1.0. Introduction

Systems thinking emerged as a trans-discipline, in the 1950's, in large part as a reaction to the reductionism of the traditional scientific method and the failure of that reductionism to cope with the complexity inherent in the biological and social domains (Jackson, 2003). Scientific methods and management theories which advocate control and predictability, aim at separating variables to understand specific cause-effect relations. In stark contrast to this 'analytical thinking' approach, systems thinking considers the system's global behavior and performance as a combined effect of all its variables and – most of all – of their mutual relations (Conti, 2010). In doing so, systems thinking sees systems holistically, emphasizing the circular nature of complex systems, i.e. cause and effect are not distinguishable (Goh et al., 2010). As systems thinking evolved, increasing attention was given to its use to tackle practical real-world problems because of its generality.

From the systems perspective, interdependence among the different systems is the main factor in determining the entire system's characteristics, behavior and performance. Such relations normally give rise to unique properties known as emergent properties (Conti, 2010). In the safety context, safety can be considered as emergent phenomenon resulting from dynamic interactions among people, technology, regulations, etc., making a systems view imperative if the aim is to evaluate or develop the entire system (Reiman & Rollenhagen, 2011). Leveson (2011a) argues that preventing accidents requires using accident models that include social, organizational, as well as technical aspects of safety. Dekker (2010) describes the systems approach as seeing sociotechnical complexity not as constituted of parts and their interactions, but as web of dynamic, evolving relationships and transactions. This notion is recently echoed by Reiman & Rollenhagen (2014), stating that safety will not be fully managed by managing its constituent parts in isolation.

The cost of these safety-related outcomes is substantial, as it is estimated that workplace fatalities, injuries, and illnesses result in economic losses amounting from four to five per cent of gross domestic product (World Health Organization, 2008). In 2007, this amounted to economic losses in the United States of over $550 billion (Bureau of Economic Analysis, 2008). In 2000, there were approximately two million work-related deaths (World Health Organization, 2008). It is clear from the above that there is a need to instil more systems thinking into safety. However, safety is not a subject itself; it is an attribute of a person or process. Likewise, managing for safety is not an independent activity, it is part of management with specific targets at different levels. Rasmussen (1997) identified a number of levels in safety-related sociotechnical systems including: work (task), staff, management, organization, regulatory and government levels; each of which is co-responsible for production and safety. Rasmussen's risk management framework is underpinned by the idea that sociotechnical systems comprise various levels; actions and decisions across these levels interact with one another and contribute to the control of hazardous process (Goode et al., 2014).

2.0. Construction safety

In Australia, the total economic cost of work-related injuries and illnesses for the 2008–09 financial year is estimated to be $60.6 billion dollars, representing 4.8 per cent of Gross Domestic Product (Safe Work Australia, 2012). The construction industry has the characteristic of small scale accidents with high frequency, and diverse hazard sources (Zhou et al., 2015). Improving productivity and safety of construction projects is among the priorities of the construction industry (Beavers et al., 2006). As construction site operations are both complex and emergent, the management of such operations requires not only a well-developed safety management system, but more crucially, the

simultaneous and continuous existence of collective norms that emphasize safety (Torner & Pousette, 2009). Due to this fact, there has been an increasing attention, over the past two decades, to address the interactions among these various sociotechnical sub-systems through the conceptualization of safety culture and safety climate constructs. Both constructs have been widely accepted by many industries including the construction industry. However, they have also been criticized as catch-all concepts that mix psychological and human factors issues that are devoid of contextual consideration (Reiman & Oedewald, 2007). In this study we refer to Glendon's safety climate instrument which is well validated in the safety literature (Fin et al., 2000; Cooper & Phillips, 2004; Hecker & Goldenhar, 2014).

Safety culture, for example, was described as an inherently normative concept having dimensions that are typically qualitatively very different from one another and can hardly be considered a coherent single variable among the other variables of the sociotechnical system (Reiman & Rollenhagen, 2014). Moreover, Myers et al. (2014) argue that the safety culture concept has lost some of its precision and analytic power. They suggest that understanding of culture can be further improved through delineating the ideological – the socially constructed abstract systems of meaning, norms, beliefs and values (which they refer to as culture) – from concrete behaviors, social relations and other properties of work-places (e.g., organizational structures) and of society itself.

