

The relationship between occupational risk and labour relations in a tyre manufacturing company

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Dissertation submitted in fulfilment of the requirements for the degree
Magister Commercii in [Labour Relations Management](#) at the Potchefstroom
Campus of the North-West University

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May 2014

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Acknowledgement and Thanks

Herewith I wish to take this opportunity to thank management of the manufacturing company where this study was conducted. Thank you for your approval and support that made this study possible. Furthermore, I wish to thank the North-West University for their friendly service and assistance throughout the course of this distance-/part time study. It was truly a pleasant experience without any obstacles or concerns. I would like to thank the NWU Statistical Consultation Services for their guidance and utmost professionalism. Special thanks go to the School of Human Resources and in particular to Professor Jan Visagie for believing in me and for making me a better researcher than I ever thought possible. Last, but not least, I wish to take this opportunity to thank my family for supporting me and especially my husband for his devotion and love that made this study so much easier to complete.

Goal Statement

The purpose of this study was to investigate the “**working-interface concept**” to determine whether a high risk work environment can influence general labour relations between employees and the employer. “Occupational Risk” was examined for this purpose to determine how an unfit workplace can influence employee productivity and work performance, as part of the employee’s right to a safe -, healthy -, and workable workplace. The relationship between man, machine and environment was investigated to understand how manufacturing and material handling; ergonomics and human resource management interlink.

Keywords: working interface; risks, hazards; ergonomics; performance; incapacity; labour relations; safe behaviour; misconduct; negligence; leadership and culture.

CAPTER 1: INTRODUCTION

PROBLEM

INTRODUCTION

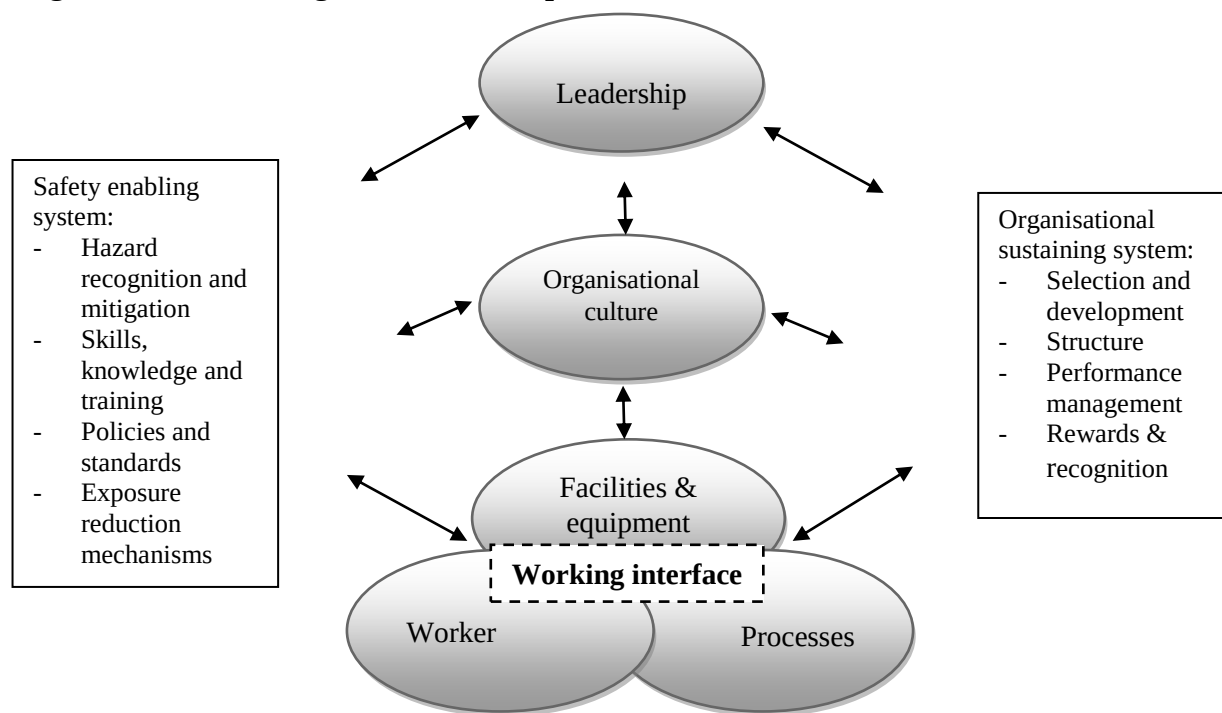
Occupational risk is undeniably one of the most fundamental truths in any organisation, especially in the manufacturing industry. It has been found that manufacturing is the only private industry sector that experienced an increase in incident rates of workplace injuries and illnesses over the last few years (Anon., 2012). In a study conducted regarding new developments in occupational safety and health it was found that more than 55 000 workers are killed each year as a result of occupational accidents or occupational diseases, another 60 000 workers are permanently disabled and nearly 7 million workers are injured on the job (Pao & Kleiner, 2001). Strydom (2009) confirms that unsafe working conditions have been a direct cause that has led to many deaths and injuries in the past three years. According to a health and safety bulletin, 3.3 million non-fatal workplace injuries and illnesses were reported in 2009 and an estimated 3.1 million incidents were reported in 2010 (Anon., 2012). According to the report, injuries accounted for 2.9 million (94.9%) of the reported incidents, while 1.1 million incidents were illnesses (Anon., 2012).

It is accepted that the responsibility lies with the employer to create safe and healthy working conditions, as far as reasonable practicable (OHSA 83 of 1993, Section 12). The intention is to maintain tolerable working conditions to prevent or reduce incidents and injuries from occurring. In relation with the employer's role and responsibilities, the Occupational Health and Safety Act (85 of 1993) further stipulate very clearly that the employee also has the responsibility and duty to engage in safe work behaviour (Section 13-14). Subsequently to this, accident investigations have focused for many years on an 'either-or' methodology, asking only whether the accident resulted from an unsafe act or unsafe condition. This approach further sets up a two-way choice of causes of accidents, between either an action by the last person involved (human error), or seemingly static facility conditions (unsafe environment) (Strydom, 2009). Undoubtedly, conflict may arise from this key feature within the relationship between the employer and employee as a result of the divergent interests between the parties (Venter, 2007). This is largely due to differing expectations of the various roles played within the labour relationship (Venter, 2007).

Traditionally, it is accepted that 85% to 95% of accidents are caused by unsafe acts, rather than unsafe conditions, and many employers' uses this as a tool to hastily conclude incident investigations. However, this study demonstrated that accident causes are not limited only to

worker behaviour and / or facilities. A combination of contributing factors could be identified by applying the ‘working interface’ concept (Strydom, 2009) and finally forms the platform for this study. According to the Leading with Safety ® system, the working interface is the configuration of equipment, facilities, systems, and behaviours that defines the interaction of the worker with technology (Behavioral Science Technology, Inc., 2010). It is further explained that this configuration is where hazards exist and safety excellence is directly related to how effective the organisation is at controlling exposures (Figure 1):

Figure 1: The working-interface concept



(Behavioral Science Technology, Inc., 2010)

Figure 1 above illustrates the working interface concept as the place where behaviours and organisational conditions, systems and processes comes together (Strydom, 2009). This is also where accidents usually occur, in that loss incidents only occur when an employee interacts with the condition in an unsafe way, where unsafe conditions exist (Strydom, 2009). Therefore, it can be accepted that human behaviour plays a significant role in the working interface concept and can subsequently increase the risk levels of the organisation (as mentioned above). Therefore, it is alleged that the human factor, in relation to a high risk and demanding work environment, as illustrated in the working interface concept above, may consequently have an effect on the labour

relationship. This theory was considered throughout this study, as well as the importance of Labour Relations – and Human Resource Management as part of controlling risks in an organisation, and will be described in more detail further on (literature review).

BACKGROUND

The question asked throughout this study was ‘*why*’? Why do accidents and incidents still occur after many systems have been put in place to manage occupational risks within the workplace? The safety mission statement of the manufacturing company, where this study was conducted, clearly states that ‘safety takes precedence over all matters’. It is relatively accepted and understood by all parties of the organisation that ‘safety is first, always’ (Chapter 3, Results discussion, Table 6, General perception of safety at work). However, the company suffered 124 minor injuries (first aid) and nine major (non-disabling and disabling) injuries in 2012 alone (Chapter 2, Statistical analyses, Table 1 Accumulative statistics for the year 2012). The international group of the same manufacturing company suffered 33 fatalities (global report) during the same year. With this in mind, the organisation followed an investigation to identify the root causes of all accidents and incidents within the global group and found that most of the incidents took place based on four fundamental safety activities. The four activities included: proper housekeeping procedures (Design, layout and housekeeping of the working environment – 3S), awareness in terms of hazard identification and removing hazards before starting a certain task (Kiken Yochi – KY), risk assessment and awareness in terms of risk reduction (Risk assessment – RA), and finally compliance with rules, regulations and standards (Safety rules).

These four fundamental activities were considered throughout this study and the results indicated that these activities carry a great deal of weight in the working interface concept and form a significant part of the prevention (and prediction) of accidents and incidents. It addresses not only the physical work environment and the design of equipment and technology and the systems of the organisation, including engineering and ergonomics, policies and procedures, standards and codes, but also considers human error and behaviour. It is argued that the working interface, where all of these factors come together, can further influence the trust relationship between the employer and the employees. Effective management, in terms of its contribution to create a safe-, healthy- and legally compliant environment with regards to occupational risks in the organisation was further considered. It was found that human resources form a great part of the working

interface concept and cannot be excluded from the industrial element. Therefore, as explained above, the management of the human resource factor will ultimately sustain the working interface concept. The concept of how an unfit workplace can influence employee productivity and work performance was investigated to fully understand how manufacturing, occupational risk and human resource management interlink.

PROBLEM STATEMENT

Therefore, the problem derived from the above discussion can finally be formulated that “the interaction between man, machine and the environment, better described as ergonomics or human engineering, will have an effect on human behaviour, employee wellbeing and desired capacity to perform a certain task, consequently influencing the labour relationship between employees and the employer, specifically in a high risk manufacturing industry.” The working interface concept/theory was investigated to determine whether a positive approach towards occupational risk management and risk assessment, including leadership, organisational structure, -climate, and -culture, can improve safety, workers’ morale and ultimately influence the industrial relationship (Figure 1).

RISK ASSESSMENT THEORIES AND PRACTICE

This study is based on risk assessment theories, in correlation with the working interface concept. Risk assessment theories relate to the working interface concept in that it reflects the procedure for examining physical, environmental and procedural interconnections between systems and their components (Bell, 1989). Although there is little agreement over a definition of ‘risk’, the notion of probability that injury or damage will occur (Guild, Ehrlich, Johnston, & Ross, 2001) is central to numerous risk assessment techniques and concepts identified in literature (White, 1995). Probability can be viewed from two perspectives – whether it is viewed objectively or subjectively (White, 1995).

According to Covello and Merkhofer (1993), the objective classical approach sees risks as a measurable property of the physical world. Therefore, a risk assessment carried out by an analyst who adopts the objective perspective will use methods based on the classical theory of probability and statistics. This view assumes probabilities to be real properties of real physical systems and require the value of variables to be drawn solely from available data (White, 1993). On the other hand, the subjective perspective sees risks as a product of perception (White, 1993). A risk

assessment carried from this perspective will adopt the Bayesian view of probability, that probability is a number expressing a state of knowledge or degree of belief that depends on the information, experience and theories of the individual who assigns it (Covello & Merkhofer, 1993, as cited by White, 1995). White (1995) outlined related concepts and theories to risk assessments, as summarised below (p. 40-43):

1.1. Route cause analysis

This method involves an investigative procedure using a total system approach to investigate causes of accidents. It further recognises that accidents are defects in the total system, that people are only part of the system, and assumes multiple causes for accidents (Senecal & Burke, 1993).

1.2. Cultural theory

Narrowing it down from total system defects, the cultural theory of risk values the notion of selection of risk. This theory suggests that risks are socially constructed in that individuals choose between risk-avoiding or risk-accepting strategies, which are guided by their culture and social context (Thompson, 1980).

1.3. Risk homeostasis theory

Relating to the notion of the selection of risk, the theory of risk homeostasis suggests that accidents are a result of behaviour that attempts to balance an accepted target level of risks against perceived risks; that is, if the level of subjective risk perceived is higher or lower than the level of risk desired, an individual will take action to eliminate this discrepancy (Wilde, 1981 as cited by White, 1995). This theory brought an important effect of bringing to the forefront the fact that behaviour is not necessarily a constant and that behaviour modification has important implications for safety (McKenna, 1985).

1.4. Risk compensation theory

Also drawing a parallel with the above, the risk compensation theory assumes that individual risk-taking decisions represent a balancing act in which perceptions of risk-taking are weighed against propensity to take risks (Adams, 1995). Risk compensation encourages risk to be viewed as an interactive phenomenon, one person's behaviour has consequences for others, it reinforces the view that people respond to risk from a subjective perspective (White, 1995).

1.5. Risks involved in the interactive phenomenon between man and machine

The interactive phenomenon, as explained in the above theories, is also supported by the ‘person-machine-environment’ system (ergonomics), which relates to the interaction between an individual and his/her work environment (Kroemer et al., 1994). Guild et al. (2001) confirm the man-machine interaction reality and explain that the characteristics of the workspace and the environment will affect the task performance of the human. According to Bowing and Harvey (2001), this interaction between an individual and the environment can be very stressful for a human being, which produces emotional strain affecting a person’s physical and mental condition. This interaction and the effects on individuals will be discussed in more detail below as an important backbone or reference towards the rest of the chapters to follow:

1.5.1. Ergonomics and lean-manufacturing

Ergonomics (or human engineering or human-centred design) simply refers to designing for human use (Sanders & McCormick, 1993). According to Scheel and Zimmermann (2009), ergonomics refers to designing the workplace to fit the worker and changing how we work, or the environment we work in, to prevent injuries. This is done by means of the application of scientific principles, methods, and data drawn from a variety of disciplines to the development of engineering systems in which people play a significant role (Kroemer, Kroemer, & Kroemer-Elbert, 1994). The ergonomic process includes the analysis of work routines to identify movement patterns that are awkward, repetitive and physically exertional (Heller, 2006). Ergonomics studies human capabilities, limitations and other characteristics for the purpose of developing human-system interface technology to design systems, organisations, jobs, machines, tools, and consumer products for safe, efficient, and comfortable human use, for example safe lifting techniques, proper posture, appropriate seating positions, and adaptive equipment (Guild et al., 2001, p. 317).

Therefore, ergonomic evaluations identify specific task factors that contribute to ergonomic risks, because these factors link to point-of-motion constraints that directly interfere with production and efficiencies (Smith, 2002). According to Heller (2006), one of the most important factors for businesses today is the ability to maintain a competitive advantage, and the essential need for businesses to run as effectively and efficiently as possible to eliminate wasteful operations that do not add value to their products and services. Walder, Karlin, and Kerk (2007) explain that by keeping people and ergonomics at the heart of the lean philosophy helps to ensure that the

company is not removing waste in the process by creating new wastes of overburden on the workers.

As explained above, ergonomics is not limited to organisational design, working conditions and facilities – it can also be accepted that ergonomics aspires to optimise the well-being and total system performance of human beings working in an environment. Ergonomics is “concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design, in order to optimise human well-being and overall system performance” (Guild, Ehrlich, Johnston, & Ross, 2001, p. 317). This reflects the origin of ergonomics as it was originally invented by a group of scientists and engineers interested in the relationship between people and machines. Ergonomics, as stated here, further correlates with the working interface concept as explained before: Both ergonomics and the working interface concept are focused on the fixed relationship between man, technology and the working environment. Therefore, it can be expected that the application of ergonomics in relation with humans will have a significant influence on the labour relationship, as was discussed earlier.

According to the National Research Council (1983), ‘optimal conditions’ would be an environment that is so well adapted to human characteristics, capabilities and desires that physical, social and mental well-being is achieved. Of course, the achievement of optimal conditions is used to maximise human performance and to optimise overall system performance, subsequently increasing profits (lean ergonomics). As explained above, employee wellbeing has become essential for the proficiency of businesses and the achievement of optimal working conditions. Companies are fielding requests for increasing flexibility and decreasing lead-time, while at the same time the global market place is forcing companies to find new ways to decrease costs while maintaining (or increasing) their levels of quality (Walder, Karlin, & Kerk, 2007). In response to these pressures, the employer wishes to improve production by increasing productivity rates, while the employee, on the other hand, wishes to work in a healthy, safe and less stressful environment. This may contribute to conflicting interests between the employer and employee, subsequently influencing the labour relationship, which will be discussed in more detail further on.

According to Newell (2002), high job demands and unpleasant working conditions as a result of internal and external pressures to perform can be very stressful for a person, both physically and psychologically. In reaction to work-related stress, the individual will attempt to cope with stress in the form of behavioural, physiological and psychological responses (Baron, 2001). Activities that employees may adopt in order to cope with stress may influence the healthy employment relationship. According to Heller (2006), a combination of lean manufacturing and ergonomics is the answer to assist in reducing wasteful activities and improving productivity, employee health, and profits. Roper and Yeh (2007) also believe that ergonomics is a significant factor in achieving and maintaining high levels of worker productivity. According to Smith (2002), the link between improved ergonomics and productivity gains becomes clear when a risk management process is followed. Smith (2002) states that risk management begins with the recognition of ergonomic issues, the hassles and barriers to productivity that are present in many manufacturing jobs. Smith (2002) explains that by eliminating these hassles, it will naturally lead to a more productive workplace and improved worker morale. This statement further envisages the connection between ergonomics and human resource management, which is controlled by healthy labour relations.

1.5.2. Human behaviour in a high risk work environment

According to Fourie (2009), the biggest challenge management is facing is not in working conditions, but rather in behaviour. According to Kruger and Van Wyngaard (2009), behaviours are never random, but are rather the result of a thought process. This thought process includes the calculation of potential effects by making use of an ‘if-then’ formula. The degree of desirability of outcomes determines the choice among the methods available for achieving the shortlisted outcomes. Behaviour or unsafe behaviour directly relates to the perception of one’s own ability, or self-concept, and is driven by one’s direct and immediate needs. A self-concept relies on the role of cognition, which represents “any knowledge, opinion, or belief about the environment, about oneself, or about one’s behaviour” (Festinger, 1957, p. 3). Among many different types of cognition, those involving anticipation, planning, goal-setting, evaluation, and setting personal standards are particularly relevant to organisational behaviour (Kreitner, & Kinicki, 2008). In addition to the working environment, other factors may also contribute to performance and behaviour, such as the organisational climate and culture, leadership and management of staff, expectations regarding behaviour and performance (Diagram 1). As explained above, differing expectations may create conflict and influence the labour relationship.

Kruger and Van Wyngaard (June, 2009) explain that attitudes determine what people tolerate, what they pay attention to and how much effort they apply to correcting at-risk behaviour. At-risk behaviour that is tolerated or anticipated is gradually perceived to carry no risk of loss and tends to become accepted with repetition. Soon it is not even noticed and becomes part of the industrial culture (Kruger, & Van Wyngaard, 2009, p. 8). It was concluded that attitudes about human error drive individual and peer group behaviour (Kruger and Van Wyngaard, 2009). Furthermore, it was explained that the greatest at-risk tolerance usually sets the standard for behaviour on a site. Consequently, incidents and accidents follow supervisors with large risk tolerance of at-risk behaviour (Kruger, & Van Wyngaard, 2009). Nair (2009) believes in a culture of non-tolerance for violations. He explains that in transforming from a transactional or punitive culture to a transformational culture, leaders are compelled not to overlook violations that invariably lead to serious incidents and injuries if left untreated.

Therefore, safety performance has its roots in organisational culture and is primarily a function of the quality and quantity of the leadership energy and effort expended (Nair, 2009). Rules and standards must be communicated, and management must explain its intent and purpose. Nair (2009) explains that violations must be treated swiftly and decisively through a process of disciplinary action to correct behaviour, and to eliminate similar undesired behaviour. Disciplinary corrective measures are sometimes viewed negatively, but when they are used consistently and applied constructively, labour relations management forms an important part in achieving desired behaviour and a safe work culture. According to Venter (2007), labour relations could be described as the dynamic complexities of the various relationships between parties to the employment relationship. This includes the relationship between workers and their work (working interface).

This study will remain in the manufacturing industry, as it is believed that this industry deems appropriate to examine the interaction between employees, the environment, and processes, as stated above.

This study is divided into two articles, which will be described in more detail below.

RESEARCH QUESTIONS

1.6. General

- Does an interactive relationship between occupational risk and employee behaviour exist and can it consequently influence the labour relationship between employee and employer?

1.7. Specific

- To what extent will the physical risk environment influence employee wellbeing? (Article 1)
- To what extent will the psychosocial risk environment influence employee behaviour and/or misbehaviour? (Article 2)
- What are the different factors involved in unsafe conditions and how do they relate to occupational risk? (Article 1)
- What are the different factors involved in unsafe practice and how do they relate to occupational risk? (Article 2)

RESEARCH OBJECTIVES

1.8. General objective

- To investigate the interactive relationship between occupational risk, employee behaviour, and consequently labour relations in the manufacturing industry.

1.9. Specific objectives

- To study ergonomics as the relationship between man, machine and environment as a dynamic occupational/physical workplace risk (Article 1).
- To study employee behaviour within the context of a psychosocial risk environment (Article 2).
- To investigate unsafe conditions and determine how they contribute to occupational risk (Article 1).
- To investigate unsafe practices and determine how they contribute to occupational risk (Article 2).

- To determine how labour relations should be managed in order to address incapacity due to ill health and injury (Article 1).
- To determine how labour relations should be managed in order to address misconduct based on unsafe practice (Article 2).

RESEARCH METHODOLOGY

The interaction between humans and technology always takes place in a certain workspace, which is located in a specific 1) physical- and 2) psychological environment (Guild et al., 2001). The first type of environment can be described in terms such as temperature, lighting, noise and vibration, as well as the presence and effect of chemical and biological agents, whereas the second type of environment is set in psychological terms, such as teamwork, management structure, shift conditions and psychosocial factors (Guild et al., 2001). This study has focused on the interactive relationship between employers and employees within the context of a high risk environment. A quantitative research approach was used in this study and no variables have been manipulated by the researcher. The research method consisted of a literature review and an empirical study.

1.10. Literature review

An in-depth (1) literature research approach focused on gathering information regarding previous research on occupational risk and the dynamics of an employer-employee relationship. Information was obtained from both national and international publications, such as textbooks, academics, including dissertations and theses, articles, journals, as well as scientific Internet references. Labour legislation and theories were used in support of this study. Occupational risk draws on various fields, such as ergonomics, human sciences and technology. These sciences that are integrated with occupational health and safety were also studied to gather relevant knowledge and to fully understand the man-machine system (person interacting with technology). Therefore, an in-depth literature evaluation was used as the groundwork to prepare a number of hypotheses based on previous research findings in order to examine the specific research objectives of this study. The hypotheses are only broad statements that have been confirmed by the findings of a certain questionnaire and found that the stated hypotheses are supported.

1.11. Research design

A cross-sectional survey or questionnaire design was used to collect the data to attain the research objectives. A quantitative sample of respondents was asked to respond to a structured sequence of questions. The questionnaire was formulated from examples of existing surveys and questionnaires based on ergonomics, occupational risk factors and psychosocial factors.

Statistical data based on the frequency and occurrence of accidents and/or injuries in the workplace was examined and analysed to better understand the high risk environment of the manufacturing industry.

1.12. Research participants

The research study was conducted at one of South Africa's largest manufacturers situated in the North West Province. The research participants, therefore, consist of adult employees employed by this specific manufacturing company in different departments. This industry is deemed appropriate due to the nature of the manufacturing industry where it is expected that occupational risks, health and safety hazards will be present to some degree. Simple random samples of 251 employees employed on a full-time basis were obtained from senior management, middle/line management, office staff, artisan to operator's level. Permission was obtained from management to conduct the study at the manufacturing company. The purpose of the study was explained verbally and in writing to management and workers. Participation in the research was voluntary and the participants were free to withdraw at any point in the research process. The participants were assured that their names will not be revealed in the research reports emanating from the project. They were also assured that no negative consequences will emerge for those who participated in the research process. The final report will be made available to both management and the workers.

1.12.1. Study population

The aim was to obtain simple random samples (200) from employees working at the manufacturing industry. A total of 814 employees are working at the designated tyre factory and are divided into different departments. The organisational design consists of:

Senior executive management: 12

Top/departmental management: 24

Line management (foremen):	57
Office staff:	62
Artisans:	56
Operators:	603

To determine the study population, the following formula will be used ($N = 814$; $n = 200$):

$$\frac{n_i}{n} = \frac{N_i}{N}$$

Stratum	Stratum extent	Sample
Senior/executive management	12 (N_1)	3
Top/departmental management	24 (N_2)	6
First-line management (foremen)	57 (N_3)	14
Office staff	62 (N_4)	15
Artisans	56 (N_5)	14
Operators	603 (N_6)	148
	Total	200

A total of 251 participants finally responded to the research questionnaire, instead of only 200 respondents, as anticipated.

1.13. Data gathering

Data was gathered from the participants in the form of a questionnaire that was attached to their payslips, including an explanatory covering letter. This specific method of data gathering was chosen since it produced homogeneous and specific information pertaining to research study. This method also had the advantage of being faster and more effective than interviews with each participant.

1.14. Measuring battery

A questionnaire, drafted from the Dutch Musculoskeletal Questionnaire (TNO Work and Employment, 2001), Ergonomics Risk Identification and Assessment Tool, (CAPP and CPPI Ergonomics Working Group, 2000), HSE Safety Climate Survey Tool (Health and Safety Executive, 2002), Survey Ergonomics in the Workplace (National Seafood Sector Council, 2005) will be used to gather the data. The questionnaire is divided into subsections addressing 1) health, including physical fitness, strength and endurance, 2) work, including type of work, rotation, repetitiveness and workload, 3) employee wellness, including job satisfaction, exhaustion and work-home balance, 4) organisational culture, including management commitment, expectations, perceptions and organisational climate, and 5) labour relations, including the employment relationship between employer and employee. The validity of the questionnaire will be tested in order to ensure a suitable and appropriate measuring battery to answer the specific research objectives.

1.15. Statistical analysis

Multivariate hypothesis testing enabled the researcher to answer the specific research objectives regarding the overall occurrence of occupational risks and unsafe behaviour in the workplace. The statistical analysis of the data was conducted through the assistance of different statistical techniques, which was carried out by the SPSS program. Descriptive statistics were used to summarise and interpret the data. The validity and reliability were expressed through correlation coefficients to demonstrate the effectiveness of the measurement.

OVERVIEW OF CHAPTERS

1.16. Chapter 1: Research proposal

1.17. Chapter 2: Article 1: The experience of occupational risk and the handling of incapacity due to ill health and injury

1.18. Chapter 3: Article 2: The exploration of occupational risk and the handling of unsafe acts and misconduct

1.19. Chapter 4: Conclusions regarding the interactive relationship between occupational risk and labour relations in the manufacturing industry: Discussions, recommendations, conclusions, limitations of the study and recommendations for future research.

INTRODUCTION TO CHAPTER 2 AND CHAPTER 3

Chapter 2 (Article 1): This article is titled “The experience of occupational risk and the handling of incapacity due to ill health and injury” and focuses on the physical risk environment influencing employee wellbeing and industrial relations. A detailed introduction regarding ergonomics, physical hazards and workplace risks was formulated from a thorough literature review, relevant to the frequency of occupational incidents and accidents, as a result of a high risk environment. By means of a literature review, the characteristics of strains on the human body, relating to unsafe conditions and work-related stressors, were identified and discussed in order to understand human capabilities and limitations within the work environment. The findings of this study were used to draw comparisons between unsafe conditions and employee incapacity due to injury or ill health and how it should be addressed from a labour relations point of view.

Chapter 3 (Article 2): This article is titled “The exploration of occupational risk and the handling of unsafe acts and misconduct” and focuses on the psychosocial risk environment influencing employee behaviour and industrial relations. The unique nature and commonness of negative acts, such as unsafe behaviour, human errors, poor performance and negligence, also referred to as unsafe practice, were explored. A literature review was conducted to investigate the nature of negative acts or unsafe behaviour. The findings of this study were used to draw comparisons between unsafe behaviour and misconduct and poor work performance and how they should be addressed from a labour relations point of view.

Article 1 (Chapter 2) was prepared for publication and was submitted to the Journal of Social Sciences, India. Article 2 (Chapter 3) was prepared and submitted for publication to the international journal Managing Global Transitions, Slovenia. The outline of these two articles was changed to meet the requirements of the different two journals and is attached to this dissertation as annexure “B” and “C”. It should be noted that these two articles, which were irrespectively prepared for the two different journals, do not replace chapter 2 and chapter 3 of this dissertation.

An APA Reference style was used throughout this study, including the two articles (chapter 2 and chapter 3).

CAPTER 2: ARTICLE 1

The experience of occupational risk and the handling of incapacity due to ill health and injury

Abstract

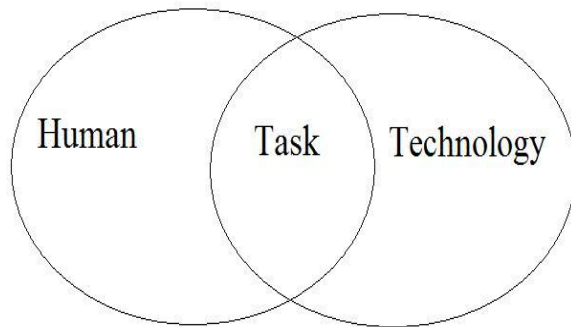
This article is concerned with the assessment of risks in the manufacturing industry and the effects thereof on employee wellbeing, performance ability and consequently on the labour relationship between employee and employer. The centre of this article relies on the interaction between the person and the machine and the design of the interface between the two. Bridger (2003) also describes this as the heart of Ergonomics, and it further includes the nature of the task, workload, the working environment, the design of displays and controls, and the role of procedures (HSE, 2012). The characteristics of strains on the human body, in terms of unsafe conditions and work-related stressors, are identified and discussed in order to explain human capabilities and limitations within his/her work environment. The frequency of occupational incidents and accidents, as a result from a high risk environment, is examined and discussed. Occupational hygiene surveys, medical reports, real incident statistics and annual reports, based on the empirically researched organisation, were collect and used to sustain the research objectives. The data was analysed and is summarised in this article to support the conclusion of the effect of a high risk work environment in correlation with employee wellbeing, and subsequently on labour relations. The results indicate comparisons between unsafe conditions and employee incapacity due to injury or ill health and how it should be addressed out of a labour relations point of view.

Keywords: Occupational risks, health and safety, ergonomics, incapacity, accidents, frequency and severity, management commitment, labour relations

INTRODUCTION

According to Guild, et al (2001) the interaction between human and technology always takes place in a certain workspace, which is located in a specific physical and psychological environment. The environment can be described in terms of temperature, lighting, noise and vibration, the presence and effect of chemical and biological agents, as well as in psychological terms such as teamwork, management structure, shift conditions and psychosocial factors (Guild, Ehrlich, Johnston & Ross, 2001). The working interface between human and technology is the configuration of equipment, facilities, systems, and behaviours that defines the interactive tasks of the worker with technology (Behavioral Science Technology, Inc., 2010). Strydom (2009) explains that the working interface concept is the place where behaviours and organisational conditions, systems and processes come together. He elaborates that this is also where accidents usually occur, in that loss incidents only occur when an employee interacts with the condition in an unsafe way, where unsafe conditions exist (Strydom, 2009).

Figure 1: The human-technology-workspace-environmental model



Guild, Ehrlich, Johnston, & Ross (2001, p. 319)

The human-technology-workspace-environmental model (Figure 1) is useful in identifying the factors that will have an effect on comfort, task performance and safety (Guild, et al., 2001). Strydom (2009) supports this view and explains that the interaction between workers and technology should be the focus of safety improvement efforts. Guild (2001), elaborates that by identifying “ergonomic risk factors” rather than “ergonomic hazards” or “ergonomic problems” allows several techniques of proactive risk management (Strydom, 2009). Although there is little agreement over a definition of “risk” the notion of probability that injury or damage will occur (Guild, et al., 2001) is central to all risk assessment techniques identified in literature, although the interpretation of probability depends on whether it is viewed objectively or subjectively

(White, 1995). Risk probability is known as the possibility that something unpleasant or unwelcome will happen, or a possibility of harm or damage against which something is insured (Oxford University Press, 2013). Within the context of occupational safety and health, “harm” generally describes the direct or indirect degradation, temporary or permanent, of the physical, mental, or social well-being of workers (NAFEN, 2010). Therefore, factors that cause injuries, such as back and neck strains, shoulder injuries and strains, knee sprains and strains, elbow injuries and strains, carpal and tunnel syndrome and musculoskeletal disorders have become crucial for management to identify and control real risks (Scheel & Zimmermann, 2009).

Therefore, in relation with the above it can be sustained that the goal is to decrease the risk of injury and illnesses, to improve worker performance, to decrease worker discomfort, and to improve the quality of work life (Guild, Ehrlich, Johnston & Ross, 2001). Human-system interactions have frequently been identified as major contributors to poor operator performance (Anon, 2012; HSE, 2012), while an ergonomically correct workplace provides many advantages that will improve productivity and product quality. This statement will form the focus point of this article as it suggests consequently an effect on the labour relationship between employee and employer. Individuals have a wide range of abilities and limitations within a working environment. Human factors (or Ergonomics) focus on how to make the best use of human capabilities by designing jobs and equipment that are fit for people (HSE, 2012).

PROBLEM STATEMENT

Finally, the problem derived from the above discussion is that the working interface between human and technology, existing in a demanding work environment, will have an adverse effect on the wellbeing of the employee, influencing the individual’s ability to perform, subsequently affecting the labour relationship between employer and employee.

