus, in this paper the researchers consider safety performance behaviours and safety outcomes to be distinct. In contrast to safety performance behaviours, safety outcomes are tangible events or results, such as accidents, injuries, or fatalities (Christian *et al*., 2009).

On the other hand, Burke *et al*., (2002) argue that safety performance behaviours can be scaled by the frequency with which employees engage in the behaviours and are distinguishable in terms of their antecedents and co-variation with safety outcomes. Thus, the model of performance can be applied to safety performance in the workplace. The components of performance describe the actual behaviours that individuals perform at work. Borman and Motowidlo (1993) proposed two major components of performance: task performance and contextual performance. These two components of performance can be used to differentiate safety behaviours in the workplace. First, based on definitions of task performance, the researchers use the term *safety compliance* to describe the core safety activities that need to be carried out by individuals to maintain workplace safety. These behaviours include adhering to lockout procedures and wearing personal protective equipment. Second, based on definitions of contextual performance, the researchers use the term *safety participation* to describe behaviours such as participating in voluntary safety activities or attending safety meetings. These behaviours may not directly contribute to workplace safety, but they do help to develop an environment that supports safety (Griffin and Andrew, 2000). Figure 4 shows the two types of workers' safety behaviour, which are considered as safety performance in this paper and extends the link between safety performance and safety outcomes.

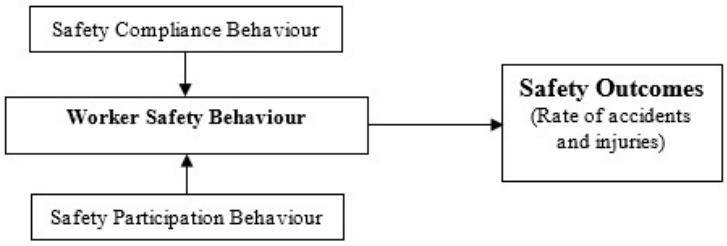

Figure 4: Safety Behaviour (Performance) and Safety Outcomes

In order to validate the model and establish the link between all the factors with safety outcomes, this paper intends to measure both safety performance (participation and compliance behaviour) and safety outcomes (rate of injuries and near misses). The

majority of the safety climate and safety behaviour researchers have validated their model by establishing a link with safety outcomes (Clarke, 2006).

DEVELOPMENT OF THE PSYCHOLOGICAL CONTRACT OF SAFETY MODEL

The relationships shown in Figure 3 are used to extend the concepts via the model below (Fig 5). In order to get an extended view and create a link among them all, previous figures are merged into one, i.e. Figure 5, this expresses the relationships between different components of the model. The new model adopts the model of Neal *et al*., (2000), concerning safety climate and safety behaviour, along with Walker's (2010) model of PC of safety. However, as an alternative of using safety knowledge and safety motivation as determinants of safety performance in the Neal *et al*. (2000) model, a psychological contract of safety (PCSafety) is offered as a determinant/mediator of safety performance.

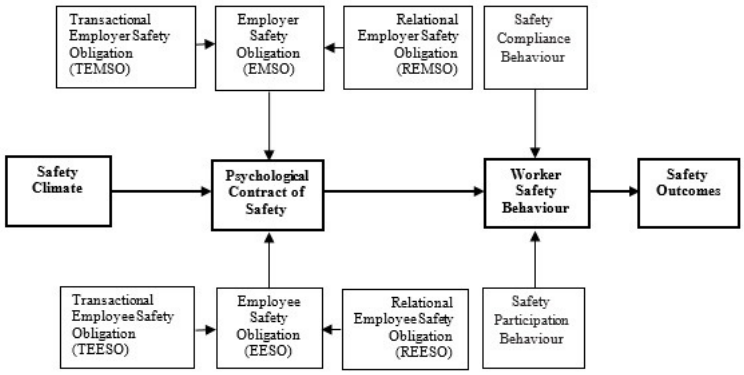

Figure 5: Hypothetical Model of Psychological Contract of Safety

Walker's (2010) tested model of PCSafety is incorporated in order to capture the dimension of relational and transactional aspects of employee and employer safety obligations to reveal a comprehensive analysis of safety obligations from the employee's point of view and their impact on construction safety performance (worker's safety behaviour). It is crucial to decide the factor structure of safety climate considering the effect of the factors on PC of safety and safety behaviour. Though previous research has sought to explore safety climate factors (Glendon and Litherland, 2001) and ways of improving and measuring it (Zhou *et al*., 2008) there is little agreement on which dimensions or factors constitute the most common safety climate factor structure. Researchers continue to explore different factor structures to study safety climate, whereas there is a call to develop industry specific safety climate factor structures for ease of understanding the prime causes of positive and negative outcomes of safety initiatives (Zohar, 2010). The authors of this paper are currently working with a meta-analysis to develop a relevant safety climate factor structure for construction and after the analysis of empirical data the results will be presented in another forum.