Systems thinking is a philosophy currently prevalent within construction safety literature that is applied to understand and improve performance and safety in sociotechnical systems. The literature reports a number of theoretical and empirical studies promoting application of systems thinking concepts on construction safety management systems and processes (Mohamed & Chinda, 2011).

Among systems, project organizational systems is of particular interest to this paper. Internal relations within this system, are strongly influenced by the kind of social relations that take place in the surrounding social environment. In terms of organizing for project safety, the dynamics and complexity imply that workers continuously experience change in the form of adaptations in response to short-term productivity and cost objectives. In these situations, it is possible that safety defenses degenerate as a result of the production pressures and changes. To keep the construction operation system within the safe limit, and maintain system adaptation, human inputs are essential as it is through humans that recognition, communication, socialization, and improvisation of unexpected events, changes, and disruptions that system safety is achieved (Mitropoulos & Memarian, 2012). In this sense, human operators (site workers and supervisors) and their interactions are the catalysts in managing project safety.

2.1 Feeling Safe at Work

Learning from incidents is a fundamental approach in accident prevention. Too often, we fail to learn from the past and make inadequate changes in response to losses (Leveson, 2011b). One of the reasons an organization may not learn from a safety loss is that, in many cases, it is an exercise in diligence by paperwork rather than taking personal responsibility or duty of care. There are reported cases (e.g., Hopkins, 2009) where in the event of an accident the organization is quick to attribute blame to the frontline supervisor who had not completed the correct paperwork. This approach is likely to obviate the organization's legal responsibility while doing relatively little to create a safer world view for their workers. From a systems perspective this creates an emphasis where the locus of control and responsibility for safety is passed to forms and processes.

Kahn (1990) and May et al., (2004) suggest trust and fairness along with other antecedents help promote a sense of psychological safety (feeling safe) at work. In many organizations, supervisors are charged with the responsibility of minimizing safety. However, this is largely achieved by requiring frontline workers to participate in a system that is considered technically safe. Thus, the hardware often employed creates an engineered environment considered to be as safe as world's best practice allows.

In many organizational realities, even though the right 'boxes' are ticked accidents still occur and employees are likely to feel that their personal safety is less than optimal. This paper aims to explore, from the perception of the actors in the system their world view of about the factors that impact their perceptions of safety at work. This is articulated in the following research question (RQ):

RQ1: What factors contribute to an AAPI worker feeling safe in their workplace?

In this paper we also explore the relationship between feeling safe at work and feeling bored at work. Boredom at work appears to be a fairly common phenomenon and is linked to many negative outcomes for individuals and organizations (Whiteoak, 2014). Boredom at work is impacted by an individual's perception of the challenge and interest they find in their work. Boredom at work can occur due to an inadequately stimulating environment because of a lack of work to perform (Berlyne, 1960; Kass et al., 2001), when one's skills exceed one's immediate challenges (Czikszentmihalyi, 1975) or when tasks are overly challenging for the individuals leading to withdrawal behavior (Fisher, 1993). This literature is arguably under-researched and requires more exploration (Game, 2007; Skowronski, 2012).

Research has demonstrated that work-related boredom relates to a many negative workplace outcomes including counterproductive work behavior, engaging in unsafe work practices and causes work injuries (Bruursema, et al., 2011; Frone, 1998; Runcie, 1980). In extreme cases bored individuals may simply fall asleep on-task (Grose, 1989). On the other hand, Game (2007) reported those better able to cope with boredom showed high compliance to organizational safety rules. While there is evidence to link between boredom and safety behavior, there is a relatively limited understanding of how boredom may be related to a worker's perception of feeling safe at work. In this paper the potential link between boredom at work and feeling safe is explored, leading to the following RQ:

RQ2: Is there a relationship between boredom in the workplace and feeling safe?

It is argued that boredom is the polar opposite of engagement (Warr and Inceoglu, 2012; Whiteoak, 2014). This is based on the definition that engaged workers are fully involved in and enthusiastic about their work (May et al., 2004; Bakker & Bal, 2010) and that boredom is at the polar opposite of enthusiasm on the affective circumplex (Remington, et al., 2000; Russell, 1980). Thus, employees who are able to better cope with boredom are likely to have higher levels of employee engagement (Whiteoak, 2014).