Factors and exposures in the workplace, relating to accidents and injuries, are explored and summarised below (Section 1). Real incident statistics were gathered from the empirical researched organisation and are analysed and discussed below (statistical analyses). Methods in terms of handling poor work performance and/or incapacity due to ill health or injury as a result of human interaction with a high risk work environment are stipulated below (results discussion). The article builds up to explore the effect of a high risk work environment on the labour relationship (conclusion). Attached is Annexure A, referring to real labour relations cases,

referred to the CCMA on the basis of Dismissals arising from incapacity, due to injury or ill health. The objective of this article is to demonstrate the influence and effect of occupational risks, bringing forth ill health and / or injury, on the labour relationship between employer and employee.

FACTORS AND EXPOSURES RELATING TO ACCIDENTS AND INJURIES

Slips and falls are thought to account for almost a third of all workplace accidents (Smith, 2010). In a vast number of these instances, the accident has occurred in wet or contaminated conditions and most trips are put down to bad housekeeping where substances left on the floor, obstructions, adverse weather and poor flooring have been the cause (Durham, 2013). Other incidents include manual handling, such as lifting, lowering, pulling, pushing, carrying, moving, or any other form of strenuous duties; motorised vehicles coming in and going out or even moving things from one side of the building to another; electric shock; and causes related to hazardous chemicals, fire and water, and machinery (Smith, 2010). Cumulative Trauma Disorders (CTD) were identified as one of the fastest growing occupational injuries in the last decade in South Africa (Grobler, et al., 2002), and are now considered to be the largest work-related health problem (Bacchi, 2010). Cumulative Trauma Disorders are injuries of the musculoskeletal system including the joints, muscles, tendons, ligaments, nerves, and blood vessels that are often grouped together as CTDs, Repetitive Stress Injury (RSI), overuse syndrome, and repetitive motion disorders (Bacchi, 2010).

Furthermore, Walder et al (2007) explain that when ergonomic principles and guidelines are not being followed in the workplace, operator fatigue and stress, leading to potential work-related Musculoskeletal and Neurovascular Disorders (MSDs), will be the end result. The risk factors of these disorders are multifactorial and present aspects that have not been clarified and explored fully (Alazab, 2007). The three major risk factors for the potential development of work-related MSDs are high-force, awkward posture and excessive repetition (Konz & Johnston, 2004). These health risks develop from muscular work, nervous control movements, and contact stressors (Granjean, 1988). Muscular disorder injuries experienced by employees relating to overexertion or repetitive motion, will subsequently lead to Repetitive Muscular Disorder (RMDs) (Kreitner & Kinicki, 2008).

Work-related RMDs/MSDs are not specific to any type of job and affect workers in a wide variety of occupations (Alazab, 2007). These usually take months or even years to develop and they are a

major cause of lost time at work, worker's disability and health care costs (Alazab, 2007). A study relating to ergonomic risks in a car assembly plant (Alazab, 2007, p.17) found that MSDs of the neck is associated strongly with combined ergonomic stressors; hand-arm pain is associated strongly with repetitiveness and pushing forces; while lumbo-sacral disorders is associated strongly with combined trunk ergonomic stressors. MSDs due to biomechanical overload play a significant socioeconomic role as they represent one of the major causes of disability and consequent absence from work. Many employers do not pay enough attention to the measurement and the effects of absenteeism and its control (Johnson, 2007). Almost all employers understand that high absenteeism rates have a negative effect on their businesses, but the monetary effect of abnormally high absenteeism is very rarely quantified. Direct costs of absence are estimated by considering the employee's annual salary (assuming absences are paid) and output-to-pay ratio, multiplied by the amount of time missed within the year (Corporate Research Association, 2011).

Indirect costs on the other hand are 'hidden' costs, which include (among others) the cost of replacing the absent employee in critical positions, possible overtime payments to replacement workers, as well as the effects that absenteeism has on workforce levels, medical aid costs, group life and disability premiums (Johnson, 2007). Adding to the cost of absenteeism, the cost of musculoskeletal disorder is estimated based on medical costs; wage losses; and associated costs (Alazab, 2007). Subsequent to the above, the importance and necessity of job design and designing the work environment is increasing in light of the costs involved related to the number of employees who are suffering from injuries associated with RMDs/MSDs/CTDs. Kreitner and Kinicki (2008) describe three approaches managers should consider when designing the work environment:

The first approach is the mechanistic approach that is drawn from research in industrial engineering and scientific management and is most heavily influenced by the work of Frederick Taylor, who developed the principles of scientific management. Kreitner and Kinicki (2008, p. 230) defined scientific management as 'using research and experimentation to find the most efficient way to perform a job.' The second approach is the motivational approach. Kreitner and Kinicki (2008, p. 230) explain this approach as 'the attempt to improve employees affective and attitudinal reactions such as job satisfaction and intrinsic motivation as well as a host of

behavioural outcomes such as absenteeism, turnover, and performance. The above mentioned authors refer to job enlargement, job rotation, and job enrichment.

Last, Kreitner and Kinicki (2008, p. 234) refer to the Biological- and Perceptual-Motor approach. The biological approach to job design is based on research from biomechanics, work psychology, and ergonomics and focuses on designing the work environment to reduce employees' physical strain, fatigue, and health complaints. The perceptual motor approach is derived from research that examines human factors engineering, perceptual and cognitive skills, and information processing. This approach to job design emphasises the reliability of work outcomes by examining error rates, accidents, and workers feedback about facilities and equipment (common / popular approach currently used by management of the manufacturing company where this study was conducted).

Therefore, the Biological- and Perceptual-Motor approach refers to designing the workplace to fit the worker (Scheel and Zimmermann, 2009) or fitting the task to the man (Grandjean, 1993), by using ergonomic principles when designing the work environment. An analysis of human capabilities, skills and potentials are required to make a proper fit between workers and jobs (UNISA, 2008). If the abilities required for a certain job are too complex, the work should be reorganised to utilise to a greater degree the abilities that are available (UNISA, 2008). The interactive phenomenon as explained above is also supported by the "person-machine-environment" system, which elaborates further on the interaction between an individual and his work environment (Kroemer, et al., 1994). The quality of the workplace environment may determine the level of employee motivation, and subsequently performance and productivity (Leblebici, 2012).

The human perceives information simultaneously of his working environment through various senses while at the same time plans and executes actions (Kroemer, et al., 1994). People working under inconvenient conditions, unpleasant and dangerous work places, and poor office / workspace designs may face occupational health diseases (Leblebici, 2012), such as occupational stress and burnout (Singh, 2002, as cited by Grobler, et al., 2002, p. 469). Stress is caused by stressors, which are events that create a state of disequilibrium within the individual, causing again high absenteeism and turnover, as explained afore (Grobler, et al., 2002; Leblebici, 2012). Common characteristics of working conditions in a manufacturing environment, may present lack

of safety, health and comfort issues such as improper lightening (artificial illumination), poor ventilation, excessive occupational noise, thermal (heat) conditions and emergency excess (Chandrasekar, 2011; Leblebici, 2012). These characteristics, which can be very stressful for a human being, will be discussed in more detail below.

2.1. Occupational noise

Noise is conveniently and frequently defined as ‘unwanted sound’, a definition which in its looseness enables a sound source to be considered as ‘noise’ or ‘not noise’ solely on the basis of the listener’s reaction to it (Oborne, 1985). For example, sometimes the noise may not even be considered to be noise, such as the loud music to which entertainers are exposed to, however, when we are exposed to harmful noise (sounds that are too loud or loud sounds that last a long time), sensitive structures in our inner ear can be damaged, causing noise induced hearing loss (Amesen, 2007; Van Deventer, 2011).

Noise is one of the most common of all occupational hazards (Workplace Health and Safety Bulletin). Legal exposure limits to noise vary depending on the length of exposure, but since compliance with this exposure limit should be checked for every employee, it is necessary to ascertain the sound attenuation for each individual (Van Deventer, 2011). According to the Occupational Health and Safety Act (85 of 1993), the South African noise exposure limit is no more than 85 dB (A). It also mandates that after December 2008, the hearing conservation programme implemented by industries must ensure that there is no deterioration in hearing greater than 10% among occupationally exposed individuals (Van Deventer, 2011). In addition, by December 2013, the total noise emitted by all equipment installed in any workplace must not exceed a sound pressure level of 110 dB (A).

According to Van den Heever (2012) noise is often accepted as a “necessary evil”, a part of doing business, an inevitable part of an industrial job. The reason for this is that there is no pain associated with hearing loss (Amesen, 2007). Hazardous noise causes no bloodshed, breaks no bones, produces no strange-looking tissue, and if workers can manage to get through the first few days or week of exposure, they often feel as if they have “got used” to the noise (Van der Heeven, 2012, p. 7). However, as explained by Van Devenner (2011) it remains the responsibility of the employer to ensure that workers’ hearing is protected where necessary. Loss of hearing is certainly the most well-known adverse effect of noise, and probably the most serious, while other

detrimental effects include tinnitus (ringing in the ears), interference with speech, communication and with the perception of warning signals, disruption of job performance, annoyance and extra-auditory effects (Van der Heever, 2012, p. 7). Exposure to noise causes stress, anxiety and sleeping disorders and compromises the quality of all daily activities (performance), resulting in an increasing demand for medication and treatment, such as tranquilisers and sleeping pills (Vinck, 2007).

2.2. Thermal (heat) stress

The thermal environment has a special effect on the comfort of an individual. Serious deviations from the comfort experienced by an individual can have a detrimental effect on productivity, increase the possibility of making errors (and therefore the accident rate), and can also have a negative effect on the health of the individual (Van den Heever, 2012). Heat stress occurs when the body's means of controlling its internal temperature (thermoregulation) starts to fail and the body generates more heat than it can lose (Crockford, 1999; HSE, 2002). There are various types of heat-related illnesses, including heat cramps, heat exhaustion, heat rash, or heat stroke, each with its own symptoms and treatments (Iowa State University of Science and Technology, 2013). These symptoms vary from an inability to concentrate, severe thirst, fainting, fatigue (heat exhaustion), giddiness, nausea, headaches, moist skin, or hot dry skin, confusion, convulsions and eventual loss of consciousness, commonly known as heat stroke (HSE, 2002; Iowa State University of Science and Technology, 2013).

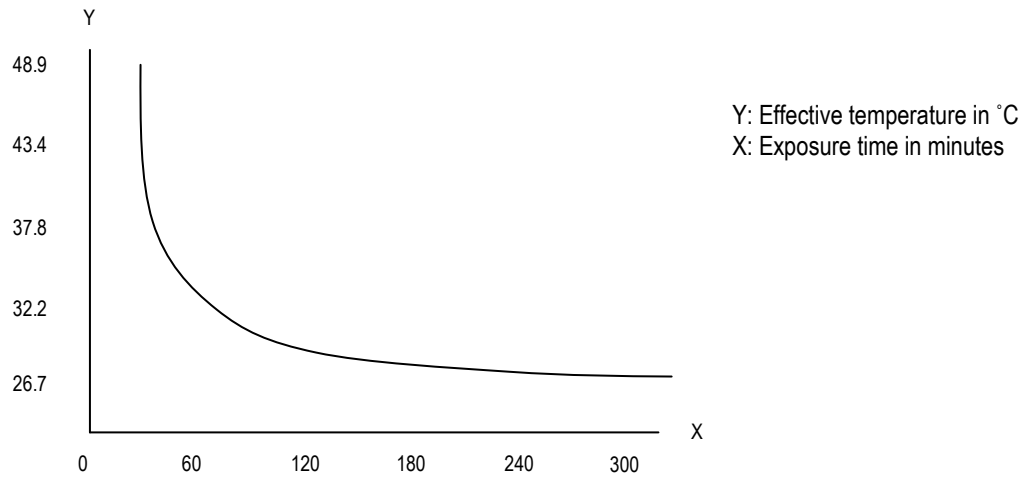
Thermoregulation is achieved by balancing the two main factors that determine body temperature – the metabolic heat produced and the rate of heat loss (Bridger, 2003). Skin temperature rises and falls with the temperature of a person's surroundings (environment), however, the temperature of deep body tissue, that is, the core temperature, remains relatively constant at 36 - 37°C (Diaz & Becker, 2010). More insidious effects of an elevated body temperature occur if the deep body temperature increases to a level of about 42°C or more (Oborne, 1985; Calvin, 2012). When this occurs, the onset of heat stroke (hyperthermia) can be very sudden with the collapse and the forthcoming death of the individual (Oborne, 1985).

Therefore, employers are faced with the challenge to control and maintain a safe and workable workplace for employees. In terms of the Environmental Regulations for Workplaces, 1987 (as amended), an employer must, if practically possible, take steps to reduce the Time-Weighted

Average Wet Bulb Globe Temperature (TWA-WBGT) index, recorded over a period of 1 hour, to be below 30. The TWA-WBGT refers to a combination of three local climate measurements: natural wet bulb temperature, the globe temperature, and the air temperature (Kjellstrom, Holmer, & Lemke, 2009). Therefore, in cases where the index limit of 30 is exceeded, it is expected that workers can develop heat illness, as explained above (Van den Heever, 2012). Apart from heat illness, high temperatures in the workplace reduce worker morale and productivity, and increase absenteeism and mistakes (Tombling Ltd, 2006), which will be explained below.

In a study performed by ASHVE it was proven that a typical manufacturing plant loses 1% efficiency per man-hour for every degree the temperature rises above 27°C (ASHRAE, as cited by Tombling Ltd, 2006). Some of the earliest and most comprehensive experiments of the effects of various stressors, including temperature, on performance were carried out by Mackworth in the 1950's. It was found that performance on various tasks remains fairly constant until a dry/wet bulb temperature of 30/24° to 32/27° is reached, after which the performance on all tasks decreases dramatically. In addition to considering the critical temperature levels for decreased performance, the effects of such variables were investigated in correlation with the experience of motivation to complete a task. Results showed remarkably that in overall conditions, the increased temperature did not affect the various skilled groups differently; however, higher temperatures appeared to affect the unskilled operators in the final hour more than they did the skilled operators (Oborne, 1985). Wing (1965) has combined the data from some of Mackworth's studies in an attempt to point out, in terms of the duration of exposure, the temperature levels able to be tolerated before cognitive performance decrements become apparent (As cited by Osborne, 1985, p. 222).

Graph 1: Upper tolerance limit for impaired mental performance



(Oborne, 1985, p. 222)

The graph above (Graph 1) indicates the decreasing effects on performance in relation to higher temperatures over longer exposure times. (Kjellstrom & Dirks, 2001) elaborates that performance is further affected in terms of the relationship between the ability to carry out work at different intensities: Performance will decrease more rapidly, depending on the work rate level in correlation with an increase of temperatures.

(Additional reference in support to the above: Kjellstrom, Holmer, & Lemke, 2009)

2.3. Artificial illumination

In any inhabited environment, safe conditions, including the measurement of light, are essential in the design and evaluation of workplaces. Because the eye adapts to light levels, automatically compensating for any changes in illumination, subjective estimates of the amount of light in a work area are likely to be misleading (Bridger, 2003). It is therefore important to design lighting installations to compensate for human limitations, and to increase the probability that a person will detect a potential hazard and act to avoid it (Van den Heever, 2012). In many cases where illumination has been associated with accidents, factors such as glare, both direct and reflected, visual fatigue and harsh shadows were identified (Van den Heever, 2012).

The light levels listed in the OHS Act (85 of 1993), are the absolute minimum statutory average light levels that may exist in a workplace at any time in the life of that workplace. Failure to

comply with the OHS Act requirements is an offence committed by the employer. The employer is always responsible for providing and maintaining a safe, healthy and workable workplace (OHS Act, 85 of 1993, section 16).

Effective lighting is achieved by illuminating both task and surroundings with light of adequate quantity and quality from the most advantageous direction, without causing eyestrain, and with the minimum consumption of energy (Van den Heever, 2012).

The advantages available to industry by virtue of good lighting can be listed as follows (Anon, 2013, p. 1):

'The quality of lighting in a workplace can have a significant effect on productivity. With adequate lighting workers can produce more products with fewer mistakes, which can lead to a 10 to 50 % increase in productivity. Good lighting can decrease errors by 30 to 60 % as well as decrease eye-strain and the headaches, nausea, and neck pain which often accompany eyestrain. Adequate lighting allows workers to concentrate better on their work which increases productivity. The level of lighting that workers need varies depending on the nature of the task, the sharpness of the workers' eyesight, and the environment in which the work is done. For example, detailed work, such as inspection, assembling of small parts or technical drawing, needs a great deal of light. Coarse work, on the other hand, such as loading or unloading materials, handling of materials or packaging, requires less light.'

2.4. Ergonomics and safety

As emphasised above, the human body is part of the physical world and obeys the same physical laws as other living and non-living objects (Bridger, 2003). Therefore, the goal of ergonomics is to optimise the interaction between the body and its physical surroundings. Bridger (2003) elaborates that “ergonomic problems often arise because, although the operator is able to carry out the task, the effort required overloads the sustaining and supportive process of the body and causes fatigue, injury or errors” (p. 6).

Humans have limited capability for processing information (such as from displays, alarms, documentation and communications), holding items in memory, making decisions and performing tasks (HSE, 2010). Experience of being driven to the margin of physical and psychological capability by strenuous exertion, hot climate, schedule pressure, unreasonable behaviour of

superiors or colleagues, oncoming illness, or the feeling of useless efforts can cause “stress on the job” (Kroemer, et al., 1994). Some of these stressors are physical, others are psychological; self-imposed or external; short-term or continual (Cox, 1990; Chim, 2006).

Workload is defined as the total amount of work that a person is expected to do in a specified time (Chim, 2006). Job demands depend on type, quantity, and schedule of tasks; the task environment (in physical and technical terms); and the task conditions – referring to the psycho-social relations existing on the job (Kroemer, et al., 1994; HSE, 2010). Mental workload is defined primarily as the relationship between the worker’s perceptions of the demands of the task and their perceived coping capacity (MacDonald 2004, p.40).

When the job demands exceed the person’s capability, he/she is over-loaded and would seek either to reduce the workload, or to increase capability (Kroemer, et al., 1994). A high (or perceived high) workload not only adversely affects safety, but also negatively affects job satisfaction and, as a result, contributes to high turnover and staff shortages (HSE, 2010). Furthermore, an environment demanding more of the operator than he is able to give can result in human performance issues such as slower task performance and errors such as slips, lapses or mistakes, and subsequently serious accidents (Osborne, 1985; HSE, 2010).

It should also be noted that ‘underload’ can also lead to human performance issues such as boredom, loss of situation awareness and reduced alertness (HSE, 2010), as can be expected from repetitive work, or working in the same area, position, or posture with little human interaction. Accidents are unfortunate, unpredictable, unavoidable, and unintentional interactions with the environment. However, it is believed to be preventable, with reference to the old paradigm of H. W. Heinrich who first described the relationship between injury types (Boyd, 2010):

- Lost time accident;
- Non-lost time accident;
- Damage accident.

The safety triangle holds that an inverse relationship exists between frequency and severity: the more severe the injury, the less frequent it is (Boyd, 2010). It is furthermore suggested that these three types occur in the ratio of approximately 1:60:400 (lost time: non-lost time: damage

accident), so that for every lost time accident occurring in the industry, there will be approximately 400 damages to property/no-injury accidents (Oborne, 1985).

The safety triangle has been useful in providing an accurate description of various incident categories and their relationship to each other, suggesting that a single, high-severity event signals the likelihood of significant exposure in the workplace (Boyd, 2010). Furthermore, data shows that frequent low-severity events indicate the potential for high-severity events. Boyd (2010) explains that an environment that frequently generates low-severity events harbours systems, cultural and leadership issues that will generate high-severity events as well. This is also the heart of this study and will be examined further on (Article 2).

METHODOLOGY

SAMPLE

The data gathered at the manufacturing/production plant were obtained through real incident and accident records, documented over a period of 10 years. The data analysed reflects the frequency and severity ratios of types of accidents experienced within the researched manufacturing plant, where an average of 814 employees are employed (at the time when this study was conducted), including machine operators; machine maintenance servicemen, line- to top management, and office staff – all of whom are exposed to some sort of occupational hazards and risks through each normal day of work.

The occupational hygiene data gathered were conducted by an approved inspection authority in terms of the Occupational Health and Safety Act 85 of 1993 (as amended), on request from management and as part of legal compliance. A random selection of the most recent reports at certain departments was analysed and included in the study to sustain the research objectives. The occupational hygiene data includes occupational noise, thermal conditions, and artificial illumination.

MEASURING INSTRUMENT

Dr DJ Van den Heever, a registered occupational hygienist, conducted all measurements at the premises of the manufacturing/production plant. Special permission was received to use the reports and results in this article:

Assessment of noise in all areas was carried out with three Quest 1200 type 1 integrating sound-level meters. Measurement was conducted on-site according to South African National Standard 10083 (2004) (The measurement and assessment of occupational noise for hearing conservation purposes). The measurements were taken at an average temperature of 22°C and the wind speed at the sound level meter never exceeded 0.02 m.s-1.

Measurements of artificial illumination were carried out during the day according to Appendix H of SANS 10114-1:2005. The standard method was used for the measurement of artificial illumination. The survey was performed under actual working conditions and from a specific work point location. Measurements were carried out with a calibrated cosine and colour corrected light meter (Extech S/N Q023267).

The monitoring of the thermal conditions was performed using a calibrated electronic direct reading heat stress monitor. The instrument was set up and used according to ISO method 7243 in combination with the method of the American Conference of Industrial Hygienists (ACGIH, 2001; Schröder & Schoeman, 1989; South Africa, 1987). Measurements were made in the areas where workers were executing their normal duties.

The time-weighted average WBGT was calculated as follows:

$$WBGT_1t_1 + WBGT_2t_2 + WBGT_3t_3 + \dots + WBGT_nt_n$$

$$t_1 + t_2 + t_3 + \dots + t_n$$

where; WBGT₁, WBGT₂, WBGT₃, ... WBGT_n = the calculated wet-bulb globe temperature index for the different work environments, and; t₁, t₂, t₃, ... t_n = the respective time periods in minutes over which the measurements were taken.

STATISTICAL ANALYSIS

Lost time accidents are divided into ‘disabling’ – and ‘non-disabling’ accidents. Within this context the disabling accidents refer to any accident that resulted in more than 14 days lost (absenteeism) due to the injury. Non-disabling accidents represent fewer than 14 days lost to the company due to injury. Non-lost days accidents are identified as ‘first aid’ cases, and represent minor injuries.

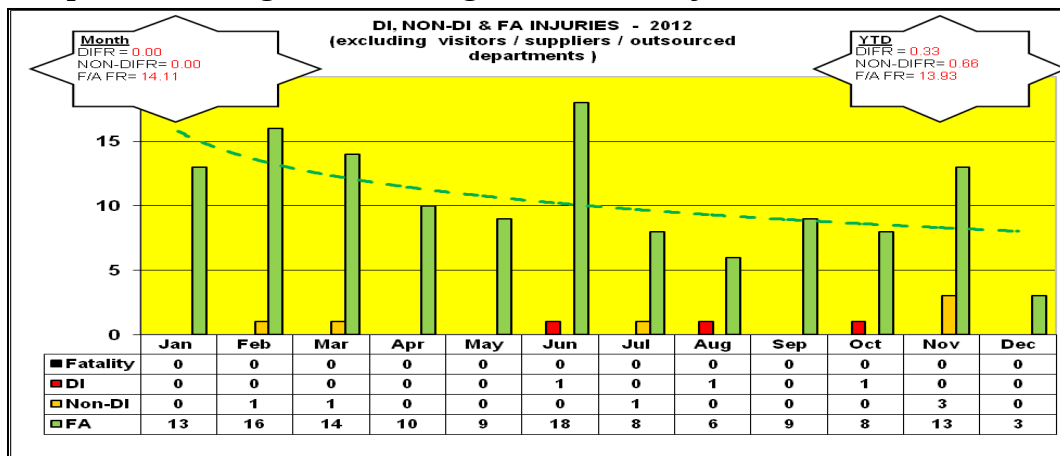
Table 1: Accumulative statistics 2012

ACCUMULATIVE STATISTICS												
FOR THE YEAR: 2012												
	Qtr 1/4			Qtr 2/4			Qtr 3/4			Qtr 4/4		
	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12
EMPLOYEES	817	819	816	818	815	812	827	827	827	837	824	825
MANHOURS	152480.58	163380.44	158133.66	127580.50	171130.26	166947.72	171966.03	167726.61	157577.84	175059.46	168530.25	42534.36
FATAL INJ/ILLNESS	0	0	0	0	0	0	0	0	0	0	0	0
DISABLING INJURIES	0	0	0	0	0	1	0	1	0	1	0	0
NON-DISABLING INJURIES	0	1	1	0	0	0	1	0	0	0	3	0
DISABLING ILLNESSES	0	0	0	0	0	0	0	0	0	0	0	0
DI FREQUENCY RATE	0.00	0.00	0.00	0.00	0.00	1.20	0.00	1.19	0.00	1.14	0.00	0.00
NON-DI FREQUENCY RATE	0.00	1.22	1.26	0.00	0.00	0.00	1.16	0.00	0.00	0.00	3.56	0.00
LOST WORKDAYS	0	1	1	0	0	1	23	0.00	1.0	21	5	0
SEVERITY RATE	0.00	1.22	1.57	0.00	0.00	0.60	26.75	0.00	1.27	23.99	5.93	0.00
FIRST AID CASES	13	16	14	10	9	18	8	6	9	8	13	3
FA FREQUENCY RATE	17.05	19.59	17.71	15.68	10.52	21.56	9.30	7.15	11.42	9.14	15.43	14.11
DI FREQ. PERCENTAGE	0.00%	0.00%	0.00%	0.00%	0.00%	1.20%	0.00%	1.19%	0.00%	1.14%	0.00%	0.00%
ACCUM M/H SINCE LAST DISABLING INJURY/ILLNESS	290821.00	178729.66	110856.31	238436.81	409567.07	17270.45	121896.40	5588.94	163011.56	163323.83	5617.68	219760.86
TOTALS												9864

(Month-end report, December 2012, R01)

It was found that a total of 127 non-lost day accidents (first aid cases) occurred during 2012, in relation with nine lost-day accidents (disabling and non-disabling). This indicates a ratio of 14:1 (non-lost day: lost day accidents). A total of 53 days were lost to the company, only for injuries on duty (IOD), during 2012. The average frequency rate for first aid cases, calculated against man hours worked over 2012, is 17.51, while the severity of accidents, calculated in terms of lost days against man hours worked, is rated at 0.70, for 2012. The graph below shows the relationship between the types of injuries suffered in the manufacturing plant (study population).

Graph 3: Disabling, non-disabling and first aid Injuries for 2012



(Month-end report, December 2012, R01)

During June 2012, the researched manufacturing plant experienced the highest level of first aid cases, as well as one serious disabling incident. The disabling incident suffered in June 2012 is

known as the worst incident experienced by the manufacturing company, during the last 10 years. This incident will be discussed in more detail below.

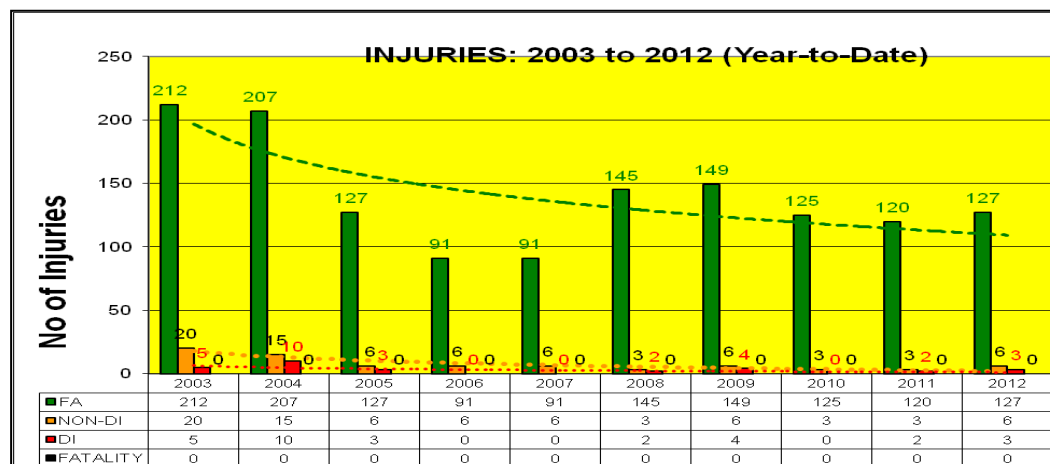
Table 2: Accumulative statistics for the period 2004 to 2012

	ACCUMULATIVE STATISTICS								
	2012 - 2004								
	2012 Totals	2011 Totals	2010 Totals	2009 Totals	2008 Totals	2007 Totals	2006 Totals	2005 Totals	2004 Totals
EMPLOYEES	9864	9785	9054	9025	9930	10646	10877	11190	11274
MANHOURS	1823047.71	1736702	1647956.7	1602466.1	1791901.5	1998441.1	2025434.8	1981399.9	1996202.47
FATAL INJ/ILLNESS	0	0	0	0	0	0	0	0	0
DISABLING INJURIES	3	2	0	4	2	0	0	3	6
NON-DISABLING INJURIES	6	3	3	6	3	6	6	6	15
DISABLING ILLNESSES	0	0	0	0	0	0	0	0	0
DI FREQUENCY RATE	0.00	0.75	0.00	0.34	0.00	0.00	0.00	0.00	0.70
NON-DI FREQUENCY RATE	0.62	0.00	0.36	1.13	0.00	1.28	0.61	0.92	1.52
LOST WORKDAYS	53	39	19	60	71	28	43	84	304
SEVERITY RATE	0.70	2.15	3.38	16.22	0.00	3.91	10.24	15.66	35.98
FIRST AID CASES	127	120	125	149	145	91	91	128	188
FA FREQUENCY RATE	17.51	15.02	15.81	22.01	14.80	10.13	8.81	14.17	19.13
DI FREQ. PERCENTAGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
ACCUM M/H SINCE LAST DISABLING INJURY/ILLNESS	160406.71	357663.81	718854.55	265080.67	760126.30	503658.36	364931.51	195004.62	93470.58

(Month-end report, December 2012, R01)

Over a period of nine years, the researched organisation had a total of 1164 non-lost day accidents (first aid cases), and a total of 74 lost day accidents (disabling and non-disabling cases). This indicates a ratio at 15:1 (non-lost day: lost day accidents), which correlates with the ratio experienced in 2012 (as explained above). A total of 701 days were lost to the company due to injuries on duty (IOD) from 2004 to 2012.

Graph 4: Disabling, Non-Disabling and First Aid Injuries from 2003 – 2012



(Month-end report, December 2012, R01)

It was found that the most common injuries sustained during 2012 per department were finger and hand injuries: 55 minor hand injuries and 23 minor finger injuries were recorded in 2012 alone. Others included:

Table 3: First Aid Injuries vs. Disabling / Non-Disabling Injuries per category 2012

First Aid Injuries	2012	DI / Non-DI	2012
FINGER	55	FINGER	4
HANDS	23	HANDS	1
LEGS	10	LEGS	2
FEET	4	FEET	1
FACE	2	FACE	0
EYES	8	EYES	0
HEAD	5	HEAD	0
ARMS	11	ARMS	1
BACK	6	BACK	0
OTHER	3	OTHER	0
TOTAL	127	TOTAL	9

(Graph created from data analysed out of month-end report, December 2012, R01)

Occupation hygiene

Noise

An assessment of the noise exposure of the workers was conducted on request from management at the researched manufacturing plant, for the following purposes:

- To determine the individual noise exposure for personnel with or without fixed work locations.
- Verification of the noise levels according to SANS 10083 (2004) and to demarcate noise zones where necessary.
- Compliance with the requirements of the Noise-Induced Hearing Loss Regulations, 2003.

Results indicated that the maximum continuous exposure time at one department was 1.9 hours per day, with a maximum dBA noise level at 106.3. Furthermore, it was found that the majority of areas or departments of the researched manufacturing plant (factory) were classified as noise zone areas with eight hour rating levels (LAr, 8h) of more than 85 dBA (Occupational Hygiene Survey CI 030 OH VDHIH 114/12, 2012).

Thermal conditions

Heat monitoring was conducted on request from management at the researched manufacturing plant, for the following purposes:

- Assessment of the heat exposure of the workers in various working areas;
- Compliance with the requirements of the Environmental Regulations for Workplaces, 1987 (as amended); and
- Determination of the exposure of the workers to excessive heat in their workplaces.

Heat stress measurement results at selected workplaces of the researched manufacturing plant indicated the following:

Table 4:

Area / Dept	Wet Bulb Temp. (C°)	Dry Bulb Temp. (C°)	Globe Temp. (C°)	WBGT Index
“A”	21.6	31.2	33.1	25
“B”	22.6	33.2	35.3	26.4
“C”	20.7	28.6	30.4	23.6

(Occupational Hygiene Survey CI 030 OH VDHIH 446/12)

The outdoor ambient temperature was 28°C and the relative humidity inside the factory ranged from 29 to 38%.

Table 5:

Area / Dept	Wet Bulb Temp. (C°)	Dry Bulb Temp. (C°)	Globe Temp. (C°)	WBGT Index
“D”	20.8	33.1	35.7	26
“E”	21.7	34.0	35.7	26.0
“F”	22.7	37.7	38.2	27.4
“G”	22.4	35.2	37.1	26.8

(Occupational Hygiene Survey CI 030 OH VDHIH 050/12)

The outdoor ambient temperature was 32°C and the relative humidity inside the plant ranged from 28 to 32%.

As stipulated above, the WBGT-index was not exceeded during the measurement periods mentioned (with reference to Section 1.2, p. 9).