This hypothetical model has number of implications. This is a unique model explaining the relationship between safety climate and safety behaviour, mediated by the PC of safety in construction. In addition, the research will identify how PC of safety is formed from safety climate. The association between PC of safety and safety behaviour will also express the strength of relationship between different PC of safety elements and safety behaviour components. Finally, in order to achieve the predictive validation of the model, relationship of all the three factors (safety climate, PC of

safety and safety behaviour) with safety outcomes (rate of accidents/injuries) will be examined through empirical evidence for this model, which will reveal the strength of their association both individually and collectively.

CONCLUSION

After more than 30 years of safety research, it is still unclear how safety climate influences safety behaviour. To address this gap, this research argues that the psychological contract of safety is the key to explain the dynamics between safety climate and safety behaviour, especially in construction. In addition, this research identifies the theoretical formation of the psychological contract of safety arising from safety climate. It proposes a framework to examine the mediated relationship of safety climate and safety behaviour by psychological contract of safety which influences safety outcomes in a construction setting. The implications of this research are useful for managers, supervisors, safety advisors and workers on construction sites, helping to understand how safety activities should be managed and to identify the factors that shape worker safety behaviour and safety outcomes. The next stage of the research is to collect data from a mega-construction project in New South Wales, Australia. The researchers intend to test the proposed model and present the analysis of the empirical data at the next ARCOM conference.

REFERENCES

Bass, B M (1991) From transactional to transformational leadership: Learning to share the vision. *Organizational dynamics,* **18**(3)**,** 19-31.

Blau, P M (1964) *Exchange and Power in Social life*. New York: Wiley.

Borman, W C and Motowidlo, S M (1993) Expanding the criterion domain to include elements of contextual performance. *Personnel Selection in Organizations,* US: Jossey-Bass**,** 71.

Burke, M J, Sarpy, S A, Tesluk, P E and Smith-Crowe, K (2002) General safety performance: A test of a grounded theoretical model. *Personnel Psychology,* **55**(2)**,** 429-457.

Choudhry, R, Dongping, F and Helen, L (2009) Measuring safety climate of a construction company. *Journal of construction Engineering and Management,* **135**(9)**,** 890-899.

Christian, M S, Bradley, J C, Wallace, J C and Burke, M J (2009) Workplace safety: A meta-analysis of the roles of person and situation factors. *Journal of Applied Psychology,* **94**(5)**,** 1103-27.

Clarke, S (2006) The relationship between safety climate and safety performance: A meta-analytic review. *Journal of Occupational Health Psychology,* **11**(4)**,** 315-27.

Conway, N and Briner, R B (2002) Full-Time versus Part-Time Employees: Understanding the Links between Work Status, the Psychological Contract, and Attitudes. *Journal of Vocational Behavior,* **61**(2)**,** 279-301.

Cooper, M D and Phillips, R A (2004) Exploratory analysis of the safety climate and safety behavior relationship. *Journal of Safety Research,* **35**(5)**,** 497-512.

Dedobbeleer, N and Béland, F (1991) A safety climate measure for construction sites. *Journal of Safety Research,* **22**(2)**,** 97-103.

Fang, D, Chen, Y and Wong, L (2006) Safety Climate in Construction Industry: A Case Study in Hong Kong. *Journal of Construction Engineering and Management***, 132**(6), 573-584.

Fang, D, Wu, C and Wu, H (2015) Impact of the Supervisor on Worker Safety Behavior in Construction Projects. *Journal of Management in Engineering*, **31**(6), 04015001.

Flin, R, Mearns, K, O'Connor, P and Bryden, R (2000) Measuring safety climate: Identifying the common features. *Safety Science,* **34**(1), 177-192.

Gillen, M, Baltz, D, Gassel, M, Kirsch, L and Vaccaro, D (2002) Perceived safety climate, job demands, and co-worker support among union and non-union injured construction workers. *Journal of Safety Research,* **33**(1), 33–51.

Glendon, A I and Litherland, D K (2001) Safety climate factors, group differences and safety behaviour in road construction. *Safety Science,* **39**(3), 157-188.

Griffin, M A and Andrew, N (2000) Perceptions of safety at work: a framework for linking safety climate to safety performance, knowledge, and motivation. *Journal of Occupational Health Psychology,* **5**(3)**,** 347.

Hofmann, D A and Morgeson, F P (1999) Safety-related behavior as a social exchange: The role of perceived organizational support and leader-member exchange. *Journal of Applied Psychology,* **84**(2)**,** 286-296.

House, R, Rousseau, D and Thomashunt, M (1995) The Meso paradigm-a framework for the integration of micro and macro organizational-behavior. *Research in organizational Behaviour*, **17,** 71-114.