The related literature also provides evidence of a link between employee engagement and workplace safety outcomes. For example, a meta-analysis undertaken by Harter et al. (2009) found that the top 25 per cent of business units (in terms of engagement) have 49 per cent less safety incidents than the bottom 25 per cent. Employees that describe themselves as engaged are more likely to be highly involved and absorbed in their work (Saks, 2006). If an employee is not engaged, they are less focused

on their work and more likely to make mistakes. This has significant implications for industries in which safety is an important factor and provides the theoretical link between safety and engagement at work.

According to Kahn (1992) sustained effort for psychological presence (i.e., being engaged at work) can be draining at a personal level and depending on other demands an individual may not always be possible to sustain this level of effort. If it is the case that maintaining levels of safety awareness is like maintaining levels of psychological presence, then an individual is likely to become depleted through that sustained effort. This has the potential to undermine a sense of personal safety at work. With this in mind, it is possible that small improvements in perceptions about safety may also bring about significant improvements in worker engagement. Feeling unsafe is likely to create a sense of disengagement whereas a small change in the sense of feeling safe may bring about a notable change in employee engagement, hence the third and final research question:

RQ3: Does feeling-safe contribute significantly to predictors for a sense of engagement in work?

3.0. Methodology

This research was conducted in the Australian Asphalt and Pavement Industry (AAPI). AAPI is responsible for managing billions of dollars of infrastructure across the country and everyday almost everyone in Australia uses their products. A key focus for leaders of this industry is to continually look at ways to reduce the number of deaths and injuries occurring across their workforce. The research was to support strategies to impact accidents occurring in the industry. The research approach involved two

phases. In phase one a series of focus group interviews were conducted. Phase two involved an industry wide survey that was based on the results of the qualitative investigation.

3.1. The qualitative research

The qualitative investigation was the first phase and involved participants were 27 frontline supervisors from five different organizations in the AAPI. The participants attended one of six focus groups sessions. The participants included 25 (all male) frontline supervisors and two frontline safety officers (1 female). Table 1 presents the relevant demographic information received from the participants.

	Average (years)	**SD (years)**
Age	38.2	8.4
Industry Experience	15.7	8.1
Supervisory Experience	6.0	5.9
Direct Reports	12	11.7

Table 1: Participant demographics

The focus groups lasted between 60 and 90 minutes and involved up to nine attendees. All of the participants in the focus groups were on duty that day and were either just finishing or beginning a shift. All sessions had supervisors from at least two different organizations present The audio of each session was recorded and transcribed.

The process started with explaining the purpose of the focus groups (to understand causes of accident). This was followed by introductions. It was explained to the supervisors that the sessions were confidential and that 'Chatham House' rules were applied. This concept was clarified with the supervisors. They were told that it was expected comments made by other participants would be respected and not be discussed following the focus group. Each supervisor was asked to indicate they were comfortable with this and all verbalized their agreement.

At this stage of the research, a force-field methodology was employed to draw out the views of the supervisors. Using the whiteboard a 'football' field showing two try lines was drawn. The try lines were labelled 'home-safe' at one end and 'accidents' at the other. The participants were provided with white board pens and magnetic shapes (triangles for causes of an accident and squares for reasons they get home safe). They were asked to write, in one or two words, factors that they believed were responsible for the cause of accidents on the magnetic triangles. They were then asked to do the same on the square magnetic shapes but these responses should relate to things that helped them to get home safe.

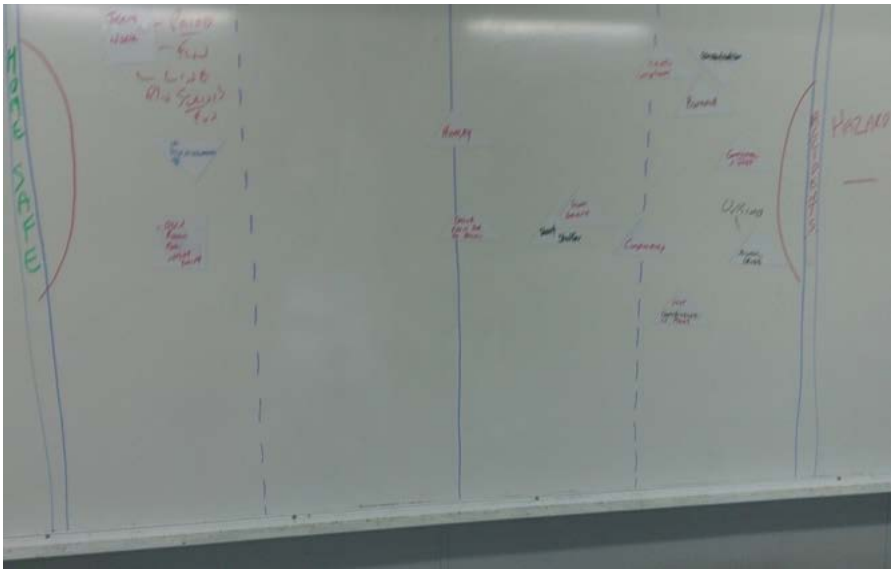

Figure 2: Example of a Force-field focus group activity.