Artificial illumination

Artificial illumination was measured at selected workplaces of the researched manufacturing plant on request from management for the following purposes:

- Assessment of artificial lighting levels in order to promote productivity, safety, health, welfare and congenial working conditions at an economic cost and to provide data to management for the implementation of the Occupational Health and Safety Act, Act 85 of 1993 (as amended) standards.
- Verification of artificial illumination levels according to the requirements of the Environmental Regulations for Workplaces, 1987 (as amended).
- Compliance with the requirements of the Environmental Regulations for Workplaces, 1987 (as amended).

Results indicated that in some cases the average luminance of the building and premises do not comply with the minimum requirements as prescribed by the Environmental Regulations for Workplaces, 1987 (as amended).

The results at one specific high accident area at the researched manufacturing plant were found to be as follow:

Table 6: Area/machine: “X”

Workplace	Illumination (Lux)	OHS Act	Compliance
Let-off	105	200	No
Let-off control panel (v)	93	200	No
Water pumps	85	100	No
Staircase to platform (f)	97	100	No
Platform	123	75	Yes
EMG No. 2 control panel (v)	40	200	No
X350 control panel (v)	32	200	No
Mill	143	200	No
Gum gauge control panel (v)	72	200	No
Winding	135	200	No
Winding control panel (v)	109	200	No
Machine	77	200	No
Control panel (v)	106	200	No

(Occupational Hygiene Survey CI 030 OH VDHIH 151/12, p. __)

Occupational diseases

The highest number of visits made to the medical station on the premises of the researched manufacturing plant by employees during 2012 was a daunting total of 1292 visits for ear, nose and throat infections only. The highest occupational disease for 2012 was related to the musco-skeletal system. A total of 703 visits were made to the medical station relating to musco-skeletal disorders (MSD's).

As a result of the above, absenteeism becomes a concern in relation with poor health and/or injuries (work days lost to the company). The absenteeism rate was found to be high above the objective target for the period 2011/2012, meaning that the employer suffered a financial burden. The ability to prevent accidents has become more important in terms of cost effectiveness, considering direct (known) and indirect costs (as explained before in the Introduction and problem statement, page 11).

Furthermore, managing cases of absenteeism, where a high rate or pattern of absenteeism is evident, may result in disciplinary actions against the employee involved, leading to dismissals.

RESULTS DISCUSSION

Real incident case study

With reference to the above, the researched manufacturing plant experienced the risk of hidden and unknown costs with a real accident that occurred during late June 2012:

The injured worker was working night shift on the day of the incident, performing his normal duties at his area of work. The injured worker came in undesirable contact with the machine, which resulted in the amputation of fingers 2,3,4,5 at level of MP joint (knuckles) of both hands, as well as de-gloving of skin from level of wrists of both hands (as stated in the final medical report, received from the hospital). The suspected cause of injury was found and stated in the investigation report as "Human Error or Unsafe Act/Practice". The evidence indicated that the injured worker wore the incorrect gloves (artisan hand protection), and furthermore ignored the safety rule to stay behind the safety bars of the machine. Consequently, the injured worker came in contact with moving machinery, which resulted in the accident. The injured worker was placed on 'long-term illness', and has been absent from work since the date of the injury in June 2012. The injured worker has remained in the employment of the company.

According to the Basic Conditions of Employment Act (75 of 1997, as amended), an employee is entitled to an amount of paid sick leave during every sick leave cycle (ss 22 (2)). A sick leave cycle means a period of 36 months' employment (three-year cycle) with the same employer, immediately following an employee's commencement of employment or the completion of that employee's prior sick leave cycle. However, during the employees first six (6) months of employment, an employee is entitled to one day's paid sick leave for every 26 days worked (ss 22(3)).

It should be noted that the injured worker in this case was only employed for three months prior to the incident, subsequently only had approximately three (3) days paid sick leave available. However, the employer accepted the responsibility to compensate the employee to the amount of 75% of his normal salary per month since the injury occurred, which the company may claim back in terms of the Compensation for Occupational Injuries and Diseases Act (130 of 1993). The risk that the employer may never be refunded is a reality that the company has to face.

Furthermore, as the employee has been classified as permanently disabled the employer is obligated to investigate alternatives to accommodate the employee in his employment. Ultimately, one cannot ignore the significant effect on human resource management and the battle it will bring forth in terms of maintaining and controlling labour relations, relating to pre-dismissal procedures when dealing with incapacity and poor work performance, disability, and dismissal arising from ill health or injuries and high absenteeism rates. Therefore, management is facing a new/future challenge: how to handle this matter of incapacity due to injury, as stated above. This will be discussed and in more detail below.

Handling incapacity due to ill health or injury as a result from human interaction with a high risk work environment

In this section, 'unfit', 'incapacity' and 'disabled' will be regarded as synonymous (Guild, Ehrlich, Johnston, & Ross, 2001):

Unfit for work: Failure to meet the specific requirements of an occupation. A person can be declared unfit because of a medical condition that excludes him/her from the relevant occupation, or because of demonstrable lack of capacity to perform the work.

Impairment: Deviation from the functional capabilities expected of a healthy individual. Loss of hearing, visual acuity, lung function or joint motion is impairments.

Disability: An impairment that prevents a person from performing a task or occupation or limits the performance of the occupation or task

A common mistake made by employers when handling a case of incapacity is that most employers follow the same disciplinary procedure as would have been appropriate in a matter of misconduct. However, poor performance or an inability to perform due to incapacity is not a form of misconduct and may never be treated as such. The procedure for poor work performance or incapacity due to ill health or injury is very specific in that it is the employer's responsibility to investigate and consider all alternatives to accommodate the injured, as far as reasonably practicable. The Code of Good Practice, schedule 8 of the Labour Relations Act (85 of 1995), provides a basic guide in terms of dealing with a case of incapacity due to ill health or injury. An employer that ignores the basic guide or refuses or fails to follow the correct procedure will be found guilty on procedural unfairness in a dispute resolution council (CCMA or appropriate bargaining council). The second most common mistake made by employers is the assumption that a matter of incapacity is a quick and easy way out to terminate an employee's contract of employment. There are no shortcuts when dealing with incapacity, and employers should accept the responsibility to do everything in their power to support the employee involved. The procedure requires full commitment from the beginning to the end.

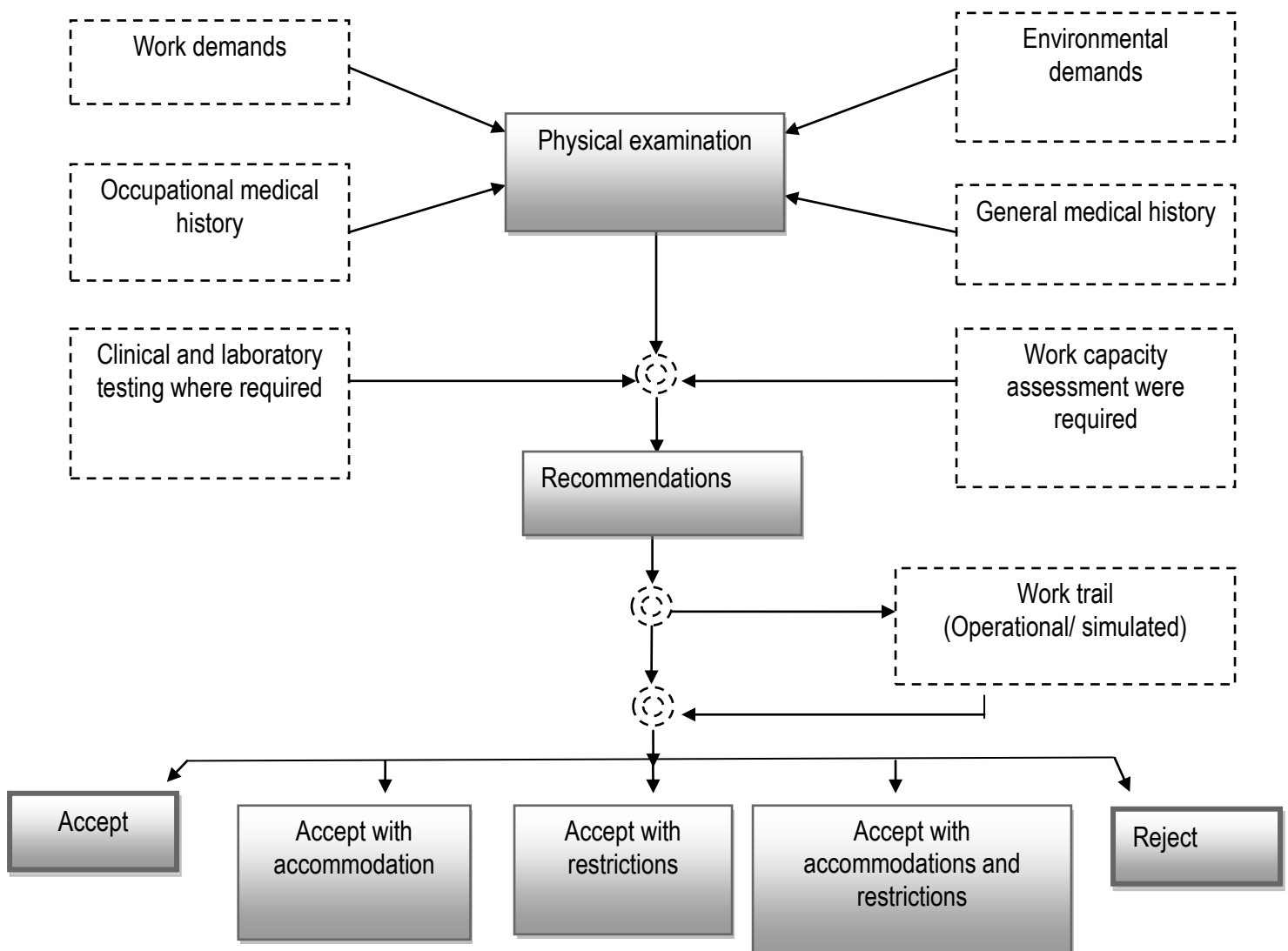
When investigating the extent of the incapacity or the injury the following factors should be considered, as summarised by SA Labour Guide (2011, p. 103):

- If the employee is likely to be absent for a time that is unreasonably long in the circumstances, the employer should investigate all the possible alternatives short of dismissal.
- When alternatives are considered, relevant factors might include the nature of the job, the period of absence, the seriousness of the illness or injury and the possibility of securing a temporary replacement for the ill or injured employee.
- In cases of permanent incapacity, the employer should ascertain the possibility of securing alternative employment, or adapting the duties or work circumstances of the employee to accommodate the employee's disability.

- In the process of the investigation, the employee should be allowed the opportunity to state a case in response and to be assisted by a trade union representative or fellow employee.
- The degree and the cause of incapacity are relevant to the fairness of any dismissal.

True impossibility of performance can constitute grounds for terminating the employment relationship, when all alternatives had been considered and reasonable accommodations to assist the employee had failed. Venter (2007) explains the reason being that, under certain conditions, a company can neither be reasonably expected to keep an employee's job open for an indefinite period, nor be expected to accept losses as a result of such accommodation. The model below described a functional assessment procedure when investigating the extent of the incapacity or the injury (Fraser, 1992, p. 97):

Model 1:



If the employee is considered to be unacceptable even with restrictions and reasonable accommodation, he/she is then rejected (Fraser, 1992, p. 97).

As an alternative measure to the above, the employer may implement a poor work performance management programme, to counsel, evaluate and measure performance with the intent to improve performance up to desired standards.

The performance management programme: poor work performance or ill health/injury consists of:

- Minimum of three (3) consecutive poor work performance counselling interviews;
- Identification of desired standards versus actual performance;
- New goal setting of minimum requirements and measuring batteries;
- Follow-up and continuous evaluation of performance.

The performance assessment and evaluation consist of four stages: The aim of the first stage is to determine the reason for poor performance, whether the non-conformance is as a result of incapacity to perform or is it related to misconduct such as attitude to work, management shortcomings or insubordination.

The second stage of the evaluation will be more formal and constructive in order to examine all direct and indirect factors that influence performance. The employee must carry full knowledge of the inherent requirements of his/her job, and must be fully aware of the minimum standards that must be reached. The employee must furthermore carry knowledge of consequences that may follow if performance is not enhanced and must be aware of the seriousness of the matter. During stage three, the employer may seriously start considering alternative measures in order to address poor work performance, including (but not limited to) further training and/or counselling, demotion or transfer alternatives short of dismissal. The fourth stage is the final stage. The employer may consider dismissal, if the employee failed to improve performance after all reasonable steps were taken, and other alternative measures were considered.

Disputes over a dismissal based on poor work performance: ill health or injury must be referred immediately to the CCMA/ Bargaining Council as the labour law provides. Referral form: LRA Form 7.11 Labour Relations Act 1995 Sections 133, 135, 191(1) and 191(5A).

CONCLUSION

The employer has the responsibility to provide a safe and healthy working environment, which includes the duty to identify and assess all possible hazards and risks involved (Introduction and Problem statement). Furthermore, appropriate precautionary measures should be considered and implemented to minimise, reduce or eliminate potential risks in the workplace. Risks take various forms, namely strategic, operational, financial, non-financial and compliance (complying with laws and regulations).

The necessity of planning, job design and designing the work environment, when managing health and safety in the workplace, has increased in light of the costs involved in workplace accidents and incidents (Factors and exposures relating to accidents and injuries, page 24). Ergonomics seeks to maximise safety, efficiency and comfort by matching the requirements of the operator's work environment to his capabilities – to design the workplace to fit the worker; or fitting the task to the man (Introduction and Problem statement, page 6).

Discomfort in the workplace, including improper lighting, poor ventilation, excessive noise, extreme thermal conditions and emergency excess places a great deal of strain on the individuals working under such conditions, adding stress and anxiety to their jobs. Operator fatigue and stress lead to potential work-related disorders (MSDs) and increase the risk of workplace incidents and accidents. As fragile as the human body is, the thought process is just as complex. Humans have limited capability for processing information, and the experience of being driven to the margin of physical and psychological capability can add stress to the job.

When becoming incapable or unfit to perform the desired standard and specifications of the job, the employee faces the possibility of termination of services, which places a great deal of strain on the employment relationship between employer and employee. A person can be declared unfit because of a medical condition that excludes him/her from the relevant occupation, or because of demonstrable lack of capacity to perform the work.

Disability due to ill health or injury is defined as an impairment that prevents a person from performing a task or occupation or limits the performance of the occupation or task. When the employer is faced with a situation where the employee is incapable of performing a work task, it is necessary to follow the reasonable steps before considering dismissal. The employer is expected to consider as far as reasonably practicable all other alternatives to accommodate the

disability of the employee. When accommodations should be made for an injured employee, it would be useful to follow ergonomic procedures to make the workplace more workable.

When taking an employer's point of view, the evaluation procedure may appear superfluous and the easiest way out would be to simply terminate the employment relationship. Fortunately for the employee, the Labour Relations Act (66 of 1995) and other legislations protect the rights of the employee, and require that fair procedures should take place before any dismissal can occur. It is necessary that employers have health and safety policies in place, procedures to follow with occupational injuries and diseases, and more importantly, ergonomic principles to create a healthy, safe and favourable workplace.

An ergonomically correct workplace provides many advantages that will improve productivity and product quality and reduces the risk of workplace discomfort, leading to unwanted incidents. Therefore, it is sustained that the working interface between human and technology, existing in a demanding work environment, will have an adverse effect on the wellbeing of the employee, influencing the individual's ability to perform, subsequently affecting the labour relationship between employer and employee.

**** Further references to support the above statement are attached and summarised in*

Annexure A –

Case studies of real incidents where the labour relationship was affected by occupational health and safety issues.

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CAPTER 3: ARTICLE 2

The exploration of psychosocial risk and the handling of unsafe acts and misconduct

Abstract

The aim of this article is to investigate the psychosocial risk environment influencing employee behaviour, and subsequently the trust relationship between employer and employee. The unique nature and commonness of negative acts, such as unsafe behaviour, human errors, poor performance and negligence, also referred to as unsafe practice, are explored. A literature review is formulated to investigate the nature of negative acts or unsafe behaviour. The findings of this study are used to draw comparisons between unsafe behaviour/misconduct and accidents in the workplace and finally conclude how it should be addressed from a labour relations point of view. The results indicate comparisons between unsafe practice/misconduct and occupational injuries and accidents, as a result of system flaws, human error or psychosocial risk.

Keywords: Occupational risks, unsafe practice; misconduct; organisational safety culture, ergonomics, management commitment and leadership, labour relations.

INTRODUCTION

In a scenario of production urgency that was examined at a large manufacturing plant in South Africa, where this study was conducted, two operators were found in violation of the 'lock out' procedure while working on moving machinery. The operators were focused on their set tasks, when production quality was influenced by a technical fault on the machine. The fault was set in the basement/pit of the machine near large moving rollers. The operators decided to investigate and to rectify the mistake at the source of the danger zone to find the error, where access is strictly forbidden. A year prior to this incident, one employee suffered a severe injury at the same machine and work area. The employee had been permanently disabled after he lost the fingers (2, 3, 4, and 5) on both of his hands. Despite being aware of this serious injury, the two operators deliberately violated the safety rules and entered the forbidden danger zone, without applying the emergency stop. The operators knowingly placed their own lives in danger. However what mind set may have produced this behaviour and what series of actions were considered before they made the decision to ignore company regulations?

The operators were duly aware of the rule and a notification sign was visible at the entrance of the forbidden area, stating that access is only allowed after the machine had been 'locked out'. After the incident, the two operators were charged with misconduct and were informed to attend a disciplinary hearing. The manufacturing company consistently applies a zero tolerance policy for safety violations and safety misconduct. This action was viewed as a serious offence, which the employer could not allow (CCMA Case Number: GATW6161/13).

This scenario, along with other examples, will be used throughout this article to understand the reason for discrepancies, involving individuals' attitudes and behaviour. This article will further consider cases, as stated above, in context of a high risk work environment, and the influence thereof on the trust relationship between employer and employee (Labour Relations). The 'work environment' referred to in this article is considered in its largest sense and includes the social - as well as the physical environment of the organisation and the relationship between an organisation and the environment in which it operates (Grandjean, 1988; Robbins, et al., 2007). This article will examine the dynamics of the psychosocial environment and examine the risks that the human-operator can introduce into an otherwise 'safe' situation, which might possibly make it 'unsafe' (Osborne, 1985). It is argued that even if the system has been designed to take account of

all the ergonomic principles (as previously discussed), statistics shows that accidents still occur when a human operator is involved (Oborne, 1985), because accidents are often attributed to human error and to the characteristics of an operator's behaviour (Oborne, 1985; Bridger, 2003). However, behaviours are never random and do not occur without some thought process preceding it (Kruger and Wyngaard, 2009). To understand the reasons behind unwanted behaviour, the 'second story' or 'full account' (the thought patterns and the context within which they occur) should be considered (Kruger and Wyngaard, 2009). Therefore, the working interface of organisational factors, that are giving life to these individual or group thought processes, must be taken into consideration.

There is a general tendency to associate poor system performance with poor human performance, yet detailed analyses of accidents and incidents of 'near misses' reveal that human error is almost never the sole cause (Bailey, 1982). It is argued that workplace accidents are frequently the result of human error, which in turn is the unfortunate outcome of flawed systems of work (Health and Safety Authority, 2004). Real systems are multi-layered and hierarchical and errors can only lead to accidents if they have consequences at other levels (Bridger, 2003). This will be discussed in more detail later on, based on a similar example to the scenario above (Swiss Cheese Model).

It is further argued that accidents do not always follow automatically from risk-taking behaviour. As a result of knowing the system, people learn to make educated guesses about when they can "get away with" taking a risk, both in the workplace and in other spheres of life (HSA, 2004). Kruger and Wyngaard (2009) refers to a thought process that calculates potential effects by an 'if-then' formula, including previous experience and prioritising of desired outcomes or goals.

Therefore, in considering the behaviour of the operators (above), Geller (2005) elaborates that people usually act in a certain way based on the consequence they expect from their actions. "People follow through with the particular behaviour activated to the extent they expect doing so will provide them a pleasant consequence or enable them to avoid an unpleasant consequence" (Geller, 2005, p. 542).

Finally, in order to fully comprehend the complex interactive phenomenon between the man-machine-environment and how the psychosocial risk environment affects individual and group behaviour, organisational behaviour as a whole must be examined. Organisational behaviour

applies the knowledge gained about individuals, groups and the effect of structure on behaviour in order to make organisations work more effectively (Robbins, et al., 2007).

PROBLEM STATEMENT

In conclusion, the problem statement derived from the above introduction is that the psychosocial risk environment will either provoke desirable or undesirable behaviour from the individual employee, subsequently influencing the trust relationship between employer and employee and the organisation as a whole (Labour Relationship).

This article will focus on the nature and commonness of negative acts, such as unsafe behaviour, human errors and negligence or unsafe practice, as a result of the psychosocial risk environment. Tolerance for safety violations and organisational culture will be investigated to understand the effect on the labour relationship between employer and employee in terms of handling unwanted behaviours at work. Furthermore, the interactive relationship between the three determinants of behaviour in organisations (individual; groups; and structures) will be investigated.

The outline of this article includes a thorough literature review on psychosocial risk and what it entails, in order to understand the effect of occupational stress on humans, to conclude the consequence on behaviour. The article further includes the research methodology of a research questionnaire implemented at the manufacturing company, in support of the literature review. The results of the empirical study are discussed and a conclusion is derived from the results, to answer the research question from the problem statement above.

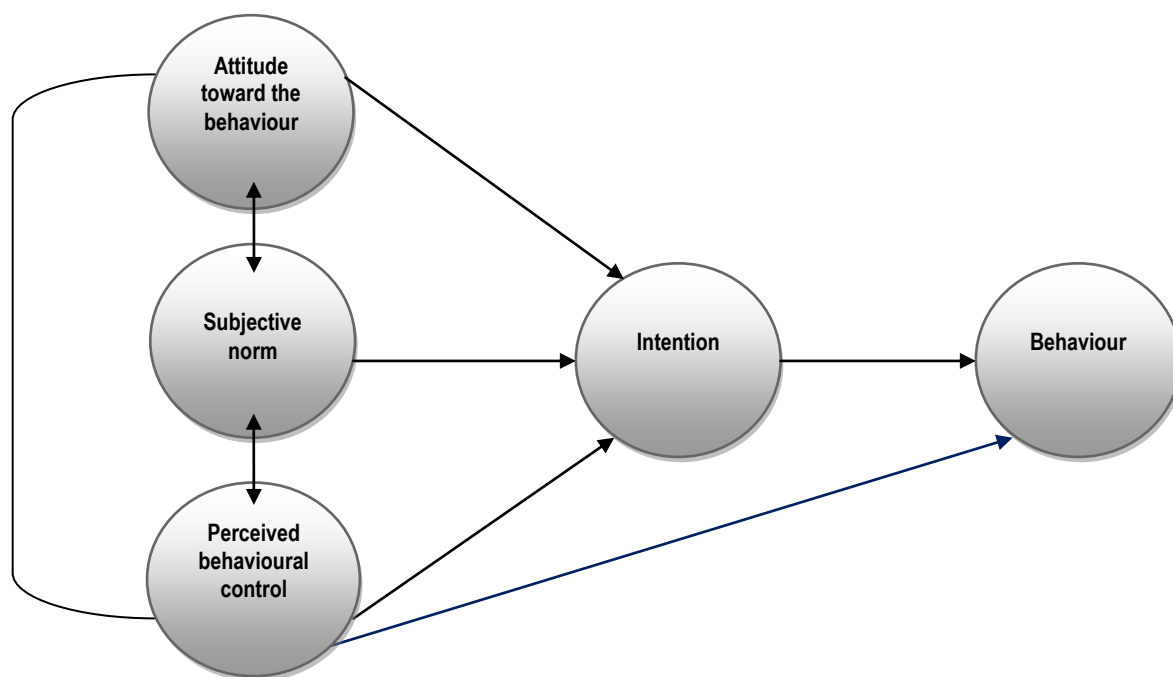
LITERATURE REVIEW

It is believed that undesirable behaviour and interaction with the environment are the cause of 80-96% of workplace injuries in that accidents only occur, when an employee interacts with the condition in an unsafe way, where unsafe conditions exist (Musolino, 2005; Strydom, 2009).

Behavioural Based Safety (BBS) looks for external factors to understand and improve behaviour. According to Geller (2005), behaviour is influenced by factors in both our external and internal worlds. Environmental conditions that influence behaviour include inadequate management systems or manager behaviours that promote or inadvertently encourage at-risk behaviour (Geller, 2005). BBS focuses on what people do, and then analyses why they do it (Geller, 2005; Musolino, 2005).

Ajzen (1991) developed a model focusing on intentions as the key link between attitudes and planned behaviour. The theory of planned behaviour includes three (3) interacting determinants of one's intention (a person's readiness to perform a given behaviour) to exhibit a specific behaviour (Kreitner & Kinicki, 2008). These three determinants include one's attitude towards certain behaviour, the subjected norm, and perceived behaviour control. The unique interaction between the three determinants will be explained in more detail below with reference to an incident that occurred at the manufacturing plant where this research study was conducted.

Model 1: Ajzen's Theory of Planned Behaviour



(Ajzen, 1991, p. 182)

The following case study will be used to explain the model above (Model 1) in more detail:

The employee, who is employed as an operator at a fast moving manufacturing machine, has a favourable attitude towards ignoring the safety rule to switch off the machine to rectify errors on the material produced by the machine. By doing this, the employee is required to move her hand into a danger zone of the machine. Her perceived subjective norm is favourable because she sees her co-workers taking shortcuts to rectify errors on the machine in the same manor. It is further concluded that this behaviour has previously been either allowed by management, or management have never been aware of this unwanted behaviour (EAR No: 06/14/01).

Therefore, regarding perceived behaviour control, she is completely in charge of acting on her intention to take the shortcut, and subsequently ignores the safety rule. The employee entered the danger zone, as she and her co-workers have done many times before. Without expecting an accident to occur, the employee suffered an injury (lacerations to the left hand) and subsequently lost days from work.

In conclusion to the above, a person's intention to engage in a given behaviour is a strong predictor of that behaviour. Kreitner and Kinicki (2008) explain this for example, that the quickest and possibly most accurate way of determining whether an individual will quit his or her job is to have an objective third party asked if he or she intends to quit. In the same sense, and with reference to the above incident - to determine whether an individual will show undesired / unsafe behaviour is to determine whether these said bad habits are accepted as the norm among all other employees (for example to take shortcuts at work to save production time). Therefore, it is suggested that risk taking behaviour can be predicted by using the theory of the planned behaviour model.

The theory further has important managerial implications. Kreitner and Kinicki (2008) explain that this model allows the realisation that behaviour is modified through intentions, which are influenced by the three determinants (Model 1). Therefore, if the model is applied correctly, it can influence behavioural change by doing or saying things that affect the three determinants of employees' intentions to exhibit a specific behaviour: attitude toward the behaviour; subjective norms; and perceived behavioural control. Kreitner and Kinicki (2008) elaborate that this is accomplished by modifying the specific beliefs that foster each of these determinants. For example, behavioural beliefs, normative beliefs, and control beliefs directly affect attitude toward the behaviour, subjective norms and perceived behavioural control, respectively.

Therefore, employee beliefs can be influenced through the information management provides on a day-to-day basis, organisational culture values, role models, and rewards that are targeted to reinforce certain beliefs (Kreitner & Kinicki, 2008).

3.1. Psychosocial risk

Workplace psychosocial factors are non-physical aspects of the workplace that are developed by the culture, policies, expectations, and social attitude of the organisation (Canadian Centre for Occupational Health & Safety, 2012). Psychosocial factors are associated with the way

individuals interact with the demands of their job and their work environment (Green & Taylor, 2008). It is important to understand that the term ‘psychosocial’ is different from ‘psychological’, which refers more narrowly to thought processes and behaviour of individuals (Burton, Kendall, Pearce, Birrell & Bainbridge (2008).

Psychosocial risks are organisational factors that affect the psychological safety and health of employees (Gilbert, 2010). Psychosocial factors include the way the work is carried out (deadlines, workload, work methods) and the context within which work occurs, including relationships and interactions with managers and supervisors, colleagues and co-workers, and clients or customers (Guarding Minds at Work, 2012).

Thirteen psychosocial factors have been identified and summarised from previous research by Samra, Gilbert, Shain and Bilsker (2012). The factors (PSR-13) are interrelated and therefore influence one another. The thirteen factors (PSR-13) assessed by Samra et al. (2012) correlates with an earlier study done by Green and Taylor (2008). The similarities are summarised below:

Green and Taylor (2008) firstly refers to social support, in terms of the amount of input that workers perceive they receive from co-workers, where as Samra et al. (2012) elaborates on psychological support and a work environment where co-workers and supervisors are supportive of employees’ psychological and mental concerns, and respond appropriately as needed.

Secondly, Green and Taylor (2008) mention a sense of community (the degree to which workers feel that they are part of a community), where as Samra et al. (2012) refer to organisational culture and a work environment characterised by trust, honesty and fairness.

Furthermore, both studies highlight the quality of leadership, clear leadership and expectations, and civility and respect. Other psychosocial risks identified by the authors include work demands and mental loads; subsequently work stress, management feedback, including recognition and reward, involvement and influence, job control, psychological protection, and protection of physical safety (for more detail see Green & Taylor, 2008, p. 2; Samra, et al., 2012, p. 2).

Therefore, psychosocial risks are constituted by organisational factors, such as lack of supportive relationships at work, job insecurity or company culture (Houtman, 2008). Exposure to psychosocial risk factors at work may result in a state of work-related stress (psychological), in which one often feels tense, concerned, less vigilant and less efficient in performing tasks

(Houtman, 2008; Rick, Briner, Daniels, Perryman & Guppy, 2001), leading to increased absenteeism, withdrawal behaviour, conflict, strain (fatigue, burnout, anxiety), turnover, loss of production, and greater risk of accidents, incidents and injuries (Canadian Centre for Occupational Health & Safety, 2012).

Work-related stress depends on individual perceptions of their work environment, dependant on resources available in the workplace and in the organisation (for example, the support of co-workers and supervisors). These psychosocial risks can have negative consequences on the organisation as a whole, including negative health outcomes, increased risk for accidents and impaired performance (Houtman, 2008; WHO, 2013; Cassitto, Fattorini, Gilioli & Rengo, as cited by WHO, 2013). This will in turn also influence the labour relationship in terms of employers' expectations versus employees' abilities to perform.

It is undeniable that psychosocial risks do not only play a significant role in organisational effectiveness, they further have an important impact on human resource management, and more specifically on labour relations.

3.2. Occupational stress

As explained above, occupational stress is often the result of exposure to psychosocial risk. Pressure at the workplace is unavoidable due to the demands of the industrial work environment (Leka, Griffiths & Cox, 2005). When pressure becomes excessive or otherwise unmanageable it leads to stress. Therefore, stress results from a mismatch between the demands and pressures on the person, on the one hand, and their knowledge and abilities, on the other. It challenges their ability to cope with work (Leka, et al., 2005). This includes not only situations where the pressures of work exceed the worker's ability to cope but also where the worker's knowledge and abilities are not sufficiently utilised (boredom).

Furthermore, Ritchie and Martin (1999) explain that someone with a high score on the need for good working conditions would suffer from stress if they worked in draughty, dingy work environment with a lot of noisy machinery. Poor work organisation, with reference to job design and work systems, can cause work stress (Leka, et al., 2005). Most of the causes of stress are concerned with the way work is designed and the way in which organisations are managed (Ergonomics, Article 1). Leka et al., (2005) refer to these aspects as "stress related hazards".

Stress-related hazards include (but are not limited to) the following aspects, summarised below in Table 1:

Table 1: Stress-related hazards (psychosocial risk factors)

1.	Job Content	Monotonous, under-stimulating, meaningless tasks; Lack of variety; Unpleasant task; Aversive task.
2.	Workload and Work pace	Having too much or too little to do; Working under time pressure.
3.	Working Hours	Strict and inflexible working schedules; Long and unsocial hours; Unpredictable working hours; Badly designed shift systems.
4.	Participation and control	Lack of participation in decision making; Lack of control over the work environment.
5.	Interpersonal Relationships	Inadequate, inconsiderate or unsupportive supervision; Poor relationships with co-workers; Harassment and violence; Isolated or solitary work; No agreed procedures for dealing with problems or complaints
6.	Home-work interface	Conflicting demands of work and home.

(Leka, et al., 2005, p. 6)

The experience of work stress, caused by the exposure to psychosocial risks and -hazard factors (as summarised above) can cause unusual and dysfunctional behaviour at work and contribute to poor physical and mental health (Leka, et al., 2005).

According to Geller (2005) people do what they do based on factors in both their external and internal worlds. In relation with the above, psychosocial risk assessment techniques that identify environmental conditions that influence behaviour, is another cost effective manner to change behaviour, where behaviour change is needed (Geller, 2005). It is widely accepted that effective risk controls depend in part on the behaviour of individuals at all levels within an organisation (Fleming & Lardner, 2002). Good systems, procedures and engineering controls on their own are not enough – it is how well an organisation ‘lives’ its systems that matters (Fleming & Lardner, 2002). This can include identifying inadequate management systems, or management behaviours that promote or inadvertently encourage at-risk work practices as stated above (Geller, 2005; Houtman, 2008; Leka & Cox, 2008).

The above summary brings us closer to the answer of the question asked in the introduction of this article: Why did the employees act in an unacceptable/undesirable manner, in terms of the known safety rules. It is now clearer that particular behaviour is activated by environmental (physical and

psychological) influences, driven by outcomes and consequences. This concept will be further considered and discussed below.