Huang, Y H, Robertson, M M, Lee, J, Rineer, J, Murphy, L A, Garabet, A and Dainoff, M J (2014) Supervisory interpretation of safety climate versus employee safety climate perception: Association with safety behavior and outcomes for lone workers. *Transportation Research Part F: Traffic Psychology and Behaviour,* **26**(Part B)**,** 348-360.

Kozlowski, S W and Klein, K J (2000) A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. *In*: K J Klein and S W Kozlowski (Eds.) *Multilevel Theory, Research, and Methods in Organizations: Foundations, Extensions, and New Directions*, San Francisco, CA, US: Jossey-Bass, 3-90.

Krackhardt, D, McKenna, J, Porter, L W and Steers, R M (1981) Supervisory behavior and employee turnover: A field experiment, *Academy of Management Journal,* **24,** 249-259.

Lee, J and Taylor, M S (2014) Dual roles in psychological contracts: When managers take both agent and principal roles. *Human Resource Management Review,* **24,** 95-107.

Lewin, K, Lippitt, R and White, R K (1939) Patterns of aggressive behavior in experimentally created 'social climates'. *The Journal of Social Psychology,* **10,** 269-299.

Lingard, H, Cooke, T and Blismas, N (2010) Safety climate in conditions of construction subcontracting: Multi-level analysis *Construction Management and Economics,* **28,** 813-825.

Lingard, H, Cooke, T and Blismas, N (2012) Do perceptions of supervisors' safety responses mediate the relationship between perceptions of the organizational safety climate and incident rates in the construction supply chain? *Journal of Construction Engineering and Management,* **138,** 234-241.

Lingard, H C. Cooke, T and Blismas, N (2009) Group-level safety climate in the Australian construction industry: within-group homogeneity and between-group differences in road construction and maintenance. *Construction Management and Economics,* **27,** 419-432.

Mohamed, S (2002) Safety climate in construction site environments. *Journal of construction engineering and management,* **128,** 375-384.

Neal, A and Griffin, M (2004) Safety climate and safety at work *In*: J Barling and M R Frone (Eds.) (2004). *The Psychology of Workplace Safety*. Washington, DC: American Psychological Association, 15-34.

Neal, A, Mark, A G and Peter, M H (2000) The impact of organizational climate on safety climate and individual behavior. *Safety science,* **34**(1-3), 99-109.

Reason, J (1990) *Human error.* Cambridge: Cambridge University Press.

Robinson, S L and Morrison, E W (2000) The development of psychological contract breach and violation: A longitudinal study. *Journal of organizational Behavior,* **21,** 525-546.

Rouse, W B and Morris, N M (1986) On looking into the black box: Prospects and limits in the search for mental models. *Psychological bulletin,* **100,** 349.

Rousseau, D M (1990) New hire perceptions of their own and their employer's obligations: A study of psychological contracts. *Journal of organizational behavior,* **11,** 389-400.

Simard, M and Marchand, A (1997) Workgroups' propensity to comply with safety rules: The influence of micro-macro organisational factors. *Ergonomics,* **40,** 172-188.

Siu, O L, Phillips, D R and Leung, T.-W (2004) Safety climate and safety performance among construction workers in Hong Kong. *Accident Analysis and Prevention,* **36,** 359-366.

Sully, M (2001) *When Rules Are Not Enough: Safety Regulation and Safety Culture in the Commercial Driving Context*. Insurance Commission of WA Conference on Road Safety, Perth.

Suraji, A, Duff, A R and Peckitt, S J (2001) Development of causal model of construction accident causation. *Journal of Construction Engineering and Management,* **127,** 337-344.

Tsui, A S, Pearce, J L, Porter, L W and Tripoli, A M (1997) Alternative approaches to the employee-organization relationship: Does investment in employees pay off? *Academy of Management Journal,* **40,** 1089-1121.

Walker, A (2010) The development and validation of a psychological contract of safety scale. *Journal of Safety Research,* **41,** 315-21.

Walker, A (2013) Outcomes associated with breach and fulfilment of the psychological contract of safety. *Journal of Safety Research,* **47,** 31-7.

Walker, A and Hutton, D M (2006) The application of the psychological contract to workplace safety. *Journal of Safety Research,* **37,** 433-41.

Wirth, O and Sigurdsson, S O (2008) When workplace safety depends on behavior change: topics for behavioral safety research. *Journal of Safety Research,* **39,** 589-98.

Zhou, Q, Fang, D and Wang, X (2008) A method to identify strategies for the improvement of human safety behavior by considering safety climate and personal experience *Safety Science,* **46,** 1406-1419.

Zohar, D (1980) Safety climate in industrial organizations: Theoretical and applied implications. *Journal of Applied Psychology,* **65,** 96-102.

Zohar, D and Luria, G (2005) A multilevel model of safety climate: cross-level relationships between organization and group-level climates. *Journal of Applied Psychology,* **90,** 616-28.

Zohar, D (2010) Thirty years of safety climate research: reflections and future directions. *Accident Analysis and Prevention,* **42,** 1517-22.