The process then involved each participant placing a magnetic strip on the 'force-field', explaining it to the other participants and checking for understanding and agreement. The process identified two general areas of risks when it came to causes of accidents. It appeared there were 'outside' and 'inside' factors. Outside factors were things that occurred 'outside' but close to the job site. For example, outside themes included concerns over the number of cars passing their work site and how close the worksite was to the passing traffic. Other outside themes impacting how safe they felt at work emerged that included having a police car at the job site and an ability to create detours and shut down lanes where necessary. The participants also identified the effective delivery of toolbox meetings, the weather, interruptions when conducting their work, receiving poor instructions, and unexpected changes to the overall plan as factors impacting their sense of feeling safe at work. It was also suggested that chopping and changing too often between days and night shifts can be an issue that impacts the likelihood of having an accident.

A number of recurring 'internal' themes were also described during the focus groups that were highly consistent. Internal themes were related more to issues that were more directly related to the workers themselves. For example, fatigue appeared as an explicit theme in the data. All of the participants agreed that being 'tired' and 'fatigued' or a 'lack of sleep' created a situation where they 'were not thinking straight' as being at the root cause of many accidents. Not concentrating was also considered an important factor and was identified in each focus group as a key cause of accidents. The supervisors consistently identified simply 'not paying attention' was a common issue in the cause of accidents.

Accidents being caused due to workers rushing were also identified as an important variable in every focus group session. The participants suggested that having ‘too many tasks’, ‘not enough staff’ and ‘pressure to finish a job on time’ led to ‘rushing’, ‘distractions’ and subsequently mistakes that caused accidents. They indicated this was amplified when working at night.

Inexperienced and poorly trained crew members whom they described as not competent were considered a safety hazard on many job sites. It was a common perception that ‘new operators’ in general lacked the ‘training’ and ‘knowledge’ needed to perform safely. The supervisors also commented on the influential nature of their workers outside personal problems (i.e., trouble at home) on safety on the work site. Many comments reinforced the theme that when workers were having personal problems at home it would lead to them become preoccupied and thus more likely to be an injury risk not only to themselves but to others on the worksite as well.

In addition, their feelings about the morale of their crew was a consistent and important issue impacting safety. There was consensus among all of the participants of the key role that the attitude of the crew plays in them getting home safe. The supervisors all agreed that the crew and its morale was, in their view, one of the most potent forces on the field. Another key theme that emerged from these qualitative data included that being bored and just ‘doing what we have always done’ were all reasons linked to the cause of accidents and frontline workers not feeling safe.

The next stage of the qualitative research was to explore the alignment with constructs that had been previously articulated by Whiteoak (2014) as useful in predicting boredom-coping in the mining industry. In this stage, when the emerging themes showed alignment with constructs overlapping with

the worldview of participants from the mining industry data a quasi-convergent interview process was utilised to help focus and consolidate these themes. In each case, there was a high-level of resonance when participants were given the opportunity to reflect on the description of the variables known to predict boredom-coping, were described.

The results of the qualitative investigation allowed the researchers to understand safety from the perceptions of the frontline supervisors and to confirm the inclusion of variables used in a previously validated model of boredom-coping. In the next section, the resulting measures used to explore the research questions are explained.

3.2. The survey research

The industry wide survey was completed by 207 frontline workers from six organizations in the AAPI. The survey was administered on-site and the respondents were exclusively male. There was no age related data collected by the researchers. Respondents indicated that their industry experience ranged from less than six months to more than 15 years. Eighteen per cent of the sample had less than three years industry experience, 35.6 pre cent had between three and six years' experience, 22 per cent had between more than six but less than 10 years' experience and 22 per cent indicated more than 15 years in the industry. Each industry partner provided a contact person (usually the Safety Officer) to facilitate the execution of the survey. Thirteen per cent of the respondents indicated that had experienced a notable accident at work in the previous 12 months.