3.3. Drivers of behaviour

The core element to promote health and safety behaviour is the ABC model of behaviour, referring to Antecedents (A), Behaviour (B) and Consequence (C) (Daniels, 1999; Geller, 2005).

Antecedents refer to a casual event (trigger) preceding the behaviour, including rules and procedures, suitable tools and equipment, information, signs, skills and knowledge, training and understanding of other people's expectations, etc. (Fleming & Lardner, 2002). Although antecedents are necessary to trigger desired behaviour, their presence does not guarantee that behaviour will occur (Fleming & Lardner, 2002), in that consequence drives behaviour.

Consequence is defined as "the outcome of the behaviour for the individual that influences the likelihood that the behaviour will be repeated"; therefore, the frequency of behaviour can be increased or decreased by altering the consequence following the behaviour (Fleming & Lardner, 2002, p. 5).

Table 2: Examples of the different types of consequence

Positive reinforcement	Negative reinforcement	Punishment
Positive feedback about achievement.	Avoidance of peer disapproval	Removal of benefits
Recognition from management.	Avoidance of pain	Disciplinary action
Praise from colleagues	Avoidance of the loss of financial reward	Physical pain or injury
Prizes	Avoidance of financial penalty/fine	Feeling guilty

(Fleming & Lardner, 2002, p. 5)

Reinforcements, as stipulated above, are important in terms managing (driving) behaviours at work. Leaders are challenged to cultivate a work culture that facilitates responsibility or self-accountability for safety (Geller, 2005). Positive reinforcements allow discretionary efforts that involve doing more than the minimum required and maximising safe performance because a person wants to, rather than has to (Fleming & Lardner, 2002). Negative reinforcement produces just enough of behaviour to avoid something unpleasant, while positive reinforcement produces more behaviour than required (Daniels, 1999). This is further important to consider when dealing

with misconduct in the workplace and punishing unwanted behaviours (labour relations management).

Geller (2005) differentiates between accountability and self-accountability or responsibility (p. 557):

'When people are held accountable, they are asked to reach a certain objective or goal, often within a designated time period. However, they might not feel responsible to meet the deadline, or might feel responsible enough to complete the assignment, but nothing more. In this case, accountability is the same as responsibility. When people extend their responsibility beyond accountability they do more of what is required. They go beyond the call of duty defined by a particular accountability system. This is often essential when it comes to occupational risk management – to improve safety beyond the current performance plateaus. Workers need to extend their responsibility for safety beyond that for which they are held accountable.'

3.4. Safety culture:

Out of the above theory/discussion related to accountability and self-accountability or responsibility, the following assumption could be made that safe behaviour is driven by consequence, which in turn, relies on the existence of a safety culture, cultivated by the leaders of the organisation.

A safety culture is directly dependent on the attitude of employees towards safety (Attock Refinery Limited, 2013). The product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of an organisation's health and safety management (U.K Health and Safety Commission, as cited by ARL, 2013). Regardless of safety management systems, policies and procedures, incident data shows that the majority of incidents and accidents in the workplace are a result of employees' attitude, perceptions and patterns of behaviour, such as to take shortcuts and intuitive-based decisions, bypassing Standard Operating Procedures (SOP's), rules and regulations (Findings from ARL, 2013). This directly correlates with the example given in the Introduction of this article and is commonly found in the majority of incident investigation reports at the researched manufacturing plant, where this empirical study was conducted (to be discussed in more detail further on).

Organisational culture refers to a system of shared meaning held by members, distinguishing the organisation from other organisations (Schein, 1985). This system of shared meaning is a set of key characteristics that the organisation values (Robbins, Odendaal & Roodt, 2007). Organisational culture represents a common perception held by the organisation's members and is concerned with how employees perceive the characteristics of an organisation's culture, not with whether or not they like them (Robbins et al., 2007). Therefore, it is further argued and believed that individuals with different backgrounds or at different levels in the organisation will tend to describe the organisation's culture in similar terms (Meyerson & Martin, 1987).

Safety culture is, "that assembly of characteristics and attitudes in organisations and individuals, which establishes that as an overriding priority, safety issues receive the attention warranted by their significance" (Reason, 1997, p. 194). According to this definition not all organisations have a safety culture; only for organisations for which safety is an overriding priority, does a safety culture exist. Therefore, a safety culture is something that is strived towards, but rarely attained, in that a safety culture of an organisation may vary in its effectiveness (Hopkins, 2002).

According to Hale (2000), referring to 'cultural influence on safety' is a more appropriate term in that it suggests that where a culture exhibits a strong emphasis on safety, a 'culture of safety' (safety culture) exists. Attitudes are a key element of a safety culture, and an organisation can improve its safety culture and in turn its safety records, by modifying the attitudes of both management and employees towards safety (HSA, 2004).

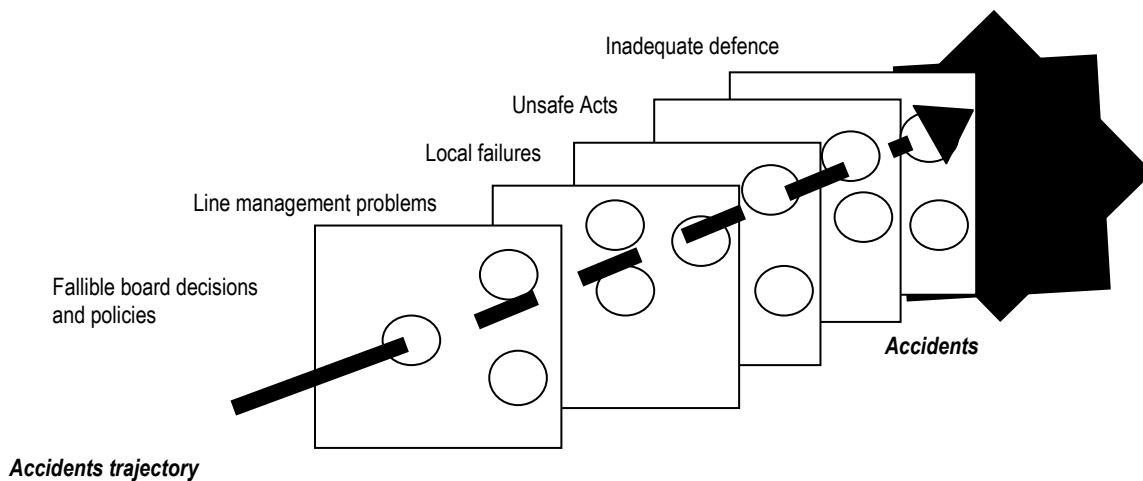
3.5. Management and control

As mentioned above, the effectiveness of a safety culture is dependent on the overall organisational behaviour, bringing me back to the interactive phenomenon (working interface), as extensively discussed in Article 1. The man-machine-environment concept is still valid and should not be forgotten (Oborne, 1985). It is believed that the majority of incidents are caused by unsafe behaviour, however, it has now been established that behaviour is never random and that it is very much influenced by the organisational structure as well as culture, group and individual perceptions and attitudes towards safety, driven by consequence, as cultivated by management. It is argued that workplace accidents caused by human error are frequently the unfortunate result of flawed systems of work (Health and Safety Authority, 2004). Major accidents can frequently be

traced to failures in safety management systems (Keltz, 1994, as cited by Hopkins, 2002). This finally brings me to the Swiss Cheese Model.

The 'Swiss Cheese' Model, designed by Reason (1997), uses an analogy in which an initial fault gets into the system, progressing along an 'accident trajectory' that depends on a weakness at the next level of system organisation (Hopkins, 2002; Bridger, 2003). If all the weaknesses, at all levels, coincide, like slices of Swiss cheese momentarily aligned so that it can be seen through the holes, an accident trajectory exists and an accident will occur (Bridger, 2003).

Model 2: 'Swiss Cheese model of accidents'



(Bridger, 2003, p. 467)

The Swiss Cheese Model (Model 2) illustrates that high technology systems will frequently suffer from weaknesses and failures in its defensive layers. According to Reason (2000, as cited by BMJ), high technology systems have many defensive layers: some are engineered (alarms, physical barriers, automatic shutdowns, etc.), others rely on people (control room operators, etc.) and yet others rely on procedures and administrative controls. In an ideal world, each defensive layer would be intact; however, in reality they are more like slices of Swiss cheese (Model 2), having many holes, which are continually opening, shutting and shifting their location (Reason, 2000, as cited by BMJ). According to the Model (2), a trajectory of accident opportunities is permitted when the holes in many layers momentarily line up – bringing hazards into damaging contact with victims (Reason, 2000). Furthermore, the holes in defences arise for two reasons: active failures and latent conditions. To explain how nearly all adverse events involve a combination of these two sets of factors (as cited by BMJ, 2000), a practical example of a real

incident that occurred on 18 May 2013 at a plant of the researched manufacturing group will be used. Special permission was received to use this information, relating to the incident, in this article:

The operator was performing his normal duties on the day of the incident when he managed to get his neck caught between a ‘can pusher’ and a frame of a pigment supply unit (See pictures 1-3 below). The same question asked in the Introduction is why did this brutal accident occur? According to the model, as stated above, the answer is the combination of active failures and latent conditions.

Active failures are the unsafe acts committed by people who are in direct contact with the system, and take a variety of forms – slips, lapses, fumbles, mistakes and procedural violations (Reason, 1990). Latent conditions are the inevitable “resident pathogens” within the system and arise from decisions made by designers, builders, procedure writers, and top-level management (Reason, 2000). Latent conditions have two kinds of adverse effects: firstly, they can translate into error provoking conditions within the local workplace (e.g. time pressure, understaffing, inadequate equipment, fatigue, and inexperience), and secondly, they can create long-lasting holes or weaknesses in the defences (untrustworthy alarms and indicators, unworkable procedures, design and construction deficiencies, etc.)(Reason, 2000, as cited by BMJ).

From the following facts concluded by investigators, it was found that the victim (operator) climbed over the door switch (safety sensor/device) and entered the danger zone of the machine without activating the emergency stop (lock-out procedure). The active failure in this case is that the operator ignored/violated the inherent rule – not to enter a danger zone without activating the emergency stop. The operator acted unsafely by climbing over the safety gate.

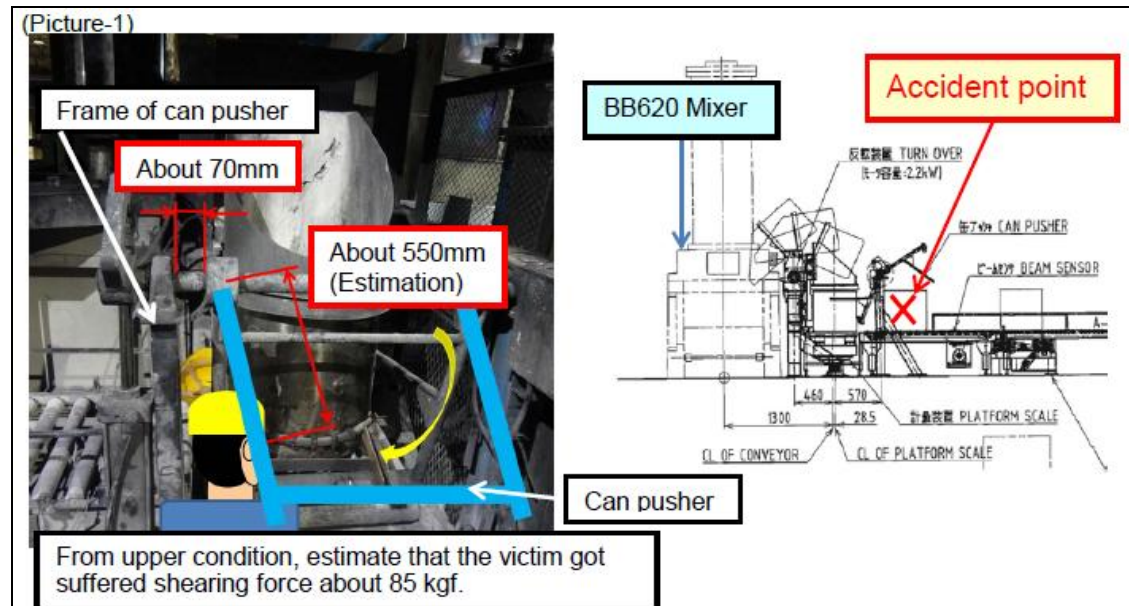
The investigators further considered the latent conditions and investigated the design of the work environment, known procedures and the build of the machine (as illustrated in pictures 1-3):

- (1) The safety gate (door switch) was found closed, with the victim in the danger zone.
- (2) The emergency stop was only activated by the first person to find the victim (Operator No.2).
- (3) The height of the safety gate (door switch) is 1200mm (refer to picture-2), while the height of the safety fence around the machine is 1800mm.
- (4) There were footprints on the frame in the upper part of the door switch (refer to picture-3).

(5) Regarding the air cylinder, which is the energy supply source for the can pusher, it was found that:

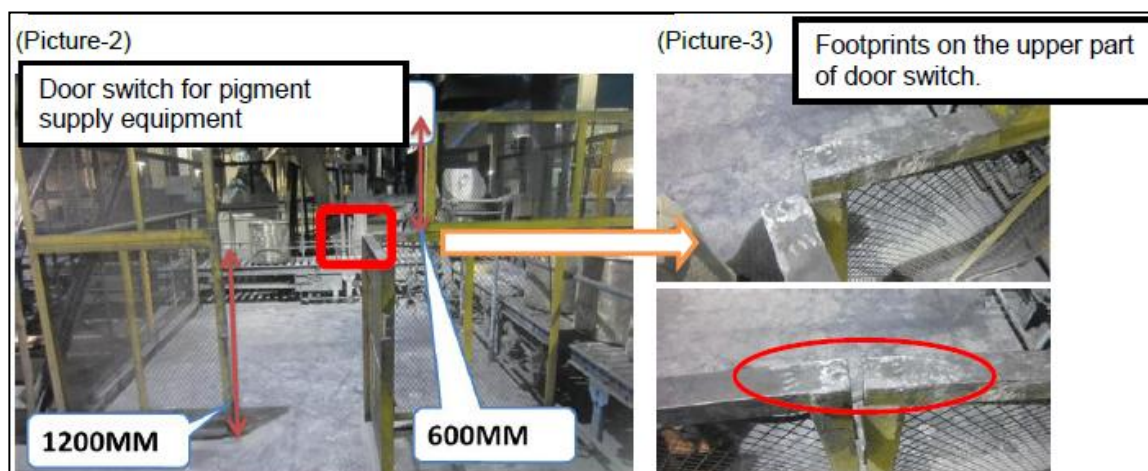
- a. the diameter is 100mm.
- b. the pressure is 0.4MPa.
- c. the thrust is 3140N (314kgf).

Picture 1: Latent conditions



(Incident investigation report dated 18 May 2013).

Pictures 2 and 3: Latent conditions (continue)



(Incident investigation report dated 18 May 2013, continue)

The error provoking conditions (the consequences that drove the unsafe behaviour) to this case is unknown, but may include time pressure, production urgency and/or fatigue. Facts that are known to the investigators (Kouji Matsuoka, General Manager, Occupational Safety, Health and Disaster Prevention Department, 2013) include:

- The design of the machine allowed the operator to climb over the safety gate;
- The operator was able to by-pass the safety sensor and to move into the danger zone without the machine switching off;
- The height of the safety gate is lower than the surrounding safety fence, creating access over the gate and into the danger zone;
- The operator failed to obey the safe operating procedure, indicating a shortfall in the system (culture, perception, attitude, leadership and management, prioritising of outcomes and goals, as discussed afore);
- The high pressure of the air cylinder ultimately caused the death of the operator;
- The air cylinder did not shut down and was able to function as normal, even though the operator was inside the danger zone.

In conclusion, the unsafe behaviour, demonstrated by the operator involved, in combination with the latent conditions of the system, created a momentarily alignment of holes that permitted the course of the accident that occurred (accident trajectory). This example, based on the Swiss Cheese Model, further proof that the interactive phenomenon between man-machine-environment exist and that accidents only occur when humans interact in an unsafe way with an environment where unsafe conditions exist. Therefore, it is still argued that an accident occurs as a result of the environment demanding more of the operator than he is able to give (Osborne, 1985). Environment here refers not only to the operators' physical- or psychosocial factors alone, but rather to the organisational system and organisational behaviour as a whole.

3.6. Error management

As explained above, systems management and risk management play a significant part in the occurrence of incidents and accidents. Human factor engineering (ergonomics management) considers two approaches in error management: limiting the incidence of dangerous errors, and creating systems that are better able to tolerate the occurrence of errors and contain their damaging effects (Reason, 2000). The Occupational Health and Safety Act (85 of 1993) refer to

the employer's responsibility to create a safe working environment, as far as reasonably practicable. As far as human error, unsafe acts or negligence is concerned, South African legislation further considers the employer's (or the reasonable person's) 'foreseeability of wrongful conduct on the part of others' (As cited in Anon, 2013). It concludes that 'there are certain situations where it is foreseeable that others will commit intentional or negligent wrongs, and in such case a reasonable person must take precautions against it'. 'The employer may himself therefore be negligent for failing to foresee and guard against the intentional and negligent behaviour of others' (Stansbie v Troman [1948] 2 KB 48 (CA) [1948] 1 All ER 599). Furthermore, where the employer has considered all possible alternatives and implemented as far as reasonably practicable all precautions, the employee has the obligation to interact with the environment in a safe way (OHSA, 85 of 1993, section 8). Keeping in mind that behaviour is never random, and that human error may be the result of flawed systems at work, one must also consider that the employer will be faced with certain situations where the employee is guilty of misconduct or negligent behaviour, as opposed to errors caused by consequence (as explained afore).

It is further very important to distinguish between human error and negligence or carelessness, which is viewed as misconduct. Negligence refers to 'failure to exercise the degree of care considered reasonable under the circumstances, resulting in an unintended injury to another party'. According to Fsp (2012) an employee who knows and understands what is expected of him and is aware of the level of care required to carry out his work tasks satisfactorily, but fails to take sufficient care, is guilty of misconduct/negligence. Although the law of delict does not distinguish different forms or degrees of negligence, or culpa (Cape Town Municipality v Payne 1923AD 207) the differences between negligence and gross negligence have been recognised in many areas of law. As Wessels, J. stated in C.S.A.R. v Adlington & Co. 1906 TS 964 at 973 "a person is guilty of gross negligence who gives no consideration whatever to the consequences of his act". A person is guilty of ordinary negligence (culpa levis) when he, though not grossly negligent, omits to take that care that ordinary people usually take in similar circumstances...." (As cited in the High Court of South Africa, Case no. AC 30/97, by Davis, 2000).

In *Government RSA (Department of Industry) v Fibre Spinners and Weavers (Pty) Ltd* 1977 (2) 324(D & CLD) at 335 E, Didcott, J. stated that gross negligence denotes “recklessness, an entire failure to give consideration to the consequence of his actions, a total disregard of duty”.

In the case of *S v Dhlamini* 1988(2) SA 302(A) at 308 it went on to follow the dictum that gross negligence includes an attitude or state of mind characterised by 'an entire failure to give consideration to the consequences of one's actions, in other words, an attitude of reckless disregard of such consequences' (at 143 F) (As cited in the High Court of South Africa Case No. AC 30/97, by Davis, 2000)).

Finally, negligence, carelessness or recklessness is viewed as a serious offence that places a great deal of strain on the organisation as a whole, whereas gross misconduct has the propensity to damage the trust relationship between the employee and the employer. In cases where negligence, as defined above, is evident, the employer may feel betrayed by the employee's actions of misconduct and disregard for rules and regulations. Where system flaws are not to blame for unsafe acts, the employer has the right to discipline unwanted behaviour. More so, the employer is faced with the responsibility to minimise, remove or eliminate the risk, in order to provide a safe work environment for the rest of the workforce. In doing so, the employer will turn to the code of good practice (Labour Relations Act, 66 of 1995, Schedule 8) as a guide to perform a fair disciplinary procedure.

A proper investigation (planning phase) is required before the employee is charged for misconduct. The Employer must consider the “second story” (as discussed afore) and the full back ground of the case, prior to the incident of alleged misconduct (negligence). A neutral third party will more likely be able to determine whether the act of unsafe behaviour was due to flawed systems at work (Swiss cheese model) or due to the employee's carelessness and failure to perform according to the known and desired standard (safety culture). The employer must be clear in charging the employee for misconduct, stating the degree of negligence and the reason why it has been brought against the employee. With reference to the incident as stated in the Introduction of this article, the two employees were charged with “negligence, in that they have failed to adhere to the safety rule not to enter any danger zone of any moving machinery or – equipment, without applying the emergency stop”. To test the substantive fairness of the charge as stated above, the employer is required to consider whether the employees were aware of the rule, or

whether it can be reasonably expected of the employees to have been aware of the rule, which they duly were. Secondly, the employer has to consider whether the rule was fair or reasonable, which it rightly was. Lastly, the employer needs to consider whether the rule was broken, which in this case the rule was deliberately and knowingly broken. Taking into consideration the background prior to the incident, this act of misconduct performed by the two operators followed a previous incident where an employee was dangerously close to losing his life at the same machine. The Employer followed up on the incident by creating more awareness in terms of safe behaviour and re-introduced the number one safety rule: the lock-out procedure. When the two operators ignored the employer's plead to take reasonable care of their own safety and of the safety of others (OHSA, 85 of 1993, section 8), the employer viewed their behaviour as disrespect towards the organisations safety culture and disregard for management's authority. The negligent act further stretched to recklessness, and what's more – insubordination, in that they have knowingly failed or ignored company policies and procedures.

Finally, the employer must consider a fair sanction, suitable to the degree of misconduct. As defined by case law, negligence refers to 'failure to exercise the degree of care considered reasonable under the circumstances, resulting in an unintended injury to another party', where gross negligence denotes "recklessness, an entire failure to give consideration to the consequence of his actions, a total disregard of duty". In terms of these definitions, the operators were grossly negligent and dismissal (termination of services) would be an appropriate sanction (Case number: 30/04/13; GATW6161-13).

In the case study discussed in the model of 'Ajzen's Theory of Planned Behaviour' (p. 6), the operator showed risk-taking behaviour, which resulted in an accident. In this case it was found that the operator's behaviour was driven by a perceived subjective norm and perceived behaviour control. Does this exclude negligence? Also in the case study discussed in the 'Swiss Cheese' Model (p. 69), it was found that latent conditions existed and momentarily alignment of system flaws resulted in the accident. Again, does this exempt the employee for being found guilty of negligence in that he failed to comply with the safety rules?

The Occupational Health and Safety Act (85 of 1993) stipulates that the employer and the employee are jointly responsible for the health and safety of the workplace: the employer has the responsibility to provide a safe work environment, as far as reasonably practicable, and in turn,

the employee has the responsibility to interact with the environment in a safe way (working interface). Therefore, the employee must take responsibility for his/her actions and must be held accountable for negligent behaviour or risk-taking behaviour.

In conclusion, with regard to behaviour based safety, it is important to understand that behaviour is never random and inspired by a desirable outcome. To understand this, the employer has the advantage to be able to predict and foresee unwanted behaviour. Behaviour based safety allows the employer to perform hazard identification and risk assessment to promote safe behaviour, safe operating procedures and to ensure compliance with rules and regulations. Psychosocial risk management is important for sound human resource management and supports labour relations management in that it relies on reinforcements, rather than punishment (refer to the studies of FW Skinner). By performing a proper risk assessment, analysing the physical and psychosocial environment allows the employer to foresee wrongful conduct on the part of others (negligence), and to change the predicted behaviour. Therefore, it is concluded that the psychosocial risk environment has an advert effect on labour relations management.

METHODOLOGY

SAMPLE

For the purpose of this quantitative research study, a structured questionnaire was used to collect the data. This section describes the sampling method, research participants and study population, questionnaire and statistical analysis conducted.

Study population and research participants

The research was conducted at one of South Africa's largest factories in the manufacturing industry. The research participants consist of adult employees employed by this specific manufacturing company in different departments and at different levels. This industry is deemed appropriate due to the nature of business found in the manufacturing industry where it is expected that occupational risks, as well as health and safety hazards will be present to some degree. Simple random samples of 280 employees employed on a full-time basis, including senior management, middle/line management, office staff and operator level, responded to the questionnaire. However, after revision, only 251 answer sheets were accepted by the researcher. The questionnaire was issued with a cover letter and included with the participants' payslips. The

questionnaire was promoted as voluntary and anonymous. Permission was obtained to conduct the study at the factory. The purpose of the study was explained verbally and in writing to management and to the workers. The participants have been assured that no negative consequences will emerge for those who participated in the research process. The final report will be made available to both management and the workers.

Simple random samples (251) were obtained from employees working at the factory, out of a total of 816 employees employed at the same manufacturing company. The organisational design consists out of:

- Senior Executive Management – 12
- Top / Departmental Management – 24
- Line management (Foremen) – 57
- Office Staff – 62
- Artisans – 56
- Operators – 603

To determine the study population the following formula has been used (N = 814; n = 200):

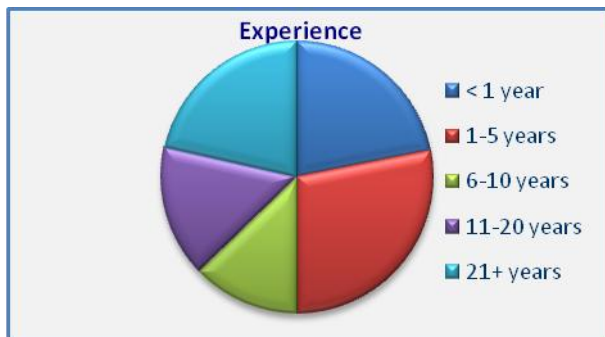
$$\frac{n1}{n} = \frac{N1}{N}$$

Table 3:

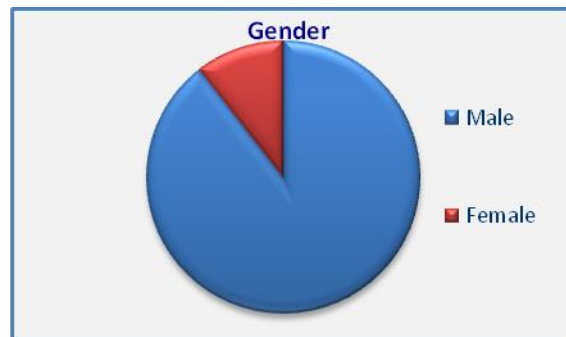
Stratum	Stratum extent	Sample	Participants
Senior / Executive management	12 (N1)	3	-
Top / Departmental management	24 (N2)	6	13
First line management (foremen)	57 (N3)	14	14
Office Staff	62 (N4)	15	38
Artisans	56 (N5)	14	51
Operators, Forklift- / Crane operator, other floor workers.	603 (N6)	148	135
	Total	200	251

Geographical characteristics of respondents:

Graph 1:



Graph 2:



The majority of respondents were male (89.5%), while female respondents represented 10.5% (Graph 2). This is consistent with the fact that the majority of employees employed at the factory are male employees.

Furthermore, the largest group of the respondents (28%) have experience at the manufacturing company for period of approximately 1 - 5 years, followed by a group of respondent who have been employed for more than 21 years (21.4%) and less than one year (21.8%), while the minority of respondents have been employed for the periods between 6-10 years (12.8%) and between 11-20 years (15.6%).

The research questionnaire:

The questionnaire was drafted from the Dutch Musculoskeletal Questionnaire (TNO Work and Employment, 2001), Ergonomics Risk Identification and Assessment Tool, (CAPP and CPPI Ergonomics Working Group, 2000), HSE Safety Climate Survey Tool (Health and Safety Executive, 2002), Survey Ergonomics in the Workplace (National Seafood Sector Council, 2005). The questionnaire was divided into subsections addressing 1) health, including physical fitness, strength and endurance; 2) work, including type of work, rotation, repetitiveness and workload; 3) employee wellness, including job satisfaction, exhaustion and work-home balance; 4) organisational culture, including management commitment, expectations, perceptions and organisational climate; and 5) labour relations, including the employment relationship between employer and employee and behaviour. The validity of the questionnaire was tested in order to ensure a suitable and appropriate measuring battery to answer the specific research objectives and will be discussed in more detail below.

STATISTICAL ANALYSIS

The statistical analysis of the data was conducted through the assistance of different statistical techniques, carried out by the SPSS program (SPSS Inc, 2007). The analysis was done in three stages: a factor analysis, a cluster analysis, and an analysis of significant differences between two group clusters of employees working at the manufacturing plant.

Firstly, a principal axis factor analysis, using an Oblimin rotation with Kaiser normalisation, was performed to explain the variance-covariance structure of a set of variables through a few linear combinations of these variables. The Kaiser-Meyer-Olkin measure of sampling adequacy was used to determine whether the covariance matrix was suitable for factor analysis. Kaiser's criteria for the extraction of all factors with eigenvalues larger than one were used because they were considered to explain a significant amount of variation in the data. All items with a factor loading greater than 0.3 were considered as contributing to a factor, and all items with loadings less than 0.3 as not correlating significant with this factor (Steyn, 2000). Any item that cross loaded onto two factors with factor loadings both greater than 0.3 was categorised in the factor where interpretability was best. A reliability coefficient (Cronbach's alpha) was computed for each factor to estimate its internal consistency. All factors with a reliability coefficient above 0.6 were considered as acceptable in this study. The average inter-item correlations were also computed as another measure of reliability, and lie between 0.15 and 0.55 (Clark & Watson, 1995).

Secondly, a cluster analysis, using Ward's method with Euclidean distances, was performed. A cluster analysis is a multivariate interdependence technique, which primary objective is to classify objects into relatively homogeneous groups based on the set of variables considered, and it is mostly an exploratory technique (Hair, Bush & Ortinau, 2000). Hierarchical clustering makes no assumptions concerning the number of groups or group structure. Instead, the members are grouped together based on their natural similarity (Johnson & Wichern, 2007). This research did not take an a priori view of which data points should fall into which segment. Rather, a hierarchical cluster analysis was used to explore the natural structure of the data, by means of Ward's method of Euclidean distances.

Thirdly, independent t-tests, two-test frequency tables, and chi-square tests were used to investigate any significant differences between the clusters. The p-value was analysed to consider

the statistical significance of the results. A small p-value (< 0.5) is considered as sufficient evidence that the result is statistically significant (Ellis, 2003).

In many cases, it is important to know whether a relationship between two variables is particularly significant. The statistical significance of such a relationship is determined with the Chi-square test, to conclude the effect size:

(a) Small effect: $w=0.1$, (b) medium effect: $w=0.3$, large effect: $w=0.5$

A relationship with $w \geq 0.5$ is considered as particularly significant (Ellis & Steyn, 2003).

RESULTS AND DISCUSSION

This section discusses the results of the factor analysis and presents the results of the t-tests and cross-tabulations with chi-square tests to investigate significant differences. The two clusters represent the lower-skilled respondents, including operators, forklift-/crane operators, artisans, and other floor workers (cluster 1) in relation to higher-skilled respondents, including support staff, line-, middle-, and top management (cluster 2). Cluster 1 further represents the majority of employees working at the manufacturing plant, while cluster 2 represent the smaller group of people employed at the manufacturing plant. The respondents from Cluster 1 are more exposed to the physical work environment and interaction between the man-machine environment and more likely to perform physical- and tiring tasks.

Table 4:

T-test result for employee physical-/mental health and work input factors in two clusters.

		N	Mean	Std. Deviation	Std. Error Mean	Effect size (w)	t-value	P
Health Status	Cluster 1	161	3.609	.6242	.0492	0.09	.624	.534
	Cluster 2	65	3.554	.5871	.0728			
Fitness Status	Cluster 1	152	3.257	.8178	.0663	0.21	1.416	.159
	Cluster 2	65	3.077	.8716	.1081			
Work requires strength	Cluster 1	159	3.277	.6927	.0549	0.78	5.628	.000
	Cluster 2	65	2.600	.8624	.1070			
Work requires endurance	Cluster 1	141	3.199	.6784	.0571	0.34	2.342	.021
	Cluster 2	61	2.918	.8225	.1053			
Health complaints	Cluster 1	157	1.764	.8559	.0683	0.10	.817	.415
	Cluster 2	65	1.677	.6640	.0824			
Suffering from tension at work	Cluster 1	155	2.335	1.0768	.0865	0.37	-2.949	.004
	Cluster 2	65	2.738	.8529	.1058			

Feeling nervous at work / anxiety	Cluster 1	153	2.000	1.0942	.0885	0.06	.437	.662
	Cluster 2	65	1.938	.8817	.1094			
Feeling tired in the mornings	Cluster 1	156	2.269	1.0370	.0830	0.06	-.476	.635
	Cluster 2	63	2.333	.8424	.1061			
Feeling physically tired at the end of a working day	Cluster 1	159	3.119	.8669	.0687	0.32	2.270	.025
	Cluster 2	64	2.844	.8012	.1001			
Feeling mentally tired at the end of a working day	Cluster 1	157	2.720	1.0429	.0832	0.31	-2.453	.015
	Cluster 2	65	3.046	.8372	.1038			

As Table 4 shows, lower skilled workers and higher-skilled workers differ significantly based on their experience of physical- and mental work input and health status ($w \geq 0.3$). In general, employees feel that their health status is good. Employees who are more exposed to the physical environment of the manufacturing industry (cluster 1), have a better perception of their own fitness status, in that their work requires more physical strength, while higher-skilled employees from cluster 2 feel that their work requires more endurance (patience or persistence). In correlation with this statement, it is shown that higher skilled workers experience more frustration and tension at work, while the level of work anxiety is experienced relatively the same between both groups. Lower-skilled workers are physically more tired at the end of a working day, while higher skilled workers are more mentally tired at the end of a working day.

Table 5:

T-test result for employee wellness – home/work balance factors in two clusters.