3.2.1. Measures

Based on the feedback from the participants in the focus groups, 15 questions were developed that captured the safety concerns of the frontline workers. Of the items identified, six aligned with the structure suggested in the focus groups as outside the worksite, the remaining nine were consistent with themes describing elements occurring inside the worksite. Appendix A presents the questions developed for the survey that were articulated by the participants in the qualitative research.

Feeling safe

Using reliability analysis a composite scale was developed to measure feeling safe. The feeling safe measure was derived from looking at the 'internal' factors described by the participants as impacting their personal safety. Four items were included in the final construct about feeling safe, these were inexperienced use of equipment, traffic controllers, feeling tired, and new casual staff. The composite scale was found to have a Cronbach's Alpha of .71. A Principal Component Analysis (PCA) confirmed the items in the scale were unidimensional.

Boredom at work

Boredom at work was measured by asking participants if 'generally my job is boring'. A one item measure was used in this study in favour of composite measure because pilot measures from research previously conducted in the mining industry suggested that asking one direct question about boredom could yield as high a result as a composite of three questions and one-item has the value of efficiency.

Consistent with the related literature on safety, and many of the comments received in the focus group interviews, we included the Glendon and Litherland (2001) Safety Climate Questionnaire (SCQ)

in the survey. The SCQ is found to encompass an array of generic socio-organizational factors related to safety, and hence, argued to be relevant to most work environments and industries. The SCQ is comprised of six factors: communication and support, adequacy of procedures, work pressure, personal protective equipment, relationships, and safety rules. Many if trhe factors were explicitly described by the frontline supervisors.

Glendon and Litherland (2001) suggest these factors are 'universal' markers of safety conditions, arguing that the introduction of more definitive dimensions (i.e., management commitment) may potentially limit the generalizability of the survey. In the analysis, all 15 items were subject to a PCA and results identified one dimension. In the interest of parsimony the best four items were selected with the highest communalities and these generated a composite scale with a Cronbach's Alpha of .87. The items included in the composite are presented in Appendix A. This provided a proxy measure of the safety climate.

In order to assess the independence of the two (external and internal) safety measures a Principal Axis Analysis (PAA) was performed on the nine variables contributing to both the safety climate and feeling safe constructs. Two factors were extracted with eigenvalues greater than one. The percentage of variance accounted for was 52.44. Factor 1 has the variables from the safety climate measure accounting for 28.56 per cent of the variance. Examination of the measures loading on this factor lead to the application of the label 'Explicit Safety'. Factor 2 included the variables identified from the qualitative study accounting for 23.88 per cent of the variance. Examination of the variables loading on this factor support the label 'Tacit Safety' (feeling safe). The two factors were subsequently entered as independent variables in assessing their contribution to engagement in the workplace (RQ3).

Items found to be successful in previous research promoting an individual's mastery over monotony in the workplace and to have resonated with the focus group participants as being linked to boredom and safety at work were also included in the survey and are operationalised below:

Foresight

Endsley and Garland (2000) suggest that foresight involves assessing possible consequences, anticipating problems before they occur, and considering the present implications of possible future events. The scale items were: I see myself as someone who 'has the capacity to think ahead and visualize future outcomes on the job', and who 'has the capacity to assess the consequences of my actions at work' showed a reliability of an acceptable level ($\alpha = .72$).

Practical intelligence

Three items relating to practical intelligence were included in the questionnaire. These items adapted from Sternberg and Hedlund (2002) were prefaced with 'I see myself as someone who', and were 'uses my knowledge and experience to come up with new ideas for how to do things better on my worksite', 'uses my knowledge and experience to predict what might happen on the job in particular circumstances', and 'is able to use my knowledge and experience to adapt to changing conditions on the job'. This scale displayed acceptable reliability ($\alpha = .66$).

Situational awareness

Situational awareness is claimed to be necessary for people to perform tasks effectively (Endsley & Garland, 2000). To measure situational awareness, scale items were adapted and were, I see myself

as someone who, ‘is always aware of what is happening around me’ ‘likes to keep track of important factors and conditions in my work environment’, and ‘makes decisions based upon what is going on around me on the worksite’. The reliability for this scale was respectable (α = .71).

Group potency

The Guzzo et al. (1993) group potency scale was adapted for this research. It was used to assess elements of pod-synergy described by the participants. Seven items from the original scale were adapted for the current research. This adapted seven-point scale contained items including ‘My crew mate and I have confidence in our work ability’. Cronbach’s Alpha coefficient for the scale was .72.

Conscientiousness

Conscientiousness (α = .77) was assessed using subscales of the abridged and adapted Big Five Inventory (John and Srivastava, 1999).

Employee Engagement

The dependent variable that was used to understand engagement was based on the perceptions of the participants. Respondent’s comments described more engaged workers as those who were able to find challenge and interest in their work. They suggested that engaged workers tended to be more energetic, enthusiastic, and “got a sense of fulfilment” through the achievement of just doing the work. This led to the following questions being included to measure engagement, “The work I do in my job is interesting”, “The work I do in my job is challenging”, “I experience a sense of fulfilment from working”, “Generally, my job is boring (reverse scored)”. When these items are framed as items in the

engagement questionnaire they generated a Cronbach's Alpha of .70, suggesting a good level of reliability.

4.0. Results

To assess RQ1, factors contributing to an AAPI worker feeling safe in their workplace, a Multiple Regression Analysis (MRA) was utilised to assess the contribution of the external measures separately against the dependent variable (feeling safe). Of the six themes identified by supervisors as external a linear composite can be formed to explain 33.8 per cent of the variance in feeling safe (r = .60). Toolboxes and interruptions did not feature in the model. The significant contributors were, irregular shift changes, bad weather, last minute changes to the plan, and poor instructions. The equation of prediction for the external contributors is:

Feeling safe = .19 x irregularly shift changes + .17 x bad weather + .11 x last minute changes to the plan + .06 x poor instructions + 1.97.

A hierarchal multiple regression was utilised to assess the contribution of the internal measures against the dependent variable (feeling safe). Of the five themes identified by supervisors as internal, a linear composite can be formed to explain 46.2 per cent of the variance in feeling safe (r = .69). Rushing and distractions did not feature in the model. At step 1, other job site workers being fatigued, other worker's outside personal issues were found to be significant predictors of Feeling safe, R = .67, adjR2 = .43, $F(4,201) = 39.92$, $p < .05$. At step 2, the addition of a lack of morale in my crew as a predictor with other job site workers being fatigued, other worker's outside personal issues resulted in a significant improvement in prediction, R = .69, adjR2 = .46, R2change = .03, $F(5,200) = 36.21$, $p < .05$.

Feeling safe = .44 x other job site workers being fatigued + .14 x a lack of morale in my crew + .10 x other worker's outside personal issues + 1.30.

In addressing RQ2, a significant positive correlation was found between boredom at work and feeling safe, $r = .36$, $p < .05$.

To assess RQ3, a hierarchal linear regression found that a composite could be formed that makes a significant contribution towards explaining a sense of engagement in the workplace. A multiple correlation coefficient (r=.63) was found. 38 per cent of the variance in the dependent variable was explained by the linear composite $F(6,197) = 22.12$.

At step 1, Situational Awareness, Explicit Safety, Tacit Safety, and Conscientiousness were found to be significant predictors of Engagement, R = .59, adjR2 = .34, $F(4,199) = 27.03$, $p < .05$. At step 2, the addition of Foresight as a predictor with Situational Awareness, Explicit Safety, Tacit Safety and Conscientiousness resulted in a significant improvement in prediction, R = .62, adjR2 = .37, R2change = .04, $F(5,198) = 25.10$, $p < .05$. At step 3, the addition of Group Potency was entered into the model with Situational Awareness, Explicit Safety, Tacit Safety, Conscientiousness and Foresight which also resulted in a significant improvement in prediction, R = .63, R2 = .38, R2change = .02, $F(6,197) = 22.12$, $p < .05$.

Engagement = .34 x Foresight + .20 x Group Potency + .19 x Explicit Safety + (- .13 x Feeling Safe) + .12 x Conscientiousness + (-.04 x Situational Awareness) + 1.20.

5.0. Discussion

This research set out to understand factors that impact worker perceptions of feeling safe at work. The paper also explored the link between a workers perception of feeling safe and boredom at work. Finally, the paper explored the link between feeling safe and employee engagement.