Group Statistics								
Skill		N	Mean	Std. Deviation	Std. Error Mean	Effect size (w)	t-value	P
Experience of psychosocial stress	Cluster 1	156	2.3553	.63774	.05106	0.29	2.172	.032
	Cluster 2	64	2.1682	.55490	.06936			
Experience of job satisfaction	Cluster 1	155	2.8817	.60339	.04847	0.37	-2.900	.004
	Cluster 2	64	3.1042	.47559	.05945			
Experience of workload	Cluster 1	156	2.4295	.52365	.04193	0.67	4.921	.000
	Cluster 2	64	2.0807	.45715	.05714			

In relation with Table 4, Table 5 further shows that lower-skilled workers and higher-skilled workers differ significantly based on their experience of psychosocial stress, job satisfaction and experience of workload ($w \geq 0.3$). In this section however it was found that workers who are more

exposed to the physical environment of the manufacturing industry, suffer on average more with psychosocial stress, perceive less job satisfaction and experience a higher rate of workload.

Table 6:

T-test result for organisational culture/-climate at the manufacturing plant in two clusters.

Group Statistics								
Skill		N	Mean	Std. Deviation	Std. Error Mean	Effect size (w)	t-value	P
Experience of social support.	Cluster 1	156	2.6092	.66496	.05324	0.27	-2.264	.025
	Cluster 2	64	2.7891	.47175	.05897			
General perception of the employer.	Cluster 1	156	2.7217	.73902	.05917	0.21	-1.725	.087
	Cluster 2	64	2.8766	.54039	.06755			
General perception of safety at work.	Cluster 1	153	3.072	1.0007	.0809	0.19	-1.609	.109
	Cluster 2	62	3.258	.6512	.0827			
General perception of tolerance for safety violations.	Cluster 1	153	1.895	1.1480	.0928	0.19	1.367	.174
	Cluster 2	62	1.677	1.0207	.1296			
General perception of Management's safety image.	Cluster 1	151	3.099	.9644	.0785	0.20	-1.597	.112
	Cluster 2	62	3.290	.7103	.0902			

Table 6 shows a small to medium effect ($w < 0.3$) or difference between lower- and higher-skilled workers, indicating that the general perception of the organisational safety culture is perceived relatively the same between the two groups.* The importance of safety at work is viewed as a high priority at all levels of the organisation. However, cluster 2 (higher skilled workers) experiences a higher level of social support, has a more positive view of the employer, and has a better perception of management's safety image. These differing perceptions between the two groups relating to the organisation's safety culture, image and climate may form a basis of differing expectations and needs, subsequently influencing the labour relationship between employer and employee. Table 7 below shows the effect of these differing views and expectations on the labour relationship and favourable behaviour.

* Refer to literature – all levels and people from different backgrounds and perceptions experience the same safety culture, where a safety culture exists in a given organisation.

Table 7:

T-test result for labour relations perceptions and favourable behaviour at the manufacturing plant in two clusters.

Group Statistics								
Skill		N	Mean	Std. Deviation	Std. Error Mean	Effect size	t-value	P
General perception of accident causes.	Cluster 1	153	3.0268	.69368	.05608	0.48	-3.757	.000
	Cluster 2	64	3.3625	.55649	.06956			
Attitude towards unsafe behaviour.	Cluster 1	154	1.6380	.52023	.04192	0.10	-.667	.506
	Cluster 2	64	1.6927	.56380	.07048			
General perception of responsibility and discipline.	Cluster 1	154	3.3598	.49897	.04021	0.27	-1.832	.070
	Cluster 2	64	3.4974	.50722	.06340			
General feeling towards a high risk work environment.	Cluster 1	150	2.847	.9177	.0749	0.34	2.492	.014
	Cluster 2	64	2.531	.8159	.1020			
General perception of Management's responsibility.	Cluster 1	146	2.363	1.0627	.0880	0.36	2.540	.012
	Cluster 2	62	1.984	.9494	.1206			
General perception of the Employer's influence towards accidents.	Cluster 1	142	2.155	.7746	.0650	0.50	3.705	.000
	Cluster 2	64	1.766	.6605	.0826			
Perception of the Employer-Employee Safety Relations	Cluster 1	147	2.367	.8996	.0742	0.21	1.455	.148
	Cluster 2	63	2.175	.8714	.1098			

As Table 7 shows, lower-skilled workers and higher-skilled workers differ significantly based on their perception of the employer's responsibility in terms of safety and their experience or views of accident causes in the organisation ($w \geq 0.3$; $w \geq 0.5$). Cluster 2 (higher-skilled workers) more significantly agreed that accidents in the workplace occur as a result of unsafe behaviour, unsafe interaction with the environment and failure to obey safety rules, in relation with the response from cluster 1 (lower-skilled workers). Both groups however strongly agreed that safety rules may never be compromised or broken. This perception supports the finding in Table 6 above that the safety culture is perceived relatively the same between the two groups. Nevertheless, cluster 2 (higher skilled workers) felt stronger that it is fair to discipline unsafe behaviour or violations of safety rules. Cluster 1 (lower skilled workers) experience more anxiety in a high risk work environment and is more likely to believe that the employer is responsible for their safety.

It may be concluded that workers, who are exposed to a higher risk work environment experience a greater fear in terms of safety in their areas of work based on their physical interaction with the

environment. These workers are more likely to believe that accidents are the result of an unsafe workplace or work environment opposed to unsafe behaviour. Furthermore, this group of workers are more likely to expect the employer to foresee safety risks and hazards (as stated afore, p. 23) and holds the employer responsible for their safety at work; whereas the higher-skilled workers (junior-, line-, middle- and top management) expect the workers to interact with the environment in a safe way and are more likely to believe that most accidents occur from unsafe behaviour, poor performance or misconduct and a failure to adhere to safety rules.

CONCLUSION

The aim of this article was to explore occupational risk and the dynamics of unsafe acts, unwanted behaviour and misconduct. The assumption was made that the psychosocial risk environment could influence employee behaviour and subsequently the labour relationship between employer and employee. The unique nature and commonness of negative acts, such as unsafe behaviour, human errors, poor performance and negligence, also referred to as unsafe practice, were explored in correlation with system flaws, safety culture, leadership, perceptions, expectations and organisational behaviour as a whole. Case studies were used as examples to answer and explore the question why incidents and accidents in the workplace occur within the working interface dynamic. The literature review investigated the nature of psychosocial risks and the origin of negative acts or unsafe behaviour. It was concluded that behaviour is not random and does not occur without some thought process preceding it (Kruger & Wyngaard, 2009). Furthermore, it was established that accidents do not always follow automatically from risk-taking behaviour. Within the working interface dynamic, the key components include: the human; the machine and the method of interaction between the components. When the method is flawed, for various reasons, it can create terrible consequences for individuals and the organisation as a whole (Health and Safety Authority, 2004; Germain, Bird & Labuschagne, 2011). Therefore, it can be concluded that the overall dynamics of the organisation's activities, systems, and organisational behaviour play a significant role in safe operational efficiency. Furthermore, in correlation with this statement, the impact of (safety) culture was viewed in particular and to the highest degree as an important component (Reiman & Oedewald, 2002). According to Germain et al. (2011), it is how people perceive, understand and commit to 'safety at work', and can be measured by observing the vision, values and commitment of people at all levels. Attitudes are a key element of a safety culture, and research has revealed that factors, such as attitudes and behaviour, are much more

capable of predicting employees' safety performance at work (Psych Press 2009 – Talent Management Psychologists).

The findings of the statistics drawn from the research questionnaire also portray comparisons between unsafe behaviour and psychosocial risk factors:

Employees who interact more directly with the physical work environment of the manufacturing plant perceive their work to be physically tiring and that it requires more physical strength, while higher-skilled employees feel that their work requires more endurance, patience or persistence. In correlation with this statement, it is shown that higher-skilled workers experience more frustration at work, and experience more tension as a result of higher expectations and based on the levels of job responsibility. Despite these differing expectations and level of responsibilities and exposure, the intensity of work anxiety is experienced relatively the same between both groups (lower- and higher-skilled worker). Therefore it can be concluded that occupational stress is a relative term, independent or free from the level of work or responsibility and physical or mental outputs of employees. Lower-skilled workers are physically more tired at the end of a working day, while higher-skilled workers are more mentally tired at the end of a working day, but the level of work stress/anxiety was psychologically experienced to the same degree at both levels. It is important here to understand that the term 'psychological' is different from 'psychosocial', and refers more narrowly to thought processes and behaviour of individuals (Burton, Kendall, Pearce, Birrell & Bainbridge, 2008).

Psychosocial risks are organisational factors that affect the psychological safety and health of employees (Gilbert, 2010). Psychosocial factors include the way the work is carried out (deadlines, workload, work methods) and the context within which work occurs, including relationships and interactions with managers and supervisors, colleagues and co-workers, and clients or customers (Guarding Minds at Work, 2012).

Within this context, it was found that workers, who interact more directly with the physical environment of the manufacturing industry, suffer on average more with psychosocial stress, perceive less job satisfaction and experience a higher rate of workload. According to Newell (2002), certain jobs are more demanding than others and certain features will generate high levels of psychosocial pressure, including: unpleasant and dangerous physical conditions; monitoring of devices or materials; as well as repeated exchange of information with others. These are typical

examples of activities that the lower skilled workers will perform on a normal day-to-day basis at the manufacturing plant. Bowin and Harvey (2001) also includes factors such as little control over the work environment; lack of participation in decision-making; sudden reorganisations and unexpected changes in work schedules and not enough time to do the expected duties. This finding superbly reflects the dynamic differences between superiors and subordinates. Furthermore, higher-skilled workers experienced a higher level of social support, have a better impression of the employer, and have a better and more positive perception of management's safety image. These differing perceptions between the two groups relating to the organisation's safety image and -climate may form a basis of differing expectations and needs, subsequently influencing the labour relationship between employer and employee. Furthermore, the higher-skilled workers felt stronger in terms of disciplining unsafe behaviour or violations of safety rules, while lower-skilled workers believe that the employer is responsible for their safety. Furthermore, higher-skilled workers feel that accidents in the workplace occur as a result of unsafe behaviour, unsafe interaction with the environment and failure to obey safety rules, as opposed to the response from lower-skilled workers, as stated before.

Finally, it can be concluded that the problem statement and research questions are accepted in that the psychosocial risk environment will either provoke desirable or undesirable behaviour from the individual employee, subsequently influencing the trust relationship between employer and employee and the organisation as a whole (Labour Relationship).

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CAPTER 4: SUMMARY AND CONCLUSION

INTRODUCTION

This study was conducted at one of the largest manufacturing companies in South Africa with the aim to explore the relationship between occupational risk and labour relations in the manufacturing industry. Occupational risk was viewed from two main perspectives: the physical risk environment (Chapter 2, p. 23) and the psychosocial risk environment (Chapter 3, p. 54) and the interaction of the human operator with the environment. In order to fully understand the labour relationship, the organisation as a whole was examined to completely recognise the different role-players, including the employer and the employee, and the interaction of the human with equipment, technology and the systems of the organisation. This interaction between the human and the environment, better described as the working interface, was explored as the area of concern where accidents usually take place: in that loss incidents only occur when an employee interacts with the condition in an unsafe way, where unsafe conditions exist, as explained before (Strydom, 2009; Chapter 1, Introduction, p. 8). The concern was raised that accidents and incidents still arise in the workplace, after many systems have been put in place to regulate and guide safe work procedures.

The relationship between the employer and the employee is regulated by legislation, including the Basic Conditions of Employment Act; the Labour Relations Act; the Employment Equity Act; the Skills Development Act; and most importantly in terms of the nature of this study, the Occupational Health and Safety Act (85 of 1993) (Also refer to Chapter 1, p. 8). Legislation provides solid guidelines in terms of promoting the relationship between the employer and the employees. It clearly stipulates the roles and responsibilities of the parties involved. In short, it is accepted that the fundamental role of the employer is to ‘provide’ and the single most important role of the employee is to ‘comply’. The employer has the responsibility to provide a safe work environment as far as reasonably practicable, including, again, the safe design of the workplace and machinery, adequate systems and technology, personal protective equipment and safe surroundings to perform normal day-to-day activities. The employee has the responsibility to interact with the environment in a safe way, and to comply with the standard operating procedure, safe work procedures, codes, disciplines, rules and regulations. Furthermore, the employee has the responsibility to take reasonable care of his/her own safety and of the safety of others. When conflict arises, due to differing expectations and perceptions in terms of the roles and responsibilities, the trust relationship may be compromised (Chapter 1, Introduction and problem

statement, p. 8-11). Subsequently, these hazards and risk factors may influence the labour relationship between the employer and the employees.

PROBLEM STATEMENT

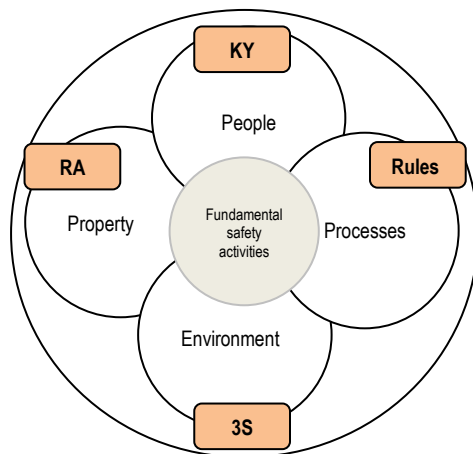
In relation to the above, the problem statement derived and explored in the previous chapters, finds that “the interaction between man, machine and the environment, better described as ergonomics or human engineering, will have an effect on human behaviour, employee wellbeing and desired capacity to perform a certain task, consequently influencing the labour relationship between employees and the employer, specifically in a high risk manufacturing industry.” Finally, it can be concluded that the research question and the general statement that were made, are hereby accepted and the evidence clearly indicates a strong relationship and correlation between the variables. The importance of this study for all operational managers in the manufacturing industry is to understand the magnitude of the human systems interface technology concept in terms of managing, not only occupational risks, but more importantly to regulate healthy labour relationships in a high risk work environment (Refer to Chapter 2, Handling incapacity due to ill health or injury as a result from human interaction with a high risk work environment, p. 43; Chapter 3, Error management, p.69).

LITERATURE REVIEW

The importance of occupational risk management has been established as a fundamental part of labour relations management. Risk management has become one of the vital functions within organisations today in enhancing profitability through the reduction of loss, and protecting the organisation from avoidable and potential loss (Germain, Bird & Labuschagne, 2011). Heller (2006) emphasises the essential need for businesses to run as effectively and efficiently as possible to eliminate wasteful operations that do not add value to their products and services. “Many companies have turned to a combination of lean manufacturing and ergonomics to assist in reducing wasteful activities and improving productivity, employee health, and profits” (Heller, 2006). Risk management may be one of the few remaining areas of business management with major cost reduction potential (Germain et al., 2011). Risk management is a holistic and integrated approach to management’s control of loss and it is part of an overall proactive strategy to achieve continuing improvement (Kaizen) in all aspects of an organisation.

Significant developments have taken place in a number of areas that brought great changes in the philosophy and general practices of safety and loss control management within the industrial establishment (Germain, Bird, & Labuschagne, 2003). These same activism factors also impact the other disciplines of nearly every aspect of an organisation, considering the extent of the influence on all resources: its people, property, processes and the environment (Germain, Bird, & Labuschagne, 2003). The safety activism factors, illustrated in Figure 1, were examined as part of the working interface concept in the previous chapters, and strongly correlate with the four fundamental safety activities that were identified by the research manufacturing company as explained in the introduction of this chapter (see below). These four fundamental safety activities create a basis for an effective management system of specific principles, performance standards and activities that have proven to be successful in achieving the desired results (Germain et al., 2003). The prevention and control of undesired incidents are at the heart of a risk management system, and understanding the causes and consequences of incidents is the key control for any organisation (Germain et al., 2003).

Diagram 1: Four fundamental safety activities



(Safety mission statement of the research manufacturing company in correlation with the safety activism factors of organisation resources, Germain et al., 2003, p. 32)

The reason why it is important for management to understand the causes and consequences of incidents, is to develop an ability to ‘predict’ and identify potential loss and unwanted behaviour (Chapter 3, Error management, p. 69). There have been many studies that identify the ratio of major, minor and property damage incidents, including near-misses, and it is argued that for

approximately 30 property-damaging incidents, at least 10 minor injuries can be expected; and for every 10 minor injuries, at least one serious or major incident can be expected (Bird's 1969 US Ratio Study). It comes down to the belief that by identifying a high frequency rate of low severity incidents, the probability exists that exposure to these hazards has the propensity to evolve into a higher and more severe incident, when no attention is paid to the 'warning signs' of near misses and less serious incidents.

This concept further correlates with the Swiss Cheese Model (SCM), which was examined and discussed in Chapter 3 (Management and control, Model 2). The model points out what defines an organisational accident, namely the concurrent failure of several defences, facilitated, and in some way prepared, by suboptimal features of the organisation design (Eurocontrol Experimental Centre, 2006). In particular, it conveys the fact that no one failure, human or technical, is sufficient to cause an accident. Rather, it involves the unlikely and often unforeseeable conjunction of several contributing factors arising from different levels of the system (Eurocontrol Experimental Centre, 2006). However, it is argued that when an effective system is implemented and managed, these system flaws can be identified and controlled before they escalate to a major or serious incident (with reference to Chapter 3 of this study).

Finally, in conclusion, a systematic study of work systems with the purpose of developing the preferred system and method (Barnes, 1963) has become increasingly important for effective business management. This study concluded the importance of ergonomics and other multivariate disciplines in this regard, not only to prevent incidents and injuries, but also to manage overall organisational performance that has the potential to affect the labour relationship between the employer and employees. Ergonomics also involves operator accuracy, comfort and satisfaction, in addition to considering the effects of aspects of his environment such as noise, temperature, and illumination (Oborne, 1985). Therefore, the aim of ergonomics is to consider and to optimise the total work system, rather than merely to manipulate the human link in the chain (Oborne, 1985). Further in line with ergonomics is the field of operations research (OR) that strives to produce an optimum total work system by forecasting the future requirements of the system and then planning the workload and system to meet these requirements (Oborne, 1985). Furthermore, organisational behaviour (OB) and organisational development (OD) are an interdisciplinary field dedicated to better understanding and managing people as part of the organisational system at work (Kreitner & Kinicki, 2008).

OD involves major changes in the organisation – changes in the way work is done, changes in the structure of systems, and perhaps changes in the physical plant. If environments were perfectly static, if employees' skills and abilities were always up-to-date and incapable of deteriorating, and if tomorrow was always exactly the same as today, organisational change would have little or no relevance to management (Robbins, Odendaal, & Roodt, 2007). The aim is to improve the functioning of the organisation, to make it more flexible and adaptable to change, to make it better equipped to solve problems and to handle conflict. Vail (1989) explains that organisational changes should be thought of as balancing a system made up of five interacting variables within the organisation, i.e. people, tasks, technology, structure and strategy (Vail, 1989, as cited by Robbins et al., 2007, p. 426):

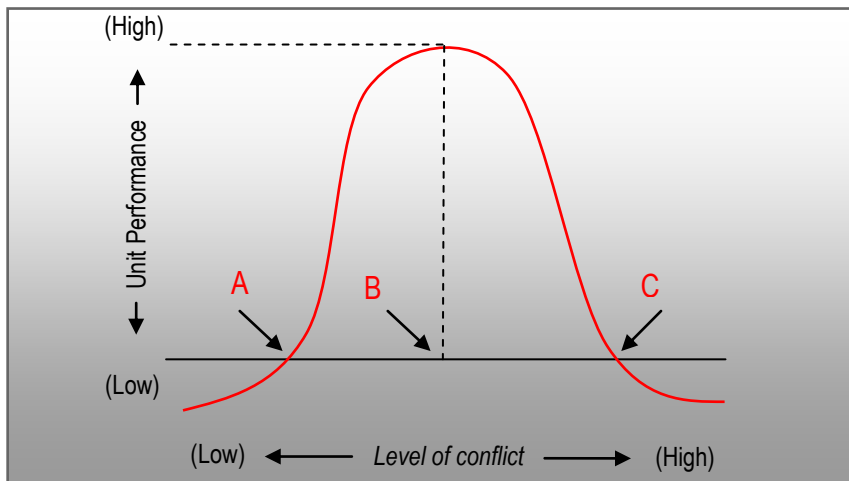
‘A change in any one variable has repercussions for one or more of the others. This perspective is episodic in that it treats organisational change essentially as an effort to sustain equilibrium. A change in one variable begins a chain of events that if properly managed, requires adjustments in the other variables to achieve a new state of equilibrium.’

Therefore, organisational change management comes back to the working interface concept – the interaction between the worker, processes, facilities and equipment (Chapter 1, Introduction and problem statement). Ergonomics takes as its central concern the human operator, his/her performance, as well as his/her safety and comfort (Oborne, 1985). Operations research and organisational behaviour are also interested in the performance and wellbeing of the human operator as he/she is valuable to the system and success for the business and organisation as a whole (Oborne, 1985). The working interface also considers the psychosocial risk environment, including leadership, organisational culture, the safety enabling system and the organisational sustaining system. This study furthermore focused on factors such as the organisation's safety strategy, authority structure and safety culture that can provide a favourable or unfavourable climate for the group to operate within (Robbins et al., 2007). A number of structural factors show a relationship to performance, including role perceptions, norms, status inequities, and cohesiveness, among others (Robbins et al., 2007). Furthermore, there is a positive relationship between role perception and an employee's performance evaluation (Verney, 1983). This study further considered the level of conflict that may arise from differing expectations and perceptions as a result of the physical- and psychosocial risk factors, as explained in Chapters 2 and 3. The

aim of this study was ultimately to show that the environmental risk factors have an effect on labour relations, directly or indirectly (Chapter 2 and Chapter 3, Conclusions).

It is often assumed that conflict is related to lower organisational performance (Robbins et al., 2007). Robbins et al. (2007) explain that inadequate or excessive levels of conflict could hinder the effectiveness of a group or an organisation, resulting in group members being less satisfied, increased absence and turnover rates, and eventually, lower productivity. Similarly, job-related stress (as a result of environmental risk factors rising to conflict), can cause job-related dissatisfaction (Steffy & Jones, as cited by Robbins et al., 2007). However, stress manifests itself in other psychological states that can enhance conflict, for instance, tension, anxiety, irritability, boredom, and procrastination (Robbins et al., 2007). Evidence indicates that when people are placed in jobs that make multiple and conflicting demands or in which there is a lack of clarity as to the incumbent's duties, authority and responsibility, both stress and dissatisfaction are increased (Cooper & Marshall, 1976). Finally, behaviour-related stress symptoms include changes in productivity, absence, and turnover (Robbins et al., 2007). In conclusion, the significant relationship between job-related stress, as a result of occupational risk factors as explained before, ensuing in conflict, is illustrated below:

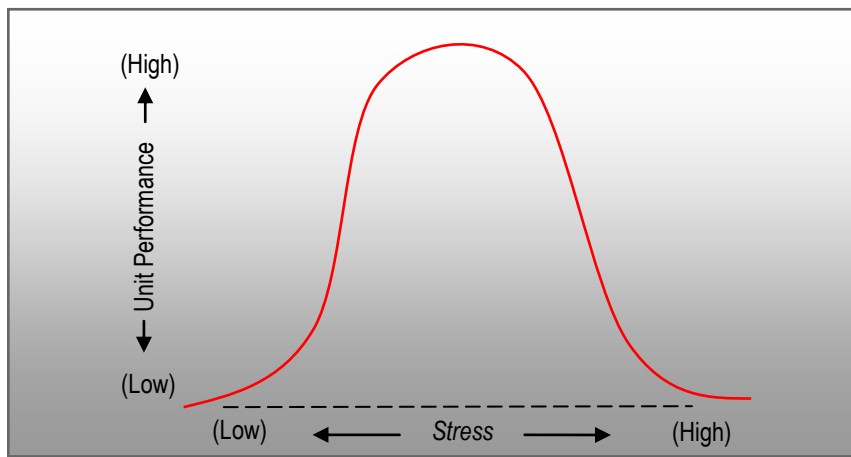
Graph 1: Conflict and unit performance



Situation	Level of conflict	Types of conflict	Internal characteristics	Performance outcome
A	Low or none	Dysfunctional	Apathetic; Stagnant	Low
B	Optimal	Functional	Viable; Innovative	High
C	High	Dysfunctional	Disruptive; Chaotic	Low

(Robbins, et al., 2007, p. 303)

Graph 2: Inverted U relationship between stress and job performance



(Robbins et al., 2007, p. 424)

Graphs 1 and 2 above indicate the similarities between high (dysfunctional) levels of conflict and high levels of stress, in relation to performance, as identified during this research study. Unattainable demands or constraints, in a high risk- and demanding work environment, place a great deal of stress on a person, which results in stress, burnout, lower performance and finally dysfunctional conflict (Robbins et al., 2007). The graph above (Graph 1) illustrates that conflict can either be constructive or destructive to the functioning of a group or a unit. Furthermore, the patterns above may also describe the reaction to stress and conflict over time, as well as to changes in stress and conflict intensity (Robbins et al., 2007). It can finally be concluded that the illustrations above can predict the influence on performance and ultimately on the labour relationship, purely by understanding the reactions of human behaviour towards environmental risk factors, which was the greatest focus of this study.

With reference to the above, this study focused on the psychosocial risk environment (personal motivation, perception and behaviours) and the physical risk environment (infrastructure, design and industrial hygiene). A widely accepted assumption is that better workplace environments motivate employees and produce better results (Leblebici, 2012). An organisation's physical environment and design of the workplace may result in a 5 to 10 percent increase in employee productivity (Leblebici, 2012). Increasingly, it is found that an organisation's physical layout is designed around employee needs in order to maximise productivity and satisfaction (Stallworth & Kleiner, 1996). Consequently, the physical environment is a duty that can be leveraged both to

improve business results and employee wellbeing (Mohr, 1996; Huang, Robertson, & Chang, 2004, as cited by Leblebici, 2012). It is critical to ensure that adequate facilities are provided to employees, to generate greater employee commitment and productivity (Leblebici, 2012). The provision of inadequate equipment and adverse working conditions has been shown to affect employee commitment towards the organisation, as well as the level of job satisfaction and the perceptions. This statement was confirmed by the research results, as discussed below.

Sekar (2011) argues that the relationship between work, the workplace and the tools of work, becomes an integral part of work itself. The management of that dictates how, exactly, to maximise employee productivity that centres around two major areas of focus: personal motivation and the infrastructure of the work environment (Sekar, 2011). Therefore, the psychosocial risk environment here also plays a significant role in productivity and safety performance. Psychosocial risks are organisational factors that affect the psychological safety and health of employees (Gilbert, 2010). Psychosocial factors include the way the work is carried out (deadlines, workload, work methods) and the context within which work occurs, including relationships and interactions with managers and supervisors, colleagues and co-workers, as explained in Chapter 3 (Guarding Minds at Work, 2012). In summary, the working interface concept explains the importance of the integration of five elements: people, work, organisation, equipment and environment, adding to human performance. Leblebici (2012) explains that there are various literatures available that examine the relation between some of these factors and the productivity of the employee. Other factors that may also contribute to performance and behaviour include the organisational climate and culture, leadership and management of staff, expectations regarding behaviour and performance (as explained before).

RESULTS DISCUSSION

In the manufacturing company, where this research study was conducted, the physical environmental factors (considered in Chapter 2) focused on employees' exposures to occupational noise, thermal heat conditions, artificial illumination and the interaction with high risk equipment and moving machinery. Discomfort in the workplace, as explained before, places a great deal of strain on the individual working under such conditions, adding stress and anxiety to their jobs. Operator fatigue and stress lead to potential work-related disorders (MSDs) and increase the risk of workplace incidents and accidents, as previously discussed (Chapter 2, Factors and exposures

relating to accident and incidents, p. 26). Through the results obtained from the research questionnaire and occupational hygiene surveys, noise was found to be one of the most common occupational hazards at the manufacturing plant. It was discussed and concluded that exposure to noise causes stress, anxiety and sleeping disorders and compromises the quality of all daily activities (performance), resulting in an increasing demand for medication and treatment such as tranquilisers and sleeping pills (Vinck, 2007) (refer to Chapter 2, Occupational noise, p. 29).

Furthermore, the manufacturing company faces the challenge where the human operator is constantly interacting directly with moving machinery on a daily basis (Chapter 2, Ergonomics and safety, p. 33). The working interface between the man-machine environment remains a high risk factor of concern. However, taking into consideration the high risks involved with the interaction between the human and the physical environment, it was found that the design of equipment, technology and machinery at the researched manufacturing company allows the operators to perform their work with very little ergonomic strain or awkward postures. The workplace design and the engineering blueprint of moving machinery and systems were found to be well in place. It was alleged that the physical work environment can add stress to the human operator performing a task in a demanding workplace, including unpleasant and dangerous physical conditions; monitoring of devices or materials; as well as repeated exchange of information with others (Newell, 2002). These are typical examples of activities that the lower-skilled workers will perform on a normal routine basis at the manufacturing plant. The research results clearly indicated that workers who interact more directly with the physical environment of the manufacturing industry suffer on average more with psychosocial stress, perceive less job satisfaction and experience a higher rate of workload (Chapter 3, Results discussion: Table 5).

Employees who interact more directly with the physical work environment of the manufacturing plant perceive their work to be physically tiring and that it requires more physical strength, while higher-skilled employees feel that their work requires more endurance, patience or persistence. The research results further indicated that lower-skilled workers are physically more tired at the end of a working day, while higher-skilled workers are mentally more tired at the end of a working day, but the level of work stress/-anxiety was psychologically experienced to the same degree at both levels (Chapter 3, Results discussion: Table 4). In correlation with this statement, it is showed that higher-skilled workers experience more frustration at work, and experience more tension as a result of higher expectations based on the level of job responsibility. Despite these

differing expectations and levels of responsibilities and exposure, the intensity of work anxiety is experienced relatively the same between both groups (lower- and higher-skilled worker).

These findings correlate with literature explored throughout this study (Chapters 1-3), and finally conclude that adverse working conditions (physical- and/or psychosocial environment) do affect employee commitment towards the organisation, as well as the level of job satisfaction and the perceptions (Leblebici, 2012) (In summary, refer to Chapter 3, Occupational stress: Table 1). Furthermore, it is concluded that the working interface influences employee wellbeing and ability to perform according to the employer's desired standards. The working relationship between the employer and employee can suffer under these conditions, resulting in conflict as explained before. The research results further found that higher-skilled workers experience a higher level of social support, have a better impression of the employer, and have a better and more positive perception of management's safety image.

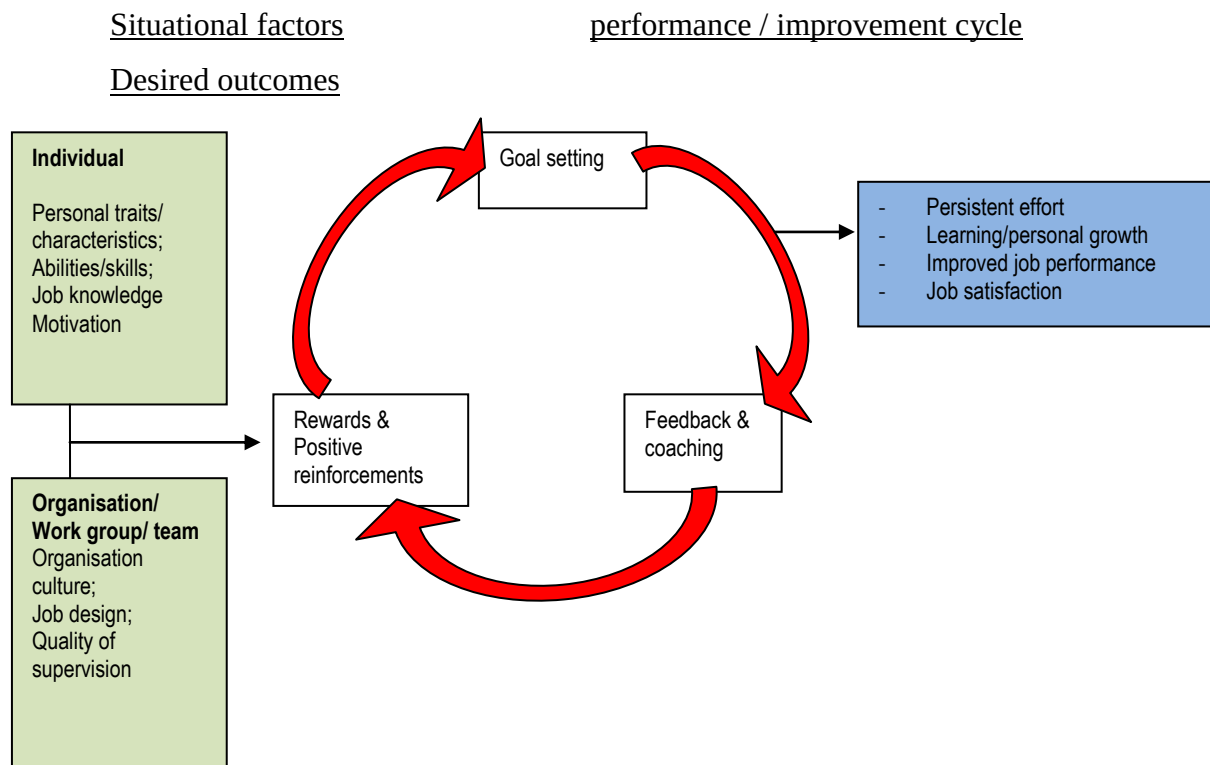
IMPORTANCE OF MANAGEMENT AND LEADERSHIP

As discussed above, and based on the research findings and literature review, the importance to maintain the physical work environment and to manage the psychosocial environment is understandable. The creation of a climate conducive to the successful operation of risk control, safety, occupational health, environmental, quality or any other system is largely dependent on the leadership provided within a company (Germain, Bird, & Labuschagne, 2011) (Refer to Chapter 1, Introduction and problem statement, p. 8-11; Chapter 2, Ergonomics and safety, p. 33; Chapter 3; Psychosocial risk, p. 59). Krause (2004) has focused most his research on developing methods for safety improvement and finally came to the conclusion that quality of leadership is the single most important distinguishing factor. In one of his research studies, it was found that two sites can have identical audit scores of their site-level safety improvement mechanisms, including identical or near-identical technology and similar workforces, and yet very different incident frequency rates. Krause (2004) further explains that just knowing about strengths of site-level mechanisms is not sufficient to determine the amount of exposure that will occur and the numbers of injuries likely to follow. Therefore, site-level culture must be explored.