The findings of the research identified 15 themes that supervisors described in focus group interviews that are related to their perceptions of feeling safe at work. Subsequent survey research identified the potential application of these concepts. Organizations and managers can now apply these results to the workplace by paying more attention to these factors. It is suggested by the findings that supervisors who can articulate and respond to these themes will have the capacity to influence the sense of safety experienced by frontline workers. The findings also suggest that this has the potential to subsequently improve levels of employee engagement and bring other important benefits to the workplace. This is outlined in more detail below.

The study also shows that four key themes of the external environment impact a frontline worker experiences of safety on a daily basis. The significant contributors were irregular shift changes, bad weather, last minute changes to the plan, and poor instructions. Each of these areas now provide the potential to provide strategic interventions to ensure that workers perceive these areas positively. Further, key themes emerging from the analysis of internal constructs contributed to improving worker perceptions of feeling safe. Fatigue among workers and other workers outside personal issues were also found to be significant.

The predominance of group potency in this research and in previous research just highlights how significant a variable group potency is in the workplace. The implications of this for managers is quite profound because things can be done about the members of a crew on a daily basis. In other words, if a crew has low synergy it should be examined and remedial action taken to improve the synergy of the crew immediately. Unlike more enduring characteristics such as conscientiousness where changes are unlikely to be affected within a short time frame.

Upon examination of the contributors to a sense of feeling safe in the workplace management can pursue, along with the rearranging of crews, elements that create a safety climate in the organization knowing that these will have an impact on workers sense of psychological safety or feeling safe.

The results suggest important elements of organizational operations that contributes to a worker's perception of feeling safe. The findings indicate that when managers demonstrate a genuine concern for safety and employees are openly able to discuss safety problems with their supervisors and managers this will be likely to boost perceptions of feeling safe. Furthermore, creating an environment where managers show a good understanding of the operational issues that impact on safety will also impact positively on a sense of feeling safe (Flin & Yule, 2004; Glendon et al., 2006; Choudhry et al., 2007). More simply, managers and supervisors need to 'walk the safety talk' when visiting job sites. Management can demonstrate their genuine interest in safety issues by showing understanding of those key components that contribute most to a sense of tacit safety among workers. For example, the results indicate making sure that inexperienced use of equipment does not go unnoticed will be supportive of this outcome.

Furthermore, when this does come to the attention of a supervisor or manager, part of walking the talk is to point out immediately how the misuse of the equipment is unsafe and to demonstrate the proper safe use of that equipment (Darrah, 1995; Akson & Hadikusumo, 2008). These findings also suggest that this seems to be highlighted by the introduction of new casual staff in the workplace with insufficient awareness to conduct themselves in a way that engenders a feeling of safety among the existing members of the crew. The role of the traffic controller featured in this study. When managers or supervisors seem unaware of circumstances where traffic controllers, particularly inexperienced traffic controllers are creating hazards or are insensitive to hazards the potential for this to undermine a sense of safety in the workplace should not be underestimated.

Any workers through circumstances beyond their control can become depleted, through concentration, through striving, through exertion. The language of the workplace should be crafted to flush out the hazardous nature of working when fatigued. The relevant literature has identified that working fatigued is similar to working under the influence of alcohol (Williamson & Feyer, 2000; Williamson et al., 2001; Lamond & Dawson, 2002). There are obvious indicators that a person may be intoxicated on a worksite. There are also obvious indicators that people are fatigued (Ahsberg, 1998; Sukwon et al., 2009; Hallowell, 2010). Supervisors and managers need to be aware of the indicators of fatigue and not let it go unnoticed. A manager or supervisor who happens to be in a positon to point out to a crew member that their fatigue is likely to endanger themselves as well as their crew members is not only going to communicate the folly of working in a fatigued state but will also communicate to the other members of the crew that there are genuinely regard for safety as part of the operations (Van Yperen & Hagedoom, 2003; Slatten et al., 2011).

Managers do not need to wait for a safety incident or a lost-time-incident in order to seize the opportunity for a quality upgrade in worker engagement. Simply by being aware of, sensitive to, and responsive to, any of the antecedents of explicit or tacit safety is going to have a positive impact on worker engagement and potentially productivity.

Using the constructs of explicit and tacit safety along with the antecedents of boredom-coping, the outcome of this process is the development of a linear composite that assesses the contribution of safety to a workers sense of engagement. As identified in previous literature, foresight plays a significant part as well as group potency, however explicit safety and tacit safety also make significant contributions. This means that when assessing an individual's sense of engagement in the workplace, the psychological feeling of safety from both the explicit and tacit perspectives need to be considered.