According to Krause (2004), management influences site-level safety improvement mechanisms, while leadership influences site-level organisational safety culture. Management's task is to see to it that site-level safety mechanisms are in place, that they are done adequately and in a timely

fashion; while leadership's task is to shape and influence the culture, to create a climate or set of conditions such that organisational norms and consistent behaviours create the right kind of safety environment (Krause, 2004, p. 2-3). The power of effective management and the importance of leadership were considered in the previous chapters and will be summarised below. Performance management is an organisation-wide system whereby managers integrate the activities of goal-setting, monitoring and evaluating, providing feedback and coaching, and rewarding employees on a continuous basis (Kreitner & Kinicki, 2008). Ergonomic principles and performance management come together when considering that production is that which people can produce with the least effort (Rolloos, 1997). Productivity is a ratio to measure how well an organisation (or individual) converts input resources (labour, materials, machines, etc.) into goods and services (Leblebici, 2012). Therefore, it makes sense for business continuity to practice the lean manufacturing theory (ergonomics) in achieving and maintaining high levels of worker productivity. As explained above, improving work performance is a continuous process, and will not thrive without a support system:

Diagram 3: Improving individual job performance: A continuous process



(Kreitner & Kinicki, 2008, p. 245)

With reference to the previous chapters, the diagram (3) above explains that two important factors will affect performance: Individual- and organisational factors (group dynamics) (refer also to the working interface concept, Chapter 1, Introduction and problem statement: Diagram 1; and Diagram 2). Individual factors include personality and personal characteristics, abilities and skills, job knowledge and motivation. Organisational factors include organisation culture and climate, job design (ergonomics) and ultimately the quality of supervision (Chapter 3, as stated above). This concept has now been discussed extensively throughout this study and this chapter. The focus now is to consider that the performance/improvement cycle (showed in Diagram 3 above) is (or should be) driven by management's influence and leadership.

The improvement cycle includes the three core performance management steps:

- Goal-setting
- Feedback and coaching
- Rewards and positive reinforcements

(Refer to Chapter 3, Drivers of behaviour and Table 2, p. 63).

Research shows that most managers fall short when it comes to carefully nurturing job performance (Kreitner & Kinicki, 2008). According to a study conducted relating to performance management, it was established that only one out of a 100 managers provides every direct report with these following five basics every day (Tulgan, 2004):

- Performance requirements and standard operating procedures related to tasks and responsibilities.
- Defined parameters, measurable goals and concrete deadlines for all work assignments for which the direct report will be held accountable.
- Accurate monitoring, evaluation and documentation of work performance.
- Specific feedback on work performance with guidance for improvement.
- Fairly distributed rewards and detriments (penalties).

Tulgan (2004) calls this situation 'under-management'.

Research has similarly shown that by raising instructors and managers' expectations for individuals performing a wide variety of tasks, higher level of achievement and productivity can be obtained (Kreitner & Kinicki, 2008). This finding implies that higher levels of achievement

and productivity can be obtained by raising managers' performance expectations of their employees (Kreitner & Kinicki, 2008) (Chapter 3, Drivers of behaviour, p. 63). Higher expectations from leaders will in effect create high self-expectations of an individual (employee), ultimately increasing performance (Galatea effect). However, the opposite effect on performance can be expected when employees perceive lower leader expectations. It is called the Golem effect, and will result in a loss in performance due to 'under-management' (as explained above).

Therefore, emphasis is placed on management, leaders, foremen and supervisors' roles and responsibility to control high goal-setting and standards for subordinates. It is of utmost importance to change the mind-set of leaders in high responsibility positions to expect maximum safety performance from subordinates, to create an effective safety culture (as explained before) (Refer to Chapter 3, Safety culture, p. 64). Furthermore, the research results showed that a supervisor's support is crucial for employees to complete a reasonable expectation. Furthermore, the interpersonal role of the supervisor is important to encourage positive relations and enhance self-confidence of the employees. The majority of the survey participants strongly agreed that relations with supervisors at the workplace affect their performance.

From the above it can be accepted that leadership plays a critical role in safety performance, safety culture, and especially the effect on the labour relationship between employer and employee (Hofmann & Morgeson, 2004). Finally, this research study, conducted at the manufacturing company, examined the interaction between the human operator and the working interface environment and concludes how organisations can benefit from the findings by ensuring that risks are managed as an integral part of the organisation's overall strategy, including its mission, vision, culture, objectives, policies, practices and processes (Germain et al., 2011). The relationship between performance management, leadership and occupational risk was considered briefly in the previous chapters in terms of ergonomics (lean manufacturing) and labour relations management (as stated above). However, leadership, including coaching and human capital development, was not the main focus of this study and shows great potential and possibility for future studies (with reference to Diagram 3, above, in relation to the working interface concept).

MANAGING LABOUR RELATIONS

In relation to the above, this study further considered the dynamics of unsafe acts, unwanted behaviour and misconduct. The assumption was made that the physical- and psychosocial risk

environment could influence employee wellbeing and behaviour; and subsequently, the labour relationship between employer and employee. The unique nature and commonness of negative acts, such as unsafe behaviour, human errors, poor performance and negligence, also referred to as unsafe practice, was explored in correlation with system flaws, safety culture, leadership, perceptions, expectations and organisational behaviour (Chapter 2, Results discussion: Real incident case law, Handling incapacity; Chapter 3, Management and control: Swiss Cheese Model, Error management).

Here, it should be considered that poor work performance or incapacity due to ill health or injury is not the same as misconduct and should never be treated as such. When becoming incapable or unfit to perform according to the desired standards and specifications of the job; or when undesired behaviour and gross misconduct are evident, the employee faces the possibility of termination of services. However, the procedures and methods followed by management to resolve the matter at hand will differ in terms poor work performance or incapacity, and misconduct. This study divided the two notions over the two previous chapters. Chapter 2 considered the physical work environment, influencing employee wellbeing and ability to perform according to the desired standards of the employer, while Chapter 3, on the other hand, considered unwanted behaviour and misconduct in terms of the psychosocial risk environment.

Real incident and accident case studies were examined in the previous chapters to confirm the effect on the labour relationship. In Chapter 2, reference was made to a disabling injury that occurred at the manufacturing plant, when the employee lost both of his hands in a horrific accident, while he was performing his normal duties (Chapter 2, Real incident case law relating to the disabling injury, dated 2012). In Chapter 3, an incident was considered of an operator who was performing his normal duties, but was injured when he took a shortcut and entered a danger zone without applying the emergency stop. Chapter 3, Swiss Cheese Model. Also take note of Chapter 3, Introduction and problem statement with reference to CCMA case number: GATW6161/13, and the incident described in Ajzen's Theory of Planned Behaviour).

As explained in the introduction of this chapter, it should be considered that a relationship exists between the employer and employees in terms of their roles and responsibilities. Furthermore, this relationship is based on trust: The employees trust that the employer will provide them with a safe work environment, including safe design of machinery and equipment, just as the employer trusts

that the employees will comply with standard operating- and safe work procedures. With an incident as stated above, the trust relationship between employer and employee can be disrupted in that the following questions immediately come to mind: Was the equipment safe to operate? Was the design of the machine safe as far as reasonably practicable? Did the employer foresee all possible risks and potential injuries? And also: Was the employee trained and found competent to perform the task? Was the employee following the correct procedures and rules? Was the employee duly aware of the regulations, policies and codes? Did the employee take care of his own health and safety, as far as reasonably practicable?

These questions above create room for blame-shifting between the parties. Subsequently, conflict may arise in terms of differing expectations that will ultimately influence the trust relationship (Chapter 1: Introduction and problem statement, addressing the different roles and responsibilities of employer and employee; Chapter 2: Addressing the employer's responsibility to ensure and provide a safe work environment; Chapter 3: Addressing the employee's role to comply with the system and standards). Therefore, when handling and managing situations as stated above, a proper investigation phase is of utmost importance to identify the best practice and suitable steps forward. The employer must consider whether the incident was due to a deliberate violation of safety rules, or whether system flaws were at fault. A proper risk assessment must follow hand-in-hand with the investigation, before a decision is made in terms of taking disciplinary steps against the employee or injured.

A person can be declared unfit because of a medical condition that excludes him/her from the relevant occupation, or because of demonstrable lack of capacity to perform the work (SA Labour Guide, 2011). Disability due to ill health or injury is defined as an impairment that prevents a person from performing a task or occupation or limits the performance of the occupation or task (SA Labour Guide, 2011). When the employer is faced with a situation where the employee is incapable of performing a work task, it is necessary to follow the reasonable steps before considering dismissal. The employer is expected to consider as far as reasonably practicable all other alternatives to accommodate the disability of the employee. When accommodations should be made for an injured employee, it would be useful to follow ergonomic procedures to make the workplace more workable. An ergonomically correct workplace provides many advantages that will improve productivity and product quality and reduces the risk of workplace discomfort, leading to unwanted incidents.

Misconduct takes various forms, including failure or refusal to comply with rules, regulations, policies, procedures or codes, insubordination and finally, negligence, carelessness or recklessness (only to name a few applicable to the nature of this study). These actions against the employer are viewed as serious offences that place a great deal of strain on the organisation as a whole, whereas gross misconduct has the propensity to damage the trust relationship between the employee and the employer. In cases where unwanted behaviour, as defined above (and in Chapter 3), is evident, the employer may feel betrayed by the employee's actions of misconduct and disregard for rules and regulations. Where system flaws are not to blame for unwanted acts, the employer has the right to discipline unwanted behaviour. Moreover, the employer is faced with the responsibility to minimise, remove or eliminate the risk, in order to provide a risk-free environment for the rest of the workforce. In doing so, the employer will turn to the code of good practice (Labour Relations Act, 66 of 1995, Schedule 8) as a guide to perform a fair disciplinary procedure. Here, the Audi Alteram Partem rule applies, meaning that the accused has the right to attend a fair disciplinary procedure; to be notified of the disciplinary proceeding; to have enough time to prepare for the proceedings; to be represented; to be given the opportunity to present evidence, lead witnesses' statements, and to defend the case brought against the accused.

Therefore, it is sustained that the working interface between human and technology, existing in a demanding work environment, will have an adverse effect on the wellbeing of the employee, influencing the individual's ability to perform, subsequently affecting the labour relationship between employer and employee.

CONCLUSION

THE WORKING INTERFACE CONCEPT AND ERGONOMICS

In the manufacturing industry, one cannot deny the importance of the interaction between man, machine and environment. It is a concept that has been investigated and examined in numerous and various studies. It is a multivariate science, embodying the anatomic, physiological, and mechanical principles affecting the efficient use of the human energy, for example safe lifting techniques, proper posture, appropriate seating positions, and adaptive equipment (Grossman et al., 2006). As a science, ergonomics studies human capabilities, limitations and other characteristics for the purpose of developing human-system interface technology. As a practice, ergonomics applies human system interfaces to design, standardise and control systems (Guild et

al., 2001, p. 317). Ergonomics is the application of scientific principles, methods, and data drawn from a variety of disciplines to the development of engineering systems in which people play a significant role (Kroemer, Kroemer, & Kroemer-Elbert, 1994).

However, very little research is available on how this working interface between the man-machine-environment affects not only human behaviour and employee wellbeing, but also the organisational behaviour and performance as a whole, and the influence thereof on the labour relationship between the employer and the employee. The focus of this study was just that and the problem derived from the previous chapters finally concluded that there is a relationship and correlation between occupational risks, employee wellbeing and behaviour, and the labour relationship, as explained before. This problem statement was formulated around the theory of the working interface, defined as (Guild, Ehrlich, Johnston, & Ross, 2001, p. 317):

The scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimise human well-being and overall system performance.

The final goal is to generate ‘optimal’ conditions, which are so well adapted to human characteristics, capabilities, and desires that physical, social and mental well-being is achieved (National Research Council, 1983, p. 2-3).

Strydom (2009) explains that the working interface concept is the place where behaviours and organisational conditions, systems and processes come together. The responsibility of the employer is to plan, organise, manage and control all aspects of the organisation by considering the effectiveness of the working interface to ensure business continuity. Appropriate precautionary measures should be considered and implemented to minimise, reduce or eliminate potential risks in the workplace. Risks take various forms, namely strategic, operational, financial, non-financial and compliance risks (complying with laws and regulations).

This research study highlighted the importance of human resource management as an integral part of risk management, by taking care of the health and safety of the workforce, which is viewed as the most important factor of any business or organisation. The necessity of planning, job design and designing the work environment, when managing health and safety in the workplace, has increased in the light of the costs involved in workplace accidents and incidents. Ergonomics seeks to maximise safety, efficiency and comfort by matching the requirements of the operator’s

work environment to his/her capabilities – to design the workplace to fit the worker; or fitting the task to the man. The benefits of practicing ‘lean manufacturing’, by taking care of the health and safety (wellbeing) of the human, have proved to increase work performance, productivity, profitability, and, most importantly, harmonious labour relationships.

RESEARCH OBJECTIVES

The hypotheses are only broad statements that have been confirmed by the findings of the research questionnaire and finally conclude that the stated hypotheses are supported. The general objective of this study was to investigate the interactive relationship between occupational risks, employee behaviour, and consequently labour relations in the manufacturing industry.

RESEARCH QUESTIONS

GENERAL

The general research question has been sustained in that this study finally concluded that the interaction between man, machine and the environment, better described as ergonomics or human engineering, will have an effect on human behaviour, employee wellbeing and desired capacity to perform a certain task, consequently influencing the labour relationship between employees and the employer, specifically in a high risk manufacturing industry.

SPECIFIC

The specific research questions listed in Chapter 1 are sustained and it has been concluded that the working interface between human and technology, existing in a demanding work environment, will have an adverse effect on the wellbeing of the employee, influencing the individual’s ability to perform, subsequently affecting the labour relationship between employer and employee. It was shown in terms of occupational hygiene studies, case studies of previous incident investigations and based on the research questionnaire that employees are exposed to physical strain and risks in the workplace. These risks can lead to various occupational injuries diseases, which can ultimately leave the employer with no other option than to consider an incapacity procedure. The specific research questions further concluded that the psychosocial risk environment will either provoke desirable or undesirable behaviour from the individual employee, subsequently influencing the trust relationship between employer and employee and the organisation as a whole (Labour Relationship).

RESEARCH CONSTRAINT

This study was limited to the manufacturing industry alone. Although the industry was deemed appropriate in terms of the nature and objectives of this study, the results could not be compared to other industries with a lower- or higher level of occupational risks. Furthermore, the study was conducted at one manufacturing site. The information gathered from the empirical study could not be compared with other organisations and groups, in the same or different industries. The results solely relied on one organisation's safety culture and climate, which may differ in terms of other organisations, groups or industries.

POSSIBILITY OF FUTURE STUDIES

This study created a basis in terms of occupational risk management and the influence thereof on the labour relationship. As stated above, the influence of effective leadership and human capital development on occupational risks may be explored more extensively. Furthermore, the correlation between occupational risk and labour relations management may be investigated in more than one organisation, group, industry and/or country to compare the results in relation with different organisational- and safety cultures, climate perceptions and behaviours.

This study can further, from of a purely legal perspective, focus on considering occupational risks in terms of the guidelines of natural- and common laws, or civil- and criminal laws, which may further influence the labour relationship between employer and employee.

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ANNEXURE A - C

1. Labourer cleaning drill while in motion and proper safety precautions not taken (The Institution of Certificated Mechanical and Electrical Engineers South Africa, 2007):

Mr. W. Vosloo representative of Zenco prosecuted under Section 8(2)(d) of the OHAS Act found that the following could've prevented the incident:

1. Proper hazard and risk identification.
2. Proper safe work procedures.
3. Proper supervision.
4. Proper information and training.

The Court found Mr. Vosloo guilty and fined him R50,000 or 12 months imprisonment.

Labour Minister Membathisi Mdladlana, has welcomed the Odendaalsrus Magistrate Court ruling, against an employer who violated the Occupational Health and Safety Act and Regulations (OHS).

In a major breakthrough in occupational health and safety related incidents, an employer of the Zenco Engineering Company in Odendaalsrus, outside Welkom in the Free State, was found guilty and sentenced to pay a fine of R 50 000 or 12 months imprisonment for exposing his workers to unsafe working conditions. The Court had found that Willem Vosloo, the employer of the Zenco Engineering Company contravened the OHS Act, after Jonas Ramotsehoa, a welder employed by the company, was strangled to death by a drilling machine while trying to clean it in 2004.

The Department of Labour instituted a formal investigation into the incident and a recommendation for a possible prosecution was referred to the National Public Prosecutions Authority. The Labour Inspector's findings during the formal investigation revealed that a lack of training, supervision and proper work procedures of operating machinery were the main cause of the fatal accident. The Court found that Vosloo failed to conduct a risk assessment to establish hazards to health and safety and did not apply any precautionary measures for his workers when operating machinery as required by the General Machinery Regulations.

2. Mineworker killed as roof support collapses (M & G, 2007, as cited by Klass Looch Associates, 2013):

'A mineworker at a coal mine near Dundee in northern KwaZulu-Natal died on Wednesday when a roof support apparently collapsed and struck him. Norman Slater, MD of Slater Coal, which operates the Magdalena Colliery, confirmed the death but said he would "prefer not to comment" further on the accident until a survey of the damage had been done and an inquiry completed. Sources at the mine said that a stick support, which helps to hold up the roof of the mine, is believed to have collapsed, striking the miner. The miner's name and age have not been released, but he is believed to have been in his forties. Netcare 911 spokesperson Chris Botha said the miner was brought to the surface by the mine's own rescue team. The miner had suffered severe head injuries that probably led to his death. Paramedics were transporting him to meet a helicopter sent from Durban when the man went into cardiac arrest. He was then rushed by ambulance to Dundee provincial hospital but was declared dead on arrival'.

3. Safety violations exposed by labour blitz (M & G, 2007, as cited by Klass Looch Associates, 2013):

'Fifty out of 85 construction employers were found to be violating workplace safety regulations during an on-site crackdown by labour inspectors in the Eastern Cape, the Labour Department said on Wednesday. Department spokesperson Zolisa Sigabi said seven construction sites had been shut down and an additional 48 contravention notices were served. The notices were served to 50 of 85 employers visited on site in Mthatha, East London, Queenstown and Port Elizabeth in the first two days of a five-day inspection blitz, which started on Monday. "All nine provinces are currently conducting inspections in the construction industry -- these are specifically to do with occupational health and safety." Employers were randomly chosen and not informed of the inspections, Sigabi said. The contravention notices were served for minor violations in which employers were given 30 and 60 days to take corrective action. Operations had been shut down where employers were served with prohibition notices. These employers had to address the violations before being given the go-ahead by labour inspectors in order to continue operations, Sigabi said. On Tuesday Labour Minister Membathisi Mdladlana led a similar operation in the Western Cape, where a contractor was cautioned for contravening various Occupational Health

and Safety regulations. Sigabi said disregard of workplace safety measures had continued to be a trend as the labour inspectors went on the surprise inspections. Increased vigilance against non-compliance with Occupational Health and Safety regulations was needed with 2010 World Cup preparations putting the construction industry under rising pressure, she said'.

4. Man electrocuted to death by fallen power cable (SABC of 1 March 2007, as cited by Klass Looch Associates, 2013):

'A man was electrocuted in northern KwaZulu-Natal earlier today and an elderly woman who went to his assistance suffered severe electric burns, police said. Jabulani Mdletshe, a police spokesperson, said roadworks were being carried out in the Sokhulu Reserve area - about 30km north of Empangeni - yesterday when a grader accidentally knocked down a pylon leaving cables hanging on the ground. "Somehow the whole area became electrified near the bottle store," he said. Several residents who walked in certain areas suffered electric shocks. Mdletshe said residents reported the fallen power cables, but there had apparently been no response from Eskom. Muzi Mkhwanazi (30) was electrocuted near the bottle store late this afternoon. Mariette Myaka (65) apparently tried to help him when she too was shocked. Chris Botha, a Netcare 911 spokesperson said Mkhwanazi was declared dead at the scene by paramedics. Myaka was taken to Ngwelezane Provincial hospital with severe burns. "They (Eskom technicians) are there now that somebody has died," said Mdletshe. He said an inquest docket had been opened. Attempts to obtain comment from Eskom were unsuccessful' ([Skhosana v Eskom \[1999\] \(W\)](#)).

5. Labour department to probe shelf collapse (IOL of 26 February 2007, as cited by Klass Looch Associates, 2013):

'The department of labour is investigating the cause of a shelf collapse at a cold storage facility in Johannesburg during which a worker was seriously injured last week. Spokesperson Zolisa Sigabi said on Sunday that 12 others also suffered injuries when they rushed to help their colleague who was trapped under 200 tons of refrigerated meat. The incident happened on Friday at QKV Cold Storage in City Deep, she said. "On inspection, labour inspectors found there was about 200 tons of meat inside when the shelves collapsed." Sigabi said the department would hold the employer to account if any of the Occupational Health and Safety Regulations had been contravened'.

6. Construction firm faces fine over worker laws (IOL of 14 February 2007, as cited by Klass Looch Associates, 2013):

'A Pretoria construction company may be fined for compromising workers' safety, the labour department said on Tuesday. "The department is set to take drastic measures against the company for defying a prohibition notice ordering them to stop all construction work at a site in Pretoria West," said spokesperson Zolisa Sigabi. ARS Projects had been charged with multiple violations of the 1993 Occupational Health and Safety Act (OHSA), she said. Sigabi alleged that it had not provided workers with personal protection equipment such as gloves or overalls and had not met the minimum requirements for scaffold erection. "Next week we will file the necessary court papers for court processes to start," he said. "These are all serious offences in terms of the OHSA Act, and pose a serious health and safety risk to the employees," said Sigabi. The company could face a R100 000 fine'.

7. Employer fined R50 000 or imprisonment for risking worker's life (Department of Labour, 2007, as cited by Klass Looch Associates, 2013):

Labour Minister Membathisi Mdladlana has welcomed the Odendaalsrus Magistrate Court ruling, against an employer who violated the Occupational Health and Safety Act (OHSA) regulations. In one of major breakthroughs in occupational health and safety related incidents, an employee of Zenco Engineering Company in Odendaalsrus, outside Welkom in the Free State, was last week found guilty and sentenced to pay a fine of R50 000 or 12 months imprisonment for exposing his employees to unsafe working conditions. The court had found that Willem Vosloo, the employer of Zenco Engineering Company contravened the OHS Act, after Jonas Ramotsehoa, a welder employed by the company was strangled to death by a drilling machine while trying to clean it in 2004. The Department of Labour instituted a formal investigation into the incident and a recommendation for a possible prosecution was referred to the National Public Prosecutions Authority. The Labour Inspector's findings during the formal investigation revealed that lack of training, supervision and proper work procedures of operating machinery were the main cause of the fatal incident. The deceased, then 64 years old sustained multiple head injuries as a result of the accident. The court found that Vosloo failed to conduct a risk assessment to establish hazards to health and safety and did not apply any precautionary measures for his employee when

operating machinery as required by the General Machinery Regulations. The sentence was suspended for five years on condition that he will not be found guilty of the same offence within the set period. Regulation 4(1) of the General Machinery Regulations indicates that an employer or user of machinery shall ensure that every person authorised to operate machinery is fully aware of the dangers attached thereto and is conversant with the precautionary measures to be taken or observed to obviate such dangers.

8. Labour, police probe double KwaZulu-Natal (KZN) workplace fatalities (Department of Labour, 2007, **as cited by Klass Looch Associates, 2013**):

'The Department of Labour and the South African Police Service have launched urgent investigations into the deaths of two workers resulting from two separate workplace accidents in Pietermaritzburg, KwaZulu-Natal yesterday (Thursday, 1 February 2007). A female employee was killed instantly when she was hit in the chest by a forklift at a farm warehouse. The tragedy occurred at around 15h30 while the deceased, Ms Mantombi Ngcobo and fellow employees were busy packaging harvest at the Tala Farm. According to reports, the driver claimed to have lost control as a result of brake failure, while witnesses accuse him of negligence. In the second fatality, a contract municipal worker was electrocuted whilst working atop a light pole in Hilton. Mr Moloko Ntini Ndimande, an employee of contractor Ukukhanya Services, died on the spot when the accident occurred at about 12h30. His employers have told labour inspectors at the scene that the power in the section where Ndimande was working at that point in time, appeared not to have been disconnected as was supposed to have been the case. The Labour Ministry has vowed to take the most drastic action possible against anyone, should investigation findings indicate negligence or non-compliance with any of the Occupational Health and Safety laws'.

9. Eskom accident: man dies (IOL of 31 January 2007, **as cited by Klass Looch Associates, 2013**):

'One person has died and four were injured following an accident in a boiler at Eskom's Tutuka power station in Mpumalanga. Aaron Mabaso was critically injured on Sunday when he and six colleagues were engulfed in hot ash while repairing machinery that had become stuck. Eskom national spokesperson Fani Zulu said that on Thursday Unit 4 of Tutuka experienced a "stuck submerged scraper conveyor" (SSC) and as a result the unit had to be shut down to fix the

problem. He explained that an SSC received the ash and transported it out of the power station. "On Sunday morning Unit 4 was shut down and we had to force-cool the boiler. After 17 hours, at about 5pm on Sunday, a team inspected the boiler and deemed it safe to work in. Seven contractors went into the boiler and started cleaning away ash and clinker on the conveyor. "While the team was busy cleaning hot ash engulfed them and five of the contractors were severely burnt. One of the men has since died in hospital," he said. On Monday Rodney van Zyl, hospital manager of the Highveld Medi-Clinic, said five patients were admitted to their emergency ward. "Two patients were transported to Pretoria." Eskom chief executive Thulani Gcabashe expressed his condolences to Mabaso's family'.

10. Workers hurt in fall from scaffolding (IOL of 31 January 2007, as cited by Klass Looch Associates, 2013):

"Two construction workers were injured when they fell from scaffolding at a building site in Edenvale on Tuesday, paramedics said. Netcare 911 spokesperson Nick Dollman said the two men fell while working at the Greenstone Hill shopping centre on Modderfontein road. The two men had "fallen from the scaffolding about three or four levels to the ground." Dollman said they may have collided with some scaffolding while falling. Both men were wearing safety harnesses when paramedics found them. The cause of the accident was unknown. The first patient was in a critical condition. He had a suspected head and chest injury and had difficulty breathing. His pelvis may have been fractured, Dollman said. He was airlifted to the Sunninghill hospital. The second patient was also seriously injured, but was more stable than the other man. Paramedics suspected fractures to his pelvis and forearm and he was stabilised on the scene before being transported by a Netcare 911 ambulance to the Sunninghill hospital.

11. Tragedy as machine falls on factory workers (IOL of 30 January 2007, as cited by Klass Looch Associates, 2013):

"Two Japanese nationals were killed at a factory belonging to a subsidiary of Toyota in Durban when a large piece of machinery fell on them, emergency services personnel said on Monday. It is believed that a "rollover machine" fell on the men on Sunday evening. Police spokesperson Inspector Annie Naidoo confirmed the incident, but could not provide more details. It is believed that one of the men was killed immediately, while the second died as paramedics attempted to

save him. Details about the two men, aged 36 and 44, were being withheld until their next of kin had been informed. Roger Houghton, spokesperson for Toyota South Africa, said in a statement released on Monday that the two men worked for the Toyota subsidiary Tshusho Africa, and were installing hydraulic machinery where steel rolls are cut into pieces before being pressed into car parts'.

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The experience of occupational risk and the handling of incapacity due to ill health and injury

Abstract

This article is concerned with the assessment of risks in the manufacturing industry and the effects thereof on employee wellbeing, performance ability and consequently on the labour relationship between employee and employer. The centre of this article relies on the interaction between the person and the machine and the design of the interface between the two. Bridger (2003) also describes this as the heart of Ergonomics, and it further includes the nature of the task, workload, the working environment, the design of displays and controls, and the role of procedures (HSE, 2012). The characteristics of strains on the human body, in terms of unsafe conditions and work-related stressors, are identified and discussed in order to explain human capabilities and limitations within his/her work environment. The frequency of occupational incidents and accidents, as a result from a high risk environment, is examined and discussed. Occupational hygiene surveys, medical reports, real incident statistics and annual reports, based on the empirically researched organisation, were collected and used to sustain the research objectives. The data was analysed and is summarised in this article to support the conclusion of the effect of a high risk work environment in correlation with employee wellbeing, and subsequently on labour relations. The results indicate comparisons between unsafe conditions and employee incapacity due to injury or ill health and how it should be addressed out of a labour relations point of view.

Keywords: Occupational risks, health and safety, ergonomics, incapacity, accidents, frequency and severity, management commitment, labour relations

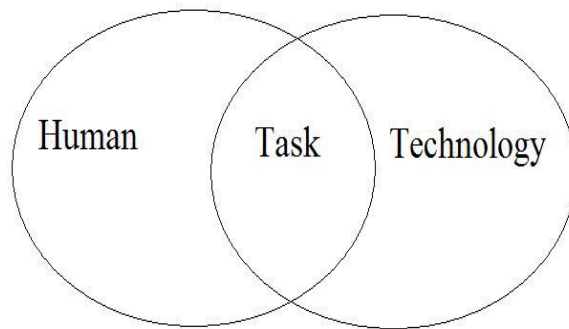
Introduction

According to Guild *et al.* (2001), the interaction between human and technology always takes place in a certain workspace, which is located in a specific physical and psychological environment. The environment can be described in terms of temperature,

lighting, noise and vibration, the presence and effect of chemical and biological agents, as well as in psychological terms such as teamwork, management structure, shift conditions and psychosocial factors (Guild, Ehrlich, Johnston & Ross, 2001).

The working interface between human and technology is the configuration of equipment, facilities, systems, and behaviours that define the interactive **tasks** of the worker with technology (Behavioral Science Technology, Inc., 2010). Strydom (2009) explains that the working interface concept is the place where behaviours and organisational conditions, systems and processes come together. He elaborates that this is also where accidents usually occur, in that loss incidents **only** occur **when an employee interacts with the condition in an unsafe way**, where unsafe conditions exist (Strydom, 2009).

Figure 1:



Source: Guild, Ehrlich, Johnston & Ross (2001, p. 319)

The human-technology-workspace-environmental model (Figure 1) is useful in identifying the factors that will have an effect on comfort, task performance and safety (Guild, *et al.*, 2001). Strydom (2009) supports this view and explains that the interaction between workers and technology should be the focus of safety improvement efforts. Guild (2001), elaborates that by identifying “ergonomic risk factors” rather than “ergonomic hazards” or “ergonomic problems” allows several techniques of proactive risk management (Strydom, 2009).

Although there is little agreement over a definition of “risk”, the notion of **probability** that injury or damage will occur (Guild, *et al.*, 2001) is central to all risk assessment techniques identified in literature, although the interpretation of probability depends on whether it is viewed objectively or subjectively (White, 1995). Risk probability is known as the possibility that something unpleasant or unwelcome will happen, or a possibility of **harm or damage** against which something is insured (Oxford University Press, 2013).

Within the context of occupational safety and health, “**harm**” generally describes the direct or indirect degradation, temporary or permanent, of the physical, mental, or social well-being of workers (NAFEN, 2010). Therefore, factors that cause injuries, such as back and neck strains, shoulder injuries and strains, knee sprains and strains, elbow injuries and strains, carpal and tunnel syndrome and musculoskeletal disorders have become crucial for management to **identify and control real risks** (Scheel & Zimmermann, 2009).

Therefore, in relation with the above, it can be sustained that the goal is to decrease the **risk** of injury and illnesses, to improve worker performance, to decrease worker discomfort, and to improve the quality of work life (Guild, Ehrlich, Johnston & Ross, 2001). Human-system interactions have frequently been identified as major contributors to poor operator performance (Anon, 2012; HSE, 2012), while an ergonomically correct workplace provides many advantages that will improve productivity and product quality. **This statement will form the focus point of this article as it suggests consequently an effect on the labour relationship between employee and employer.**

Individuals have a wide range of abilities and limitations within a working environment. Human factors (or Ergonomics) focus on how to make the best use of human capabilities by designing jobs and equipment that are fit for people (HSE, 2012).

Finally, the problem derived from the above summary is that ***the working interface between human and technology, existing in a demanding work environment, will have an adverse effect on the wellbeing of the employee, influencing the individual’s ability to perform, subsequently affecting the labour relationship between employer and employee.***

Factors and exposures in the workplace, relating to accidents and injuries, are explored and summarised below. Real incident statistics gathered from the empirical researched organisation are analysed and discussed below (*statistical analyses*). Methods in terms of handling poor work performance and/or incapacity due to ill health or injury – as a result of human interaction with a high risk work environment – are stipulated below (*results and discussion*). The article builds up to explore the effect of a high risk work environment on the labour relationship (*conclusion*).

FACTORS AND EXPOSURES RELATING TO ACCIDENTS AND INJURIES

Most common workplace accidents include **manual handling**, such as lifting, lowering, pulling, pushing, carrying, moving, or any other form of strenuous duties; **motorised vehicles** coming in and going out or even moving things from one side of the building to another; **electric shock**; and causes related to **hazardous chemicals, fire and water, slips and falls , and machinery** (Smith, 2010).