This perspective on feeling safe is essentially explained by themes associated with the workplace that are largely taking place outside of the psyche of the individual. The other factors however, foresight, group potency, conscientious, and situational awareness are all characterises of the mindset of the individual at the time.

Boredom, and some of the factors found to predict boredom-coping in previous research were found to be significantly related to feeling safe in the workplace and subsequently employee engagement. This suggests that closer scrutiny should be paid to the identified predictors of boredom-coping, both from the perspective of improving safety but also to amplify employee engagement. One example, is the role of situational awareness (SA) in the equation. Of the elements impacting engagement and safety, SA may be most influenced by training individuals in the qualities that contribute to a high level of SA. This is a strategy used by the US military in such a way that situational

awareness has been broken down in a series of complete parts each of which is subject to rigorous training interventions (Matthews & Beal, 2002; Eid et al., 2005). Strategic interventions created to support the development of heightened SA in their workers, in this industry as well as the construction industry more widely, would be likely to bring about fruitful returns in areas of important safety, engagement and productivity measures.

The predominance of group potency in this research and in previous research just highlights how significant a variable group potency is in the workplace. The implications of this for managers is quite profound because things can be done about the members of a crew on a daily basis. In other words if a crew has low synergy it should be examined and remedial action taken to improve the synergy of the crew immediately (Whiteoak, 2014). If management wants to be seen as sensitive to issues that are going to have significant impact on safety in the workplace careful attention to dysfunctional pods or crews where synergy is lacking is going to be important.

Finally, the findings indicate that relatively small improvements in worker perceptions of safety can bring about significant improvements in employee engagement and productivity. This is an important contribution as Substituting a worker's world view from one where they feel that supervisors just 'tick boxes' to a world view where supervisors actually 'walk the safety talk' can bring about a significant increase a sense of feeling safe. Based on the above logic, this should boost engagement which in turn boosts productivity. As Elton Mayo discovered in the classic Hawthorne studies, a small environmental change impacted productivity significantly. Thus, it may also be that just a small change in the sense of feeling safe may bring about a notable change in productivity in the workplace. This is an area for future research to explore.

6.0. Conclusion

This paper involved a mixed-methods approach that has provided insights into factors that impact a construction worker (in this case working in the asphalt industry) feeling safe at work. Feeling safe is a psychological condition that appears to be linked to engagement and the likelihood of being involved in an accident. Accidents can occur within the best systems and to the most engaged people. However, this research supports the view that changing perceptions of workers safety around feeling safe may provide the opportunity for a quality upgrade in the area of engagement.

The paper also highlights the drivers of boredom coping and their link to engagement. Other useful additions for safety in the construction industry are the related literature provided by this research is the articulation of language to support the management of safety and engagement. The concepts of explicit safety (management walking the safety talk) and tacit safety (workers feeling safe) have been established in this paper.

In conclusion the results of this research support the role of the supervisor and the organization in responding to safety breaches as a quality upgrade opportunity. The successful supervisor in this work environment will ‘walk-the safety-talk’ and respond to elements associated with crew-members being bored and other predictors and components of feeling safe.

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Appendix A: Safety Questions

Outside Elements

Downtime due to bad weather increases risks to my personal safety?

Toolbox meetings are beneficial in promoting safety?

During a regular shift how many times do interruptions to the work flow generally occur?

Poor instructions puts my personal safety at risk?

Last minute changes to the plan puts my personal safety at risk?

Chopping and changing too often between days and nights makes nightshift more of an issue for my personal safety?

Inside Elements

Inexperienced use of equipment puts my personal safety at risk?*

Traffic controllers put my personal safety at risk?*

Feeling tired puts my personal safety at risk?*

New casual staff put my personal safety at risk?*

A lack of morale in my crew is currently impacting my feeling of personal safety at work?

Other job site workers being fatigued puts my personal safety at risk?

Approximately how many times in the last 5 work days do you think that people's outside personal issues (e.g., problems at home) have been a safety-risk on the job-site?

During a regular shift how many times do distractions put your personal safety at risk?

During a regular shift how many times did rushing put your personal safety at risk?

Explicit Safety (adapted from Glendon & Litherland 2001)

Management regard safety as an important part of operations?

Management are genuinely interested in safety issues?

Employees are able to openly discuss safety problems with supervisors and managers?

Management has a good understanding of operational issues that impact upon safety?

*used to construct the composite of Tacit Safety.