Cumulative Trauma Disorders (CTD) were identified as one of the fastest growing occupational injuries in the last decade in South Africa (Grobler, *et al.*, 2002), and are now considered to be the largest work-related health problem (Bacchi, 2010). Cumulative Trauma Disorders are injuries of the musculoskeletal system – including the joints, muscles, tendons, ligaments, nerves, and blood vessels that are often grouped together as CTDs, Repetitive Stress Injury (RSI), overuse syndrome, and repetitive motion disorders (Bacchi, 2010).

Furthermore, Walder *et al* (2007) explain that when ergonomic principles and guidelines are not being followed in the workplace, operator fatigue and stress, leading to potential work-related musculoskeletal and neurovascular disorders (MSDs), will be the end result. The risk factors of these disorders are *multifactorial* and present aspects that have not been clarified and explored fully (Alazab, 2007).

The three major risk factors for the potential development of work-related MSDs are **high-force, awkward posture** and **excessive repetition** (Konz & Johnston, 2004). These health risks develop from **muscular work, nervous control movements, and contact stressors** (Granjean, 1988). Muscular disorder injuries experienced by

employees relating to overexertion or repetitive motion will subsequently lead to Repetitive Muscular Disorders (RMDs) (Kreitner & Kinicki, 2008).

Work-related RMDs/MSDs are not specific to any type of job and affect workers in a wide variety of occupations (Alazab, 2007). These usually take months or even years to develop and they are a major cause of lost time at work, worker disability and health care costs (Alazab, 2007). Relating to the above, MSDs play a significant socioeconomic role as they represent one of the major causes of disability and consequent absence from work.

Many employers do not pay enough attention to the measurement and the effects of absenteeism and its control (Johnson, 2007). Almost all employers understand that high absenteeism rates have a negative effect on their businesses, but the monetary effect of abnormally high absenteeism is very rarely quantified. Direct costs of absence are estimated by considering the employee's annual salary (assuming absences are paid) and output-to-pay ratio, multiplied by the amount of time missed within the year (Corporate Research Association, 2011). Indirect costs, on the other hand, are 'hidden' costs, which include (among others) the cost of replacing the absent employee in critical positions, possible overtime payments to replacement workers, as well as the effects that absenteeism has on workforce levels, medical aid costs, group life and disability premiums (Johnson, 2007). Adding to the cost of absenteeism, the cost of musculoskeletal disorder is estimated based on medical costs, wage losses, and associated costs (Alazab, 2007).

Subsequent to the above, the importance and necessity of job design and designing the work environment is increasing in light of the costs involved related to the number of employees who are suffering from injuries associated with RMDs/MSDs/CTDs. Furthermore, the quality of the workplace environment may determine the level of employee motivation, and subsequently performance and productivity (Leblebici, 2012). Comfort issues such as improper lightening (artificial illumination), poor ventilation, excessive occupational noise, thermal (heat) conditions and emergency excess (Chandrasekar, 2011; Leblebici, 2012), which can be very stressful for a human being, will be discussed in more detail below.

1.1. Occupational noise

Noise is conveniently and frequently defined as ‘unwanted sound’, a definition which in its looseness enables a sound source to be considered as ‘noise’ or ‘not noise’ solely on the basis of the listener’s reaction to it (Oborne, 1985).

Noise is one of the most common of all occupational hazards (Workplace Health and Safety Bulletin). According to the Occupational Health and Safety Act (85 of 1993), the South African noise exposure limit is no more than 85 dB(A). It also mandates that after December 2008, the hearing conservation programme implemented by industries must ensure that there is no deterioration in hearing greater than 10% among occupationally exposed individuals (Van Deventer, 2011). In addition, by December 2013, the total noise emitted by all equipment installed in any workplace must not exceed a sound pressure level of 110 dB(A).

Loss of hearing is certainly the most well-known adverse effect of noise, and probably the most serious, while other detrimental effects include tinnitus (ringing in the ears), interference with speech, communication and with the perception of warning signals, disruption of job performance, annoyance and extra-auditory effects (Van der Heever, 2012, p. 7). Exposure to noise **causes stress, anxiety and sleeping disorders and compromises the quality of all daily activities (performance), resulting in an increasing demand for medication and treatment, such as tranquilisers and sleeping pills** (Vinck, 2007).

1.2. Thermal (heat) stress

The thermal environment has a special effect on the comfort of an individual. Serious deviations from the comfort experienced by an individual can have a detrimental effect on productivity, increase the possibility of making errors (and therefore the accident rate), and can also have a negative effect on the health of the individual (Van den Heever, 2012).

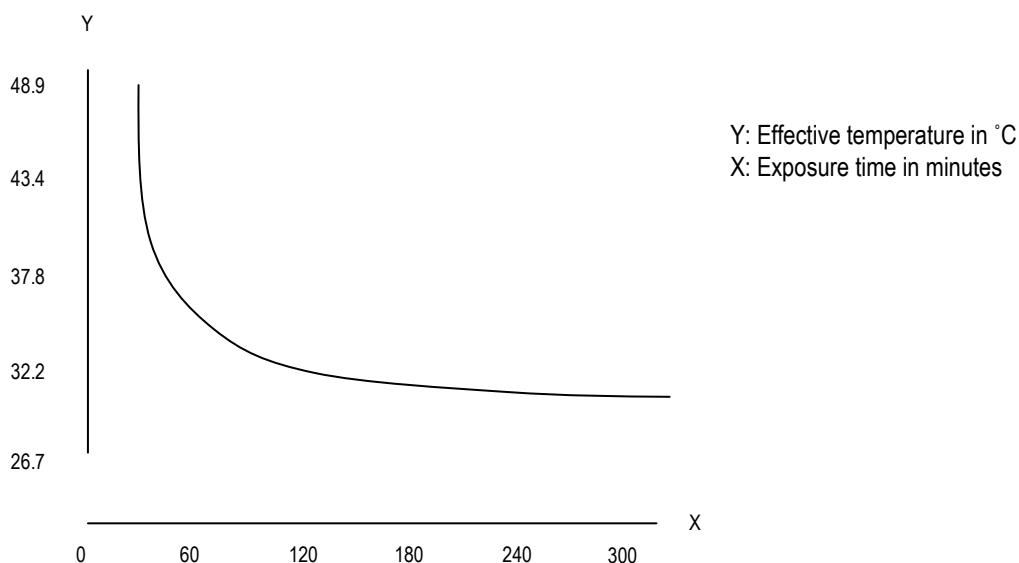
Heat stress occurs when the body’s means of controlling its internal temperature (**thermoregulation**) starts to fail and the body generates more heat than it can lose

(Crockford, 1999; HSE, 2002). There are various types of heat-related illnesses, including heat cramps, heat exhaustion, heat rash, or heat stroke, each with its own symptoms and treatments (Iowa State University of Science and Technology, 2013). These symptoms vary from an inability to concentrate, severe thirst, fainting, fatigue (**heat exhaustion**), giddiness, nausea, headaches, moist skin, or hot dry skin, confusion, convulsions and eventual loss of consciousness, commonly known as **heat stroke** (HSE, 2002; Iowa State University of Science and Technology, 2013).

Apart from heat illness, high temperatures in the workplace reduce worker morale and productivity, and increase absenteeism and mistakes (Tombling Ltd, 2006), which will be explained below.

In a study performed by [ASHVE](#), it was proven that a typical manufacturing plant loses 1% efficiency per man hour for every degree the temperature rises above 27°C (ASHRAE, as cited by Tombling Ltd, 2006). In terms of the duration of exposure to heat, the graph below shows the temperature levels able to be tolerated before cognitive performance decrements become apparent (As cited by Osborne, 1985, p. 222).

Graph 1: Upper tolerance limit for impaired mental performance



The graph above (Graph 1) indicates the decreasing effects on performance in relation to higher temperatures over longer exposure times. Performance is further affected in terms of the relationship between the ability to carry out work at different intensities: Performance will decrease more rapidly, depending on the work rate level in correlation with an increase of temperatures (Kjellstrom & Dirks, 2001).

(Additional reference in support of the above: Kjellstrom, Holmer, & Lemke, 2009)

1.3. **Artificial illumination**

In any inhabited environment, safe conditions, including the measurement of light, are essential in the design and evaluation of workplaces. Because the eye adapts to light levels, automatically compensating for any changes in illumination, subjective estimates of the amount of light in a work area are likely to be misleading (Bridger, 2003). It is therefore important to design lighting installations to compensate for human limitations, and to increase the probability that a person will detect a potential hazard and act to avoid it (Van den Heever, 2012). ***In many cases where illumination has been associated with accidents, factors such as glare, both direct and reflected, visual fatigue and harsh shadows were identified*** (Van den Heever, 2012).

The light levels listed in the OHS Act, 1993, are the absolute minimum statutory average light levels that may exist in a workplace at any time in the life of that workplace. Failure to comply with the OHS Act requirements is an offence committed by the employer. The employer is always responsible for providing and maintaining a safe, healthy and workable workplace (OHS Act, 85 of 1993, section 16).

The advantages available to industry by virtue of good lighting can be listed as follows (Anon, 2013, p. 1):

“The quality of lighting in a workplace can have a significant effect on productivity. With adequate lighting workers can produce more products with fewer mistakes, which can lead to a 10 to 50% increase in productivity. Good lighting can decrease errors by 30 to 60 % as well as decrease eye-strain and the headaches, nausea, and neck pain which often accompany eyestrain.”

1.4. Ergonomics and safety

As emphasised above, the human body is part of the physical world and obeys the same physical laws as other living and non-living objects (Bridger, 2003). Therefore, the goal of ergonomics is to optimise the interaction between the body and its physical surroundings. Bridger (2003) elaborates that “ergonomic problems often arise because, although the operator is able to carry out the task, the effort required overloads the sustaining and supportive process of the body and causes fatigue, injury or errors” (p. 6).

Humans have limited capability for processing information (such as from displays, alarms, documentation and communications), holding items in memory, making decisions and performing tasks (HSE, 2010). Experience of being driven to the margin of physical and psychological capability by strenuous exertion, hot climate, schedule pressure, unreasonable behaviour of superiors or colleagues, oncoming illness, or the feeling of useless efforts can cause “stress on the job” (Kroemer, *et al.*, 1994). Some of these stressors are physical, others are psychological; self-imposed or external; short-term or continual (Cox, 1990; Chim, 2006).

Workload is defined as the total amount of work that a person is expected to do in a specified time (Chim, 2006). Job demands depend on type, quantity, and schedule of tasks; the task *environment* (in physical and technical terms); and the task conditions – referring to the psycho-social relations existing on the job (Kroemer, *et al.*, 1994; HSE, 2010). Mental workload is defined primarily as the relationship between the worker’s perceptions of the demands of the task and their ***perceived coping capacity*** (MacDonald 2004, p.40).

When the job demands exceed the person’s capability, he/she is overloaded and would seek either to reduce the workload, or to increase capability (Kroemer, *et al.*, 1994). A high (or perceived high) workload not only adversely affects safety, but also negatively affects job satisfaction and, as a result, contributes to high turnover and staff shortages (HSE, 2010). Furthermore, an *environment* demanding more of the operator than he is able to give can result in human performance issues such as slower task performance

and errors such as slips, lapses or mistakes, and subsequently serious accidents (Oborne, 1985; HSE, 2010).

It should also be noted that ‘*underload*’ can also lead to human performance issues, such as boredom, loss of situation awareness and reduced alertness (HSE, 2010), as can be expected from repetitive work, or working in the same area, position, or posture with little human interaction. Accidents are unfortunate, unpredictable, unavoidable, and unintentional interactions with the environment. However, it is believed to be preventable, with reference to the old paradigm of HW Heinrich who first described the relationship between injury types (Boyd, 2010):

- Lost time accident; non-lost time accident; damage accident

The safety triangle holds that an inverse relationship exists between frequency and severity: the more severe the injury, the less frequent it is (Boyd, 2010). It is furthermore suggested that these three types occur in the ratio of approximately 1:60:400 (*lost time: non-lost time: damage accident*), so that for every lost time accident occurring in the industry, there will be approximately 400 damages to property/no-injury accidents (Oborne, 1985). **Boyd (2010) explains that an environment that frequently generates low-severity events harbours systems, cultural and leadership issues that will generate high-severity events as well.**

METHODOLOGY

SAMPLE

The data gathered at the manufacturing/production plant were obtained through real incident and accident records, documented over a period of 10 years. The data analysed reflects the frequency and severity ratios of types of accidents experienced within the researched manufacturing plant, where an average of **830 employees** are employed (participants), including machine operators, machine maintenance servicemen, line to top management, and office staff – all of whom are exposed to some sort of occupational hazards and risks through each normal day of work.

The occupational hygiene data gathered were conducted by an approved inspection authority in terms of the Occupational Health and Safety Act 85 of 1993 (as amended), on request from management and as part of legal compliance. **A random selection** of the most recent reports at certain departments was analysed and included in the study to sustain the research objectives. The occupational hygiene data includes occupational noise, thermal conditions, and artificial illumination.

MEASURING INSTRUMENT

Dr DJ Van den Heever, a registered occupational hygienist, conducted all measurements at the premises of the manufacturing/production plant. Special permission was received to use the reports and results in this article:

Assessment of noise in all areas was carried out with three Quest 1200 type 1 integrating sound-level meters. Measurement was conducted on site according to South African National Standard 10083 (2004) (The measurement and assessment of occupational noise for hearing conservation purposes). The measurements were taken at an average temperature of 22°C and the wind speed at the sound level meter never exceeded 0.02 m.s⁻¹.

Measurements of artificial illumination were carried out during the day according to Appendix H of SANS 10114-1:2005. The standard method was used for the measurement of artificial illumination. The survey was performed under actual working conditions and from a specific work point location. Measurements were carried out with a calibrated cosine and colour corrected light meter (Extech S/N Q023267).

The monitoring of the thermal conditions was performed using a calibrated electronic direct reading heat stress monitor. The instrument was set up and used according to ISO method 7243 in combination with the method of the American Conference of Industrial Hygienists (ACGIH, 2001; Schröder & Schoeman, 1989; South Africa, 1987). Measurements were made in the areas where workers were executing their normal duties.

The time-weighted average WBGT was calculated as follows:

$$WBGT1t1 + WBGT2t2 + WBGT3t3 + \dots + WBGTntn$$

$$t1 + t2 + t3 + \dots + tn$$

where; WBGT1, WBGT2, WBGT3, ... WBGTn = the calculated wet-bulb globe temperature index for the different work environments, and; t1, t2, t3, ... tn = the respective time periods in minutes over which the measurements were taken.

STATISTICAL ANALYSIS

Lost time accidents are divided into 'disabling' and 'non-disabling' accidents. Within this context, the disabling accidents refer to any accident that resulted in more than 14 days lost (*absenteeism*) due to the injury. Non-disabling accidents represent fewer than 14 days lost to the company due to injury. Non-lost days accidents are identified as 'first aid' cases, and represent minor injuries.

Table 1: Accumulative statistics 2012

ACCUMULATIVE STATISTICS												
FOR THE YEAR: 2012												
	Qtr 1/4			Qtr 2/4			Qtr 3/4			Qtr 4/4		
	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12
EMPLOYEES	817	819	816	818	815	812	827	827	827	837	824	825
MANHOURS	152480.58	163380.44	158133.66	127580.50	171130.26	166947.72	171966.03	167726.61	157577.84	175059.46	168530.25	42534.36
FATAL INJ/ILLNESS	0	0	0	0	0	0	0	0	0	0	0	0
DISABLING INJURIES	0	0	0	0	0	1	0	1	0	1	0	0
NON-DISABLING INJURIES	0	1	1	0	0	0	1	0	0	0	3	0
DISABLING ILLNESSES	0	0	0	0	0	0	0	0	0	0	0	0
DI FREQUENCY RATE	0.00	0.00	0.00	0.00	0.00	1.20	0.00	1.19	0.00	1.14	0.00	0.00
NON-DI FREQUENCY RATE	0.00	1.22	1.26	0.00	0.00	0.00	1.16	0.00	0.00	0.00	3.56	0.00
LOST WORKDAYS	0	1	1	0	0	1	23	0.00	1.0	21	5	0
SEVERITY RATE	0.00	1.22	1.57	0.00	0.00	0.60	26.75	0.00	1.27	23.99	5.93	0.00
FIRST AID CASES	13	16	14	10	9	18	8	6	9	8	13	3
FA FREQUENCY RATE	17.05	19.59	17.71	15.68	10.52	21.56	9.30	7.15	11.42	9.14	15.43	14.11
DI FREQ. PERCENTAGE	0.00%	0.00%	0.00%	0.00%	0.00%	1.20%	0.00%	1.19%	0.00%	1.14%	0.00%	0.00%
ACCUM M/H SINCE LAST DISABLING INJURY/ILLNESS	290821.00	178729.66	110856.31	238436.81	409567.07	17270.45	121896.40	5588.94	163011.56	163323.83	5617.68	219760.86

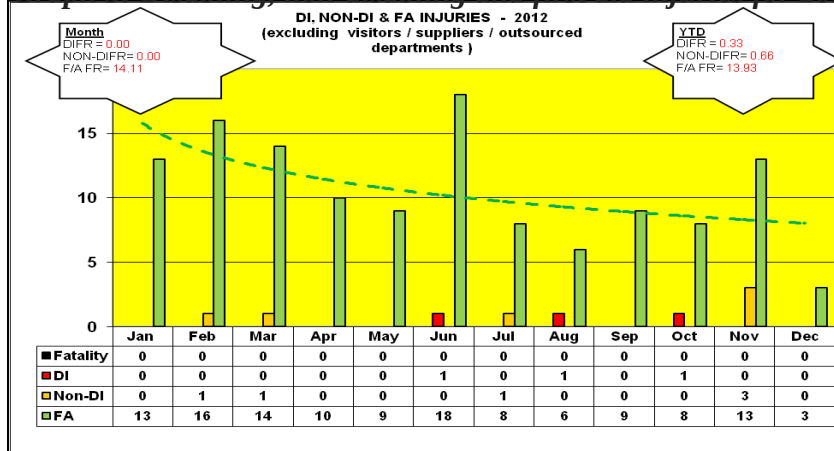
(Month-end report, December 2012, R01)

It was found that a total of 127 non-lost day accidents (first aid cases) occurred during 2012, in relation with nine lost-day accidents (disabling and non-disabling). This indicates a ratio of 14:1 (non-lost day: lost day accidents). A total of 53 days were lost to the company, only for injuries on duty (IOD), during 2012.

The average frequency rate for first aid cases, calculated against man hours worked over 2012, is 17.51, while the severity of accidents, calculated in terms of lost days against

man hours worked, is rated at 0.70, for 2012. The graph below shows the relationship between the types of injuries suffered in the manufacturing plant (study population).

Graph 3: Disabling, non-disabling and first aid injuries for 2012



(Month-end report, December 2012, R01)

During June 2012, the researched manufacturing plant experienced the highest level of first aid cases, as well as one serious disabling incident. The disabling incident suffered in June 2012 is known as the worst incident experienced by the manufacturing company during the last 10 years. This incident will be discussed in more detail below.

Table 2: Accumulative statistics for the period 2004 to 2012

	ACCUMULATIVE STATISTICS								
	2012 - 2004								
	2012 Totals	2011 Totals	2010 Totals	2009 Totals	2008 Totals	2007 Totals	2006 Totals	2005 Totals	2004 Totals
EMPLOYEES	9864	9785	9054	9025	9930	10646	10877	11190	11274
MANHOURS	1823047.71	1736702	1647956.7	1602466.1	1791901.5	1998441.1	2025434.8	1981399.9	1996202.47
FATAL INJ/ILLNESS	0	0	0	0	0	0	0	0	0
DISABLING INJURIES	3	2	0	4	2	0	0	3	6
NON-DISABLING INJURIES	6	3	3	6	3	6	6	6	15
DISABLING ILLNESSES	0	0	0	0	0	0	0	0	0
DI FREQUENCY RATE	0.00	0.75	0.00	0.34	0.00	0.00	0.00	0.00	0.70
NON-DI FREQUENCY RATE	0.62	0.00	0.36	1.13	0.00	1.28	0.61	0.92	1.52
LOST WORKDAYS	53	39	19	60	71	28	43	84	304
SEVERITY RATE	0.70	2.15	3.38	16.22	0.00	3.91	10.24	15.66	35.98
FIRST AID CASES	127	120	125	149	145	91	91	128	188
FA FREQUENCY RATE	17.51	15.02	15.81	22.01	14.80	10.13	8.81	14.17	19.13
DI FREQ. PERCENTAGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
ACCUM M/H SINCE LAST DISABLING INJURY/ILLNESS	160406.71	357663.81	718854.55	265080.67	760126.30	503658.36	364931.51	195004.62	93470.58

(Month-end report, December 2012, R01)

Over a period of nine years, the researched organisation had a total of 1 164 non-lost day accidents (first aid cases), and a total of 74 lost day accidents (disabling and non-

disabling cases). This indicates a ratio at 15:1 (non-lost day: lost day accidents), which correlates with the ratio experienced in 2012 (as explained above). A total of 701 days were lost to the company due to injuries on duty (IOD) from 2004 to 2012. It was found that the most common injuries sustained per department were finger and hand injuries: 55 minor hand injuries and 23 minor finger injuries were recorded in 2012 alone.

Occupation hygiene

Noise: An assessment of the noise exposure of the workers was conducted on request from management at the researched manufacturing plant, for the following purposes:

- To determine the individual noise exposure for personnel with or without fixed work locations.
- Verification of the noise levels according to SANS 10083 (2004) and to demarcate noise zones where necessary.
- Compliance with the requirements of the Noise-Induced Hearing Loss Regulations, 2003.

Results indicated that the maximum continuous exposure time at one department was **1.9 hours** per day, with a maximum dBA noise level at **106.3**. Furthermore, it was found that the majority of areas or departments of the researched manufacturing plant (factory) were classified as noise zone areas with eight-hour rating levels (*L_{Ar}*, 8h) of more than 85dBA (Occupational Hygiene Survey CI 030 OH VDHIH 114/12, 2012).

Thermal conditions: Heat monitoring was conducted on request from management at the researched manufacturing plant, for the following purposes:

- Assessment of the heat exposure of the workers in various working areas;
- Compliance with the requirements of the Environmental Regulations for Workplaces, 1987 (as amended); and
- Determination of the exposure of the workers to excessive heat in their workplaces.

Heat stress measurement results at selected workplaces of the researched manufacturing plant indicated the following:

Table 4:

Area / Dept	Wet Bulb Temp. (C°)	Dry Bulb Temp. (C°)	Globe Temp. (C°)	WBGT Index
“A”	21.6	31.2	33.1	25
“B”	22.6	33.2	35.3	26.4
“C”	20.7	28.6	30.4	23.6

(Occupational Hygiene Survey CI 030 OH VDHIH 446/12)

The outdoor ambient temperature was 28°C and the relative humidity inside the factory ranged from 29 to 38%.

Table 5:

Area / Dept	Wet Bulb Temp. (C°)	Dry Bulb Temp. (C°)	Globe Temp. (C°)	WBGT Index
“D”	20.8	33.1	35.7	26
“E”	21.7	34.0	35.7	26.0
“F”	22.7	37.7	38.2	27.4
“G”	22.4	35.2	37.1	26.8

(Occupational Hygiene Survey CI 030 OH VDHIH 050/12)

The outdoor ambient temperature was 32°C and the relative humidity inside the plant ranged from 28 to 32%.

As stipulated above, the WBGT-index was not exceeded during the measurement periods mentioned (with reference to Section 1.2, p. 9).

Artificial illumination: Artificial illumination was measured at selected workplaces of the researched manufacturing plant on request from management for the following purposes:

- Assessment of artificial lighting levels in order to promote productivity, safety, health, welfare and congenial working conditions at an economic cost and to provide data to management for the implementation of the Occupational Health and Safety Act, Act 85 of 1993 (as amended) standards.

- Verification of artificial illumination levels according to the requirements of the Environmental Regulations for Workplaces, 1987 (as amended).
- Compliance with the requirements of the Environmental Regulations for Workplaces, 1987 (as amended).

Results indicated that in some cases the average luminance of the building and premises do not comply with the minimum requirements as prescribed by the Environmental Regulations for Workplaces, 1987 (as amended).

The results at one specific high accident area at the researched manufacturing plant were found to be as follows:

Table 6: Area/machine: “X”

Workplace	Illumination (Lux)	OHS Act	Compliance
<i>Let-off</i>	105	200	No
<i>Let-off control panel (v)</i>	93	200	No
<i>Water pumps</i>	85	100	No
<i>Staircase to platform (f)</i>	97	100	No
<i>Platform</i>	123	75	Yes
<i>EMG No. 2 control panel (v)</i>	40	200	No
<i>X350 control panel (v)</i>	32	200	No
<i>Mill</i>	143	200	No
<i>Gum gauge control panel (v)</i>	72	200	No
<i>Winding</i>	135	200	No
<i>Winding control panel (v)</i>	109	200	No
<i>Machine</i>	77	200	No
<i>Control panel (v)</i>	106	200	No

(Occupational Hygiene Survey CI 030 OH VDHIH 151/12)

Occupational diseases

The highest number of visits made to the medical station on the premises of the researched manufacturing plant by employees during 2012 was a daunting total of **1 292 visits** for **ear, nose and throat infections** only. The highest **occupational disease** for 2012 was related to the musco-skeletal system. A total of **703 visits** were made to the medical station relating to **musco-skeletal disorders** (MSD's).

As a result of the above, absenteeism becomes a concern in relation with poor health and/or injuries (work days lost to the company). The absenteeism rate was found to be high above the objective target for the period 2011/2012, meaning that the employer suffered a financial burden. The ability to prevent accidents has become more important in terms of cost effectiveness, considering direct (known) and indirect costs (as explained before in the ***Introduction and problem statement***, page 6).

Furthermore, managing cases of absenteeism, where a high rate or pattern of absenteeism is evident, may result in disciplinary actions against the employee involved, leading to dismissals.

RESULTS AND DISCUSSION

With reference to the above, the researched manufacturing plant experienced the risk of hidden and unknown costs with a real accident that occurred during late June 2012:

The injured worker was working night shift on the day of the incident, performing his normal duties at his area of work. The injured worker came in undesirable contact with the machine, which resulted in the amputation of fingers 2,3,4,5 at level of MP joint (knuckles) of both hands, as well as de-gloving of skin from level of wrists of both hands (as stated in the final medical report, received from the hospital). The suspected cause of injury was found and stated in the investigation report as “Human Error – Unsafe Act/Practice”. The evidence indicated that the injured worker wore the incorrect gloves (artisan hand protection), and furthermore ignored the safety rule to stay behind the safety bars of the machine. Consequently, the injured worker came in contact with moving machinery, which resulted in the accident. The injured worker was placed on ‘long-term illness’, and has been absent from work since the date of the injury in June 2012. The injured worker has remained in the employment of the company.

According to the Basic Conditions of Employment Act (75 of 1997, as amended), an employee is entitled to an amount of paid sick leave during every sick leave cycle (ss 22 (2)). A sick leave cycle means a period of 36 months’ employment (three-year cycle) with the same employer, immediately following an employee’s commencement of employment or the completion of that employee’s prior sick leave cycle. However,

during the employees first six (6) months of employment, an employee is entitled to one day's paid sick leave for every 26 days worked (ss 22(3)).

It should be noted that the injured worker in this case was only employed for three months prior to the incident, subsequently only had approximately three (3) days paid sick leave available. However, the employer accepted the responsibility to compensate the employee to the amount of 75% of his normal salary per month since the injury occurred, which the company may claim back in terms of the Compensation for Occupational Injuries and Diseases Act (130 of 1993). The risk that the employer may never be refunded is a reality that the company has to face.

Furthermore, as the employee has been classified as permanently disabled the employer is obligated to investigate alternatives to accommodate the employee in his employment. Ultimately, one cannot ignore the significant effect on human resource management and the battle it will bring forth in terms of maintaining and controlling labour relations, relating to pre-dismissal procedures when dealing with incapacity and poor work performance, disability, and dismissal arising from ill health or injuries and high absenteeism rates.

Handling incapacity due to ill health or injury as a result of human interaction with a high risk work environment:

In this section, 'unfit', 'incapacity' and 'disabled' will be regarded as synonymous (Guild, Ehrlich, Johnston, & Ross, 2001):

Unfit for work: Failure to meet the specific requirements of an occupation. A person can be declared unfit because of a medical condition that excludes him/her from the relevant occupation, or because of demonstrable lack of capacity to perform the work.

Impairment: Deviation from the functional capabilities expected of a healthy individual. Loss of hearing, visual acuity, lung function or joint motion is impairments.

Disability: An impairment that prevents a person from performing a task or occupation or limits the performance of the occupation or task

A common mistake made by employers when handling a case of incapacity is that most employers follow the same disciplinary procedure as would have been appropriate in a matter of misconduct. However, poor performance or an inability to perform due to incapacity is not a form of misconduct and may never be treated as such. The procedure for poor work performance or incapacity due to ill health or injury is very specific in that it is the employer's responsibility to investigate and consider all alternatives to accommodate the injured, as far as reasonably practicable. The Code of Good Practice, schedule 8 of the Labour Relations Act (85 of 1995), provides a basic guide in terms of dealing with a case of incapacity due to ill health or injury. An employer that ignores the basic guide or refuses or fails to follow the correct procedure will be found guilty on procedural unfairness in a dispute resolution council (CCMA or appropriate bargaining council). The second most common mistake made by employers is the assumption that a matter of incapacity is a quick and easy way out to terminate an employee's contract of employment. There are no shortcuts when dealing with incapacity, and employers should accept the responsibility to do everything in their power to support the employee involved. The procedure requires full commitment from the beginning to the end.

When investigating the extent of the incapacity or the injury the following factors should be considered, as summarised by SA Labour Guide (2011, p. 103):

- If the employee is likely to be absent for a time that is unreasonably long in the circumstances, the employer should investigate all the possible alternatives short of dismissal.
- When alternatives are considered, relevant factors might include the nature of the job, the period of absence, the seriousness of the illness or injury and the possibility of securing a temporary replacement for the ill or injured employee.
- In cases of permanent incapacity, the employer should ascertain the possibility of securing alternative employment, or adapting the duties or work circumstances of the employee to accommodate the employee's disability.

- In the process of the investigation, the employee should be allowed the opportunity to state a case in response and to be assisted by a trade union representative or fellow employee.
- The degree and the cause of incapacity are relevant to the fairness of any dismissal.

True impossibility of performance can constitute grounds for terminating the employment relationship, when all alternatives had been considered and reasonable accommodations to assist the employee had failed. Venter (2007) explains the reason being that, under certain conditions, a company can neither be reasonably expected to keep an employee's job open for an indefinite period, nor be expected to accept losses as a result of such accommodation.

As an alternative measure to the above, the employer may implement a poor work performance management programme, to counsel, evaluate and measure performance with the intent to improve performance up to desired standards.

The performance management programme: poor work performance or ill health/injury consists of:

- Minimum of three (3) consecutive poor work performance counselling interviews;
- Identification of desired standards versus actual performance;
- New goal setting of minimum requirements and measuring batteries;
- Follow-up and continuous evaluation of performance.

The performance assessment and evaluation consist of four stages: The aim of the first stage is to determine the reason for poor performance, whether the non-conformance is as a result of incapacity to perform or is it related to misconduct such as attitude to work, management shortcomings or insubordination.

The second stage of the evaluation will be more formal and constructive in order to examine all direct and indirect factors that influence performance. The employee must carry full knowledge of the inherent requirements of his/her job, and must be fully

aware of the minimum standards that must be reached. The employee must furthermore carry knowledge of consequences that may follow if performance is not enhanced and must be aware of the seriousness of the matter. During stage three, the employer may seriously start considering alternative measures in order to address poor work performance, including (but not limited to) further training and/or counselling, demotion or transfer alternatives short of dismissal. The fourth stage is the final stage. The employer may consider dismissal if the employee failed to improve performance after all reasonable steps were taken, and other alternative measures were considered.

CONCLUSION

The employer has the responsibility to provide a safe and healthy working environment, which includes the duty to identify and assess all possible hazards and risks involved (*Introduction and Problem statement*). Furthermore, **appropriate precautionary measures** should be considered and implemented to minimise, reduce or eliminate potential risks in the workplace. Risks take various forms, namely *strategic*, *operational*, *financial*, *non-financial* and *compliance* (complying with laws and regulations). The necessity of planning, job design and designing the work environment, when managing health and safety in the workplace, has increased in light of the costs involved in workplace accidents and incidents (*with reference to page 5 of this article*). Ergonomics seeks to maximise safety, efficiency and comfort by matching the requirements of the operator's work environment to his capabilities – to design the workplace to fit the worker; or fitting the task to the man (*page 6*). Discomfort in the workplace, including improper lighting, poor ventilation, excessive noise, extreme thermal conditions and emergency excess places a great deal of strain on the individuals working under such conditions, adding stress and anxiety to their jobs. Operator fatigue and stress lead to potential work-related disorders (MSDs) and increase the risk of workplace incidents and accidents. As fragile as the human body is, the thought process is just as complex. Humans have limited capability for processing information, and the experience of being driven to the margin of physical and psychological capability can add stress to the job. When becoming incapable or unfit to perform the desired standard and specifications of the job, the employee faces the possibility of termination of services, which places a great deal of strain on the employment relationship between

employer and employee. A person can be declared unfit because of a medical condition that excludes him/her from the relevant occupation, or because of demonstrable lack of capacity to perform the work. Disability due to ill health or injury is defined as an impairment that prevents a person from performing a task or occupation or limits the performance of the occupation or task. When the employer is faced with a situation where the employee is incapable of performing a work task, it is necessary to follow the reasonable steps before considering dismissal. The employer is expected to consider as far as reasonably practicable all other alternatives to accommodate the disability of the employee. When accommodations should be made for an injured employee, it would be useful to follow ergonomic procedures to make the workplace more workable. When taking an employer's point of view, the evaluation procedure may appear superfluous and the easiest way out would be to simply terminate the employment relationship. Fortunately for the employee, the Labour Relations Act (66 of 1995) and other legislations protect the rights of the employee, and require that fair procedures should take place before any dismissal can occur. It is necessary that employers have health and safety policies in place, procedures to follow with occupational injuries and diseases, and more importantly, ergonomic principles to create a healthy, safe and favourable workplace. An ergonomically correct workplace provides many advantages that will improve productivity and product quality and reduces the risk of workplace discomfort, leading to unwanted incidents. Therefore, it is sustained that ***the working interface between human and technology, existing in a demanding work environment, will have an adverse effect on the wellbeing of the employee, influencing the individual's ability to perform, subsequently affecting the labour relationship between employer and employee.***

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The exploration of psychosocial risk and the handling of unsafe acts and misconduct

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Purpose: The aim of this article is to investigate the psychosocial risk environment influencing employee behaviour, and subsequently the trust relationship between employer and employee.

Design/methodology/approach: The unique nature and commonness of negative acts, such as unsafe behaviour, human errors, poor performance and negligence, also referred to as unsafe practice, are explored. A literature review is formulated to investigate the nature of negative acts or unsafe behaviour. The findings of this study are used to draw comparisons between unsafe behaviour/misconduct and accidents in the workplace and finally conclude how it should be addressed from a labour relations point of view.

Findings: The results indicate comparisons between unsafe practice/misconduct and occupational injuries and accidents, as a result of system flaws, human error or psychosocial risk.

Keywords: Occupational risks, unsafe practice; misconduct; organisational safety culture, ergonomics, management commitment and leadership, labour relations.

Article type: Research article

INTRODUCTION AND PROBLEM STATEMENT

In a scenario of production urgency that was examined at a large manufacturing plant in South Africa, where this study was conducted, two operators were found in violation of the ‘lock out’ procedure, while working on moving machinery. At that moment, production was influenced by a technical fault on the machine in the basement/pit of the machine near large moving rollers. The operators went into the ***danger zone*** to find the error, where access is strictly forbidden. A year prior to this incident, one employee suffered a severe injury at the same machine and work area. The employee had been permanently disabled after he lost the fingers (2, 3, 4 and 5) on both of his hands. Despite being aware of this serious injury, the operators knowingly placed their own lives in danger; however, what mind set may have produced this behaviour and what series of actions were considered before they made the decision to ignore company regulations?

After the incident, the two operators were charged with misconduct and were informed to attend a disciplinary hearing. The manufacturing company consistently applies a zero tolerance policy for safety violations and safety misconduct. This action was viewed as a serious offence, which the employer could not allow (CCMA Case Number: GATW6161/13).

This scenario, along with other examples, will be used throughout this article to understand the reason for discrepancies, involving individuals’ ***attitudes*** and ***behaviour***. It is argued that even if the system has been designed to take account of all the ergonomic and other safety principles, statistics show that accidents still occur when a human operator is involved (Osborne, 1985), because accidents are often attributed to human error and to the characteristics of an operator’s behaviour (Osborne, 1985; Bridger, 2003). It is also argued that workplace accidents are frequently the result of human error, which in turn is the unfortunate outcome of flawed systems of work (Health and Safety Authority, 2004). Real systems are multi-layered and hierarchical and errors can only lead to accidents if they have consequences at other levels (Bridger, 2003). This will be discussed in more detail later on (***Swiss Cheese Model***).

Finally, in considering the behaviour of the operators (above), Geller (2005) elaborates that people usually act in a certain way based on the ***consequence they expect from their actions***. “People follow through with the particular behaviour ***activated*** to the extent they expect doing so will provide them a pleasant consequence or enable them to avoid an unpleasant consequence” (Geller, 2005, p. 542). In order to fully comprehend the complex interactive phenomenon between

the man-machine-environment and how the psychosocial risk environment affects individual- and group behaviour, **organisational behaviour** as a whole must be examined. Organisational behaviour further correlates with the **working interface concept**, in that it includes the core topics of motivation, leader behaviour and power, interpersonal communication, group structure and processes, learning, attitude development and perception, change processes, conflict, work design, and work stress (Garcia & Keleman, 1989). These aspects will be further addressed through this article.

In conclusion, the problem statement derived from the above introduction is that ***the psychosocial risk environment will either provoke desirable or undesirable behaviour from the individual employee, subsequently influencing the trust relationship between employer and employee and the organisation as a whole (Labour Relationship).***

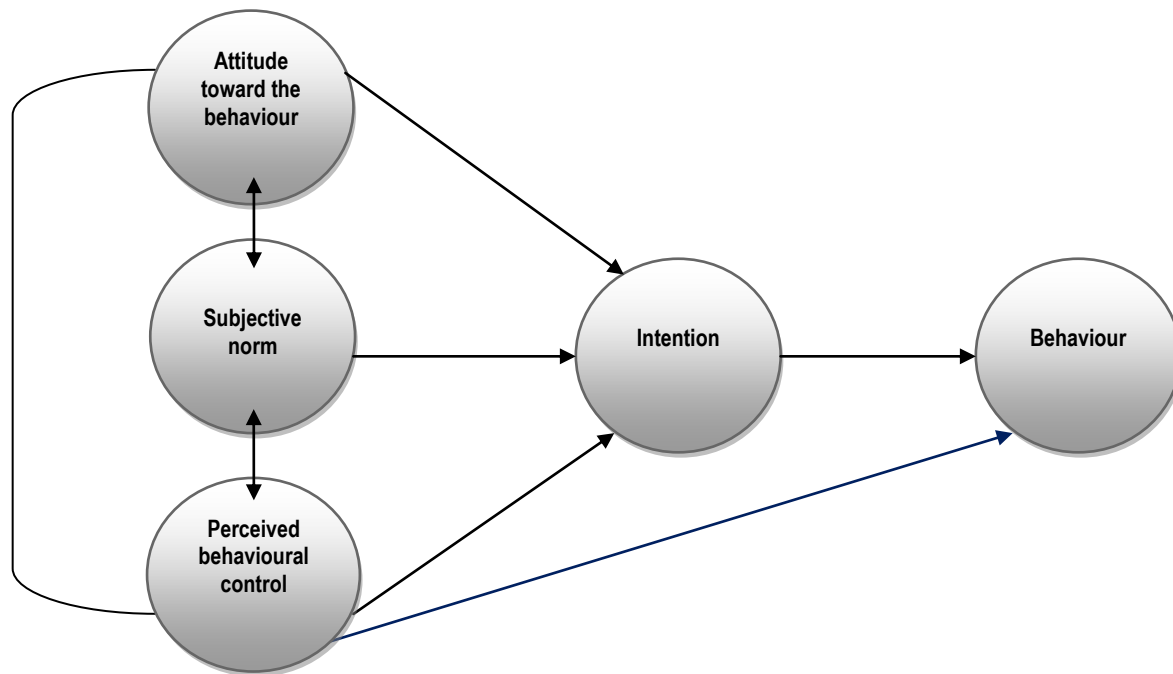
LITERATURE REVIEW:

It is believed that **undesirable behaviour** and **interaction with the environment** are the causes of 80-96% of workplace injuries in that accidents only occur **when an employee interacts with the condition in an unsafe way**, where unsafe conditions exist (Musolino, 2005; Strydom, 2009).

Behavioural-based Safety (BBS) looks for external factors to understand and improve behaviour. According to Geller (2005), behaviour is influenced by factors in both our external and internal worlds. Environmental conditions that influence behaviour include inadequate management systems or manager behaviours that promote or inadvertently encourage at-risk behaviour (Geller, 2005). BBS focuses on what people do, and then analyses **why** they do it (Geller, 2005; Musolino, 2005).

Ajzen (1991) developed a model focusing on **intentions** as the key link between attitudes and planned behaviour. The theory of planned behaviour includes three (3) interacting determinants of one's intention (a person's readiness to perform a given behaviour) to exhibit a specific behaviour (Kreitner & Kinicki, 2008). These three determinants include one's **attitude towards certain behaviour, the subjected norm**, and **perceived behaviour control**. The unique interaction between the three determinants will be explained in more detail below with reference to an incident that occurred at the manufacturing plant where this research study was conducted:

Model 1: *Ajzen's Theory of Planned Behaviour*



(Ajzen, 1991, p. 182)

The following case study will be used to explain the model above (Model 1) in more detail:

The employee, who is employed as an operator at a fast moving manufacturing machine, has a **favourable attitude** towards ignoring the safety rule to rectify quality errors. By doing this, the employee has to move her hand into a danger zone of the machine. Her **perceived subjective norm** is favourable because she sees her co-workers taking shortcuts to rectify errors on the machine in the same manor. The employee believes that she has complete control and is in charge of acting on her intention to take the shortcut (**perceived behaviour control**); however, without expecting an accident to occur, the employee suffered an injury (lacerations to the left hand) and lost days from work.

In conclusion to the above, a person's intention to engage in a given behaviour is a strong predictor of that behaviour. In the same sense, and with reference to the above incident, to determine whether an individual will show undesired- or unsafe behaviour is to determine whether these said bad habits are accepted as the norm among all other employees (for example to take shortcuts at work to save production time). Therefore, it is suggested that risk taking behaviour can be predicted by using the theory of the planned behaviour model.

Consequently, managers can influence behavioural change by doing or saying things that affect the three determinants of employees' intentions to exhibit a specific behaviour. Kreitner and Kinicki (2008) elaborate that this is accomplished by modifying the specific beliefs that foster each of these determinants. For example, behavioural beliefs, normative beliefs, and control beliefs directly affect attitude toward the behaviour, subjective norms and perceived behavioural control, respectively.

Therefore, employee beliefs can be influenced through the information management provides on a day-to-day basis, organisational culture values, role models, and rewards that are targeted to **reinforce** certain beliefs (Kreitner & Kinicki, 2008).

Psychosocial risk

Workplace psychosocial factors are **non-physical aspects** of the workplace that are developed by the culture, policies, expectations, and social attitude of the organisation (Canadian Centre for Occupational Health & Safety, 2012). **Psychosocial factors** are associated with the way individuals interact with the demands of their job and their work environment (Green & Taylor, 2008). It is important to understand that the term 'psychosocial' is different from 'psychological', which refers more narrowly to **thought processes and behaviour** of individuals (Burton, Kendall, Pearce, Birrell & Bainbridge (2008).

Psychosocial risks are **organisational factors** that affect the psychological safety and health of employees (Gilbert, 2010). Psychosocial factors include the way the work is carried out (deadlines, workload, work methods) and the context within which work occurs, including relationships and interactions with managers and supervisors, colleagues and co-workers, and clients or customers (Guarding Minds at Work, 2012).

Thirteen psychosocial factors have been identified and summarised from previous research by Samra, Gilbert, Shain and Bilsker (2012). The factors (PSR-13) are interrelated and therefore influence one another. The thirteen factors (PSR-13) assessed by Samra, *et al.* (2012) correlate with an earlier study done by Green and Taylor (2008). The similarities are summarised below:

Green and Taylor (2008) firstly refer to **social support** in terms of the amount of input that workers perceive they receive from co-workers, whereas Samra *et al.* (2012) elaborate on

psychological support and a work environment where co-workers and supervisors are supportive of employees' psychological and mental concerns, and respond appropriately as needed.

Secondly, Green and Taylor (2008) mention a sense of community (the degree to which workers feel that they are part of a community), whereas Samra *et al.* (2012) refer to **organisational culture** and a work environment characterised by trust, honesty and fairness.

Furthermore, both studies highlight the **quality of leadership, clear leadership and expectations**, and **civility and respect**. Other psychosocial risks identified by the authors include **work demands and mental loads**; subsequently **work stress, management feedback**, including **recognition and reward, involvement and influence, job control, psychological protection**, and **protection of physical safety** (for more detail see Green & Taylor, 2008:2; Samra, *et al.*, 2012:2).

Therefore, psychosocial risks are constituted by organisational factors, such as lack of supportive relationships at work, job insecurity or company culture (Houtman, 2008). Exposure to psychosocial risk factors at work may result in a state of work-related stress (**psychological**), in which one often feels tense, concerned, less vigilant and less efficient in performing tasks (Houtman, 2008; Rick, Briner, Daniels, Perryman & Guppy, 2001), leading to increased absenteeism, withdrawal behaviour, conflict, strain (fatigue, burnout, anxiety), turnover, loss of production, and greater risk of accidents, incidents and injuries (Canadian Centre for Occupational Health & Safety, 2012).

Work-related stress depends on individual perceptions of their work environment, dependant on resources available in the workplace and in the organisation (for example, the support of co-workers and supervisors). These psychosocial risks can have negative consequences on the organisation as a whole, including negative health outcomes, increased risk for accidents and impaired performance (Houtman, 2008; WHO, 2013; Cassitto, Fattorini, Gilioli & Rengo, as cited by WHO, 2013). This will, in turn, also influence the labour relationship in terms of employers' expectations versus employees' abilities to perform.

It is undeniable that psychosocial risks do not only play a significant role in organisational effectiveness, they further have an important impact on human resource management, and more specifically on labour relations.

Occupational stress

The experience of work stress, caused by the exposure to psychosocial risks and -hazard factors **can cause unusual and dysfunctional behaviour at work** and contribute to poor physical and mental health (Leka *et al.*, 2005).

According to Geller (2005), people do what they do based on factors in both their external and internal worlds. In relation with the above, psychosocial risk assessment techniques that identify environmental conditions that influence behaviour, is another cost effective manner to change behaviour, where behaviour change is needed (Geller, 2005).

It is widely accepted that effective risk controls depend in part on the behaviour of individuals at all levels within an organisation (Fleming & Lardner, 2002). Good systems, procedures and engineering controls on their own are not enough – it is how well an organisation ‘lives’ its systems that matters (Fleming & Lardner, 2002). This can include identifying inadequate management systems, or management behaviours that promote or inadvertently encourage at-risk work practice as stated above (Geller, 2005; Houtman, 2008; Leka & Cox, 2008).

The above summary brings us closer to the answer of the question asked in the introduction of this article: *Why* did the employees act in an unacceptable/undesirable manner, in terms of the known safety rules. It is now clearer that particular **behaviour is activated** by environmental (physical and psychological) influences, driven by outcomes and consequences. This concept will be further considered and discussed below:

Drivers of behaviour

The core element to promote health and safety behaviour is the ABC model of behaviour, referring to Antecedents (A), Behaviour (B) and Consequence (C) (Daniels, 1999; Geller, 2005). Antecedents refer to a casual event (trigger) preceding the behaviour, including rules and procedures, suitable tools and equipment, information, signs, skills and knowledge, training and understanding of other people’s expectations, etc. (Fleming & Lardner, 2002). Although antecedents are necessary to trigger desired behaviour, their presence does not guarantee that behaviour will occur (Fleming & Lardner, 2002), in that **consequence drives behaviour**. Consequence is defined as ‘the **outcome of the behaviour** for the individual that influences the likelihood that the behaviour will be repeated’; therefore, the frequency of behaviour can be

increased or decreased by altering the consequence following the behaviour (Fleming & Lardner, 2002, p. 5).

Table 1: Examples of the different types of consequence

Positive reinforcement	Negative reinforcement	Punishment
Positive feedback about achievement.	Avoidance of peer disapproval	Removal of benefits
Recognition from management.	Avoidance of pain	Disciplinary action
Praise from colleagues	Avoidance of the loss of financial reward	Physical pain or injury
Prizes	Avoidance of financial penalty/fine	Feeling guilty

(Fleming & Lardner, 2002, p. 5)

Reinforcements, as stipulated above, are important in terms managing (driving) behaviours at work. Leaders are challenged to cultivate a work culture that facilitates **responsibility or self-accountability** for safety (Geller, 2005). Positive reinforcements allow discretionary efforts that involve doing more than the minimum required, and maximising safe performance because a person *wants to*, rather than *has to* (Fleming & Lardner, 2002). Negative reinforcement produces just enough of behaviour to avoid something unpleasant, while positive reinforcement produces more behaviour than required (Daniels, 1999). This is further important to consider when dealing with misconduct in the workplace and punishing unwanted behaviours (labour relations management).

Geller (2005) differentiates between accountability and self-accountability or responsibility (p. 557):

When people are held accountable, they are asked to reach a certain objective or goal, often within a designated time period. However, they might not feel responsible to meet the deadline, or might feel responsible enough to complete the assignment, but nothing more. In this case, accountability is the same as responsibility. When people extend their responsibility beyond accountability they do more of what is required. They go beyond the call of duty defined by a particular accountability system. This is often essential when it comes to occupational risk management – to improve safety beyond the current performance plateaus. Workers need to extend their responsibility for safety beyond that for which they are held accountable.

Safety culture

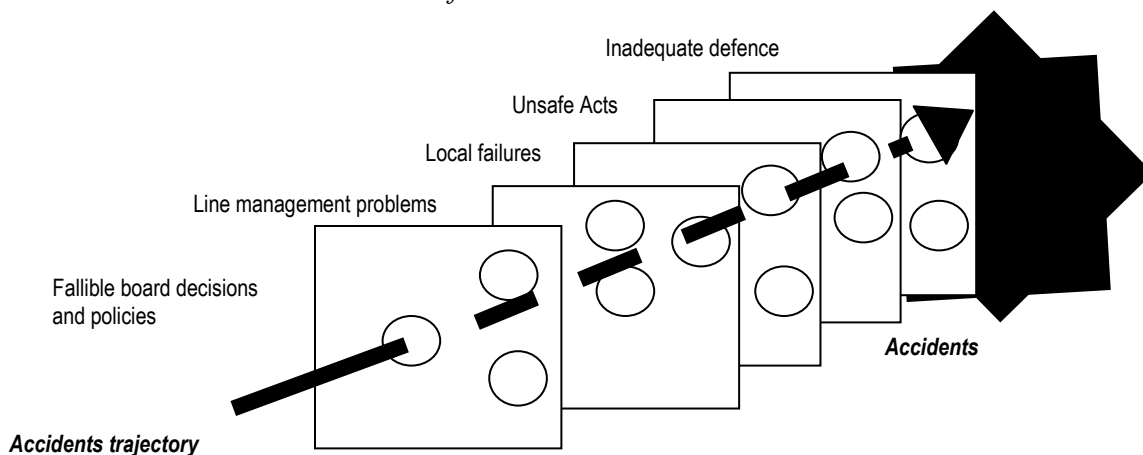
Out of the above theory/discussion related to accountability and self-accountability or responsibility, the following assumption could be made that safe behaviour is driven by consequence, which in turn, relies on the existence of a safety culture, cultivated by the leaders of the organisation. A safety culture is directly dependent on the attitude of employees towards safety (Attock Refinery Limited, 2013). The product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of an organisation's health and safety management (U.K Health and Safety Commission, as cited by ARL, 2013). Regardless of safety management systems, policies and procedures, incident data shows that the majority of incidents and accidents in the workplace are a result of employees' attitude, perceptions and patterns of behaviour, such as to take shortcuts and intuitive-based decisions, bypassing Standard Operating Procedures (SOP's), rules and regulations (Findings from ARL, 2013). This directly correlates with the example given in the Introduction of this article and is commonly found in the majority of incident investigation reports at the researched manufacturing plant, where this empirical study was conducted (to be discussed in more detail further on). Organisational culture refers *to a system of shared meaning* held by members, distinguishing the organisation from other organisations (Schein, 1985). This system of shared meaning is a set of *key characteristics* that the organisation values (Robbins, Odendaal & Roodt, 2007). Organisational culture represents *a common perception* held by the organisation's members and is concerned with how employees *perceive the characteristics* of an organisation's culture, not with whether or not they like them (Robbins *et al.*, 2007). Therefore, it is further argued and believed that individuals with different backgrounds or at different levels in the organisation will tend to describe the organisation's culture in similar terms (Meyerson & Martin, 1987). **Safety culture** is "that assembly of **characteristics and attitudes in organisations and individuals**, which establishes that as an overriding priority, safety issues receive the attention warranted by their significance" (Reason, 1997, p. 194). According to this definition, not all organisations have a safety culture; only for organisations for which safety is an *overriding priority*, a safety culture exists. Therefore, a safety culture is something that is strived towards, but rarely attained, in that a safety culture of an organisation may vary in its *effectiveness* (Hopkins, 2002). According to Hale (2000), referring to '*cultural influence on safety*' is a more appropriate term in that it suggests that where a culture exhibits a strong emphasis on safety, a '*culture of*

safety' (safety culture) exists. Attitudes are a key element of a safety culture, and an organisation can improve its safety culture, and in turn its safety records, by modifying the attitudes of both management and employees towards safety (HSA, 2004).

Management and control

As mentioned above, the *effectiveness of a safety culture* is dependent on the overall organisational behaviour, bringing me back to the interactive phenomenon (working interface), as extensively discussed in Article 1. The man-machine-environment concept is still valid and should not be forgotten (Osborne, 1985). It is believed that the majority of incidents are caused by unsafe behaviour, however, it has now been established that behaviour is never random and that it is very much influenced by the organisational structure as well as culture, group and individual perceptions and attitudes towards safety, driven by consequence, as cultivated by management. It is argued that workplace accidents caused by human error are frequently the unfortunate result of flawed systems of work (Health and Safety Authority, 2004). Major accidents can frequently be traced to failures in safety management systems (Keltz, 1994, as cited by Hopkins, 2002). This finally brings me to the Swiss Cheese Model. The 'Swiss Cheese' Model, designed by Reason (1997), uses an analogy in which an initial fault gets into the system, progressing along an 'accident trajectory' that depends on a weakness at the next level of system organisation (Hopkins, 2002; Bridger, 2003). If all the weaknesses, at all levels, coincide, like slices of Swiss cheese momentarily aligned so that it can be seen through the holes, an accident trajectory exists and an accident will occur (Bridger, 2003).

Model 2: 'Swiss Cheese model of accidents'



(Bridger, 2003, p. 467)

The Swiss Cheese Model (Model 2) illustrates that high technology systems will frequently suffer from weaknesses and failures in its *defensive layers*. According to Reason (2000, as cited by BMJ), high technology systems have many defensive layers; some are engineered (alarms, physical barriers, automatic shutdowns, etc.), others rely on people (control room operators, etc.) and yet others rely on procedures and administrative controls. In an ideal world, each defensive layer would be intact; however, in reality they are more like slices of Swiss cheese (Model 2), having many holes, which are continually opening, shutting and shifting their location (Reason, 2000, as cited by BMJ). According to the Model (2), a trajectory of accident opportunities is permitted when the holes in many layers momentarily line up – bringing hazards into damaging contact with victims (Reason, 2000). Furthermore, the holes in defences arise for two reasons: **active failures** and **latent conditions**. To explain how nearly all adverse events involve a combination of these two sets of factors (as cited by BMJ, 2000), a practical example of a real incident that occurred on 18 May 2013 at a plant of the researched manufacturing group will be used. Special permission was received to use this information, relating to the incident, in this article:

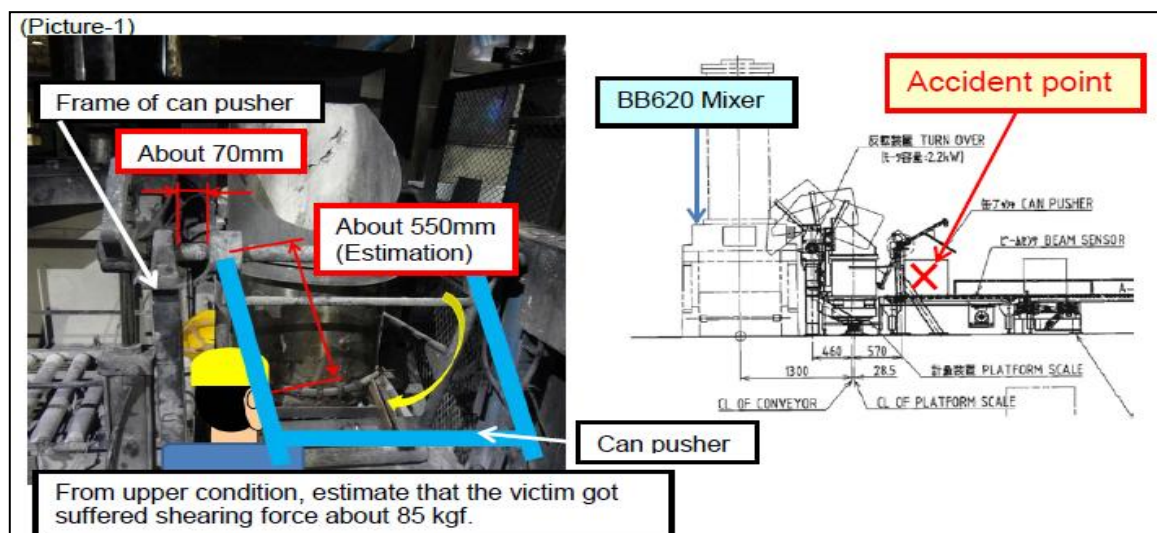
The operator was performing his normal duties on the day of the incident when he managed to get his neck caught between a ‘*can pusher*’ and a frame of a pigment supply unit (See pictures 1-3 below). The same question asked in the Introduction is **why** did this brutal accident occur? According to the model, as stated above, the answer is the combination of **active failures** and **latent conditions**.

Active failures are the **unsafe acts** committed by people who are in direct contact with the system, and take a variety of forms – slips, lapses, fumbles, mistakes and procedural violations (Reason, 1990). Latent conditions are the inevitable “resident pathogens” within the system and arise from decisions made by designers, builders, procedure writers, and top-level management (Reason, 2000). Latent conditions have two kinds of adverse effects: firstly, they can translate into error **provoking conditions** within the local workplace (for example time pressure, understaffing, inadequate equipment, fatigue, and inexperience), and secondly, they can create **long-lasting holes or weaknesses in the defences** (untrustworthy alarms and indicators, unworkable procedures, design and construction deficiencies, etc.) (Reason, 2000, as cited by BMJ).

From the following facts concluded by investigators, it was found that the victim (operator) climbed over the door switch (*safety sensor/device*) and entered the danger zone of the machine without activating the emergency stop (*lock-out procedure*). The active failure in this case is that the operator ignored/violated the inherent rule – not to enter a danger zone without activating the emergency stop. The operator acted unsafely by climbing over the safety gate.

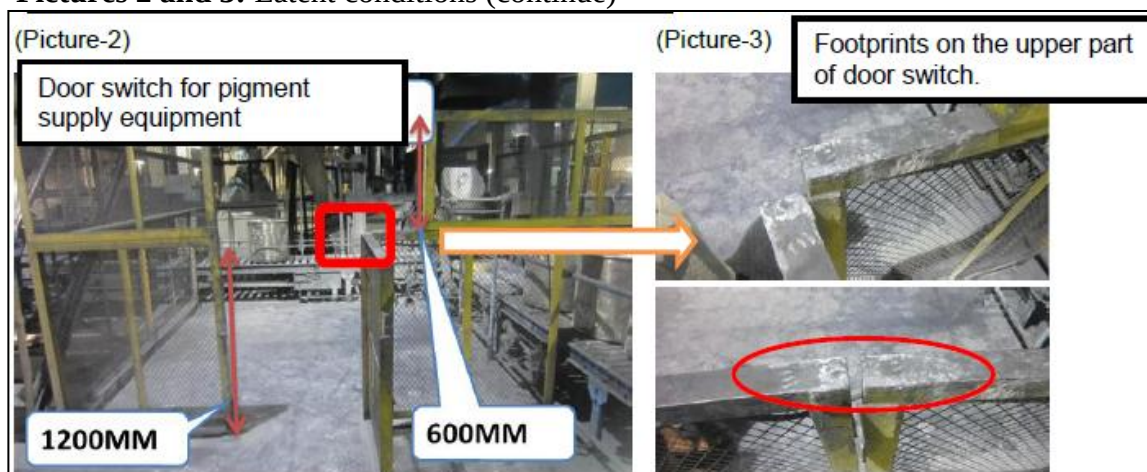
The investigators further considered the latent conditions and investigated the design of the work environment, known procedures and the build of the machine (as illustrated in pictures 1-3):

Picture 1: Latent conditions



(Incident investigation report dated 18 May 2013)

Pictures 2 and 3: Latent conditions (continue)



(Incident investigation report dated 18 May 2013, continue)

The error provoking conditions (the consequences that drove the unsafe behaviour) to this case are unknown, but may include time pressure, production urgency and/or fatigue. Facts that are known to the investigators (Kouji Matsuoka, General Manager, Occupational Safety, Health and Disaster Prevention Department, 2013) include, for example, that the design of the machine allowed the operator to climb over the safety gate; the operator was able to by-pass the safety sensor and to move into the danger zone without the machine switching off; the height of the safety gate is lower than the surrounding safety fence, creating access over the gate and into the danger zone; and the operator failed to obey the safe operating procedure, indicating a shortfall in the system (culture, perception, attitude, leadership and management, prioritising of outcomes and goals, as discussed afore); etc.

In conclusion, the unsafe behaviour, demonstrated by the operator involved, in combination with the latent conditions of the system, created a ***momentarily alignment of holes*** that permitted the course of the accident that occurred (accident trajectory). This example, based on the Swiss Cheese Model, further proves that the interactive phenomenon between man-machine-environment exists and that accidents only occur when humans interact in an unsafe way with an environment where unsafe conditions exist. Therefore, it is still argued that an accident occurs as a result of the environment demanding more of the operator than he is able to give (Osborne, 1985). Environment here refers not only to the operators' physical- or psychosocial factors alone, but rather to the organisational system and organisational behaviour as a whole.

Error management

As explained above, systems management and risk management play a significant part in the occurrence of incidents and accidents. Human factor engineering (ergonomics management) considers two approaches in error management: limiting the incidence of dangerous errors, and creating systems that are better able to tolerate the occurrence of errors and contain their damaging effects (Reason, 2000). The Occupational Health and Safety Act (85 of 1993) refers to the employer's responsibility to create a safe working environment, ***as far as reasonably practicable***. As far as human error, unsafe acts or negligence is concerned, South African legislation further considers the employer's (or the reasonable person's) '*foreseeability of wrongful conduct on the part of others*' (As cited in Anon, 2013). It concludes that 'there are certain situations where it is foreseeable that others will commit intentional or negligent wrongs,

and in such case a reasonable person must take **precautions** against it'. 'The employer may himself therefore be negligent for failing to foresee and guard against the intentional and negligent behaviour of others' (*Stansbie v Troman* [1948] 2 KB 48 (CA) [1948] 1 All ER 599).

It is explained that where precautions are required, the employer does not have to guarantee that harm will not happen, nor does the employer have to take every precaution imaginable. It is therefore wrong to say that just because the harm happened, the employer was negligent (Anon, 2013). According to legislation, the employer needs only take reasonable precautions. Furthermore, the employer will not be negligent just because better precautions could possibly have been taken. The employer only needs to take reasonable precautions (OHSA, 85 of 1993, section 14; *Robertson v Durban Turf Club and others* 1970 (4) SA 649 (N); *Minister of Forestry v Quathlamba* 1973 (3) SA 69 (A)).

Where the employer has considered all possible alternatives and implemented as far as reasonably practicable all precautions, the employee has the obligation to interact with the environment in a safe way (OHSA, 85 of 1993, section 8). Keeping in mind that behaviour is never random, and that human error may be the result of flawed systems at work, one must also consider that the employer will be faced with certain situations where the employee is guilty of misconduct or negligent behaviour, as opposed to errors caused by consequence (as explained afore). Finally, the following assumption could be made that *this* is the ground-breaking point where psychosocial risks and labour relations management come together.

It is evidently especially imperative to distinguish between human error and negligence or carelessness, which is viewed as misconduct. Negligence refers to '**failure to exercise the degree of care considered reasonable under the circumstances**, resulting in an unintended injury to another party'. According to Fsp (2012), an employee who knows and understands what is expected of him and is aware of the level of care required to carry out his work tasks satisfactorily, but fails to take sufficient care, is guilty of **misconduct/negligence**. A person is guilty of negligence (*culpa levis*) when he, though not grossly negligent, omits to take that care that ordinary people usually take in similar circumstances (As cited in the High Court of South Africa, Case no. AC 30/97, by Davis, 2000). In *Government RSA (Department of Industry) v Fibre Spinners and Weavers (Pty) Ltd* 1977 (2) 324(D & CLD) at 335 E, Didcott, J. stated that

gross negligence denotes “**recklessness, an entire failure to give consideration to the consequence of his actions, a total disregard of duty**”.

Finally, negligence, carelessness or recklessness is viewed as a serious offence that places a great deal of strain on the organisation as a whole, whereas gross misconduct has the propensity to damage the trust relationship between the employee and the employer. In cases where negligence, as defined above, is evident, the employer may feel betrayed by the employee’s actions of misconduct and disregard for rules and regulations. Where system flaws are not to blame for unsafe acts, the employer has the right to discipline unwanted behaviour. More so, the employer is faced with the responsibility to minimise, remove or eliminate the risk, in order to provide a safe work environment for the rest of the workforce. In doing so, the employer will turn to the code of good practice (Labour Relations Act, 66 of 1995, Schedule 8) as a guide to perform a fair disciplinary procedure.

In the case study discussed in the model of ‘*Ajzen’s Theory of Planned Behaviour*’ (p. 6), the operator showed risk-taking behaviour, which resulted in an accident. In this case, it was found that the operator’s behaviour was driven by **a perceived subjective norm** and **perceived behaviour control**. Does this exclude negligence? Also in the case study discussed in the “Swiss Cheese” Model (p. 16-19), it was found that **latent conditions** existed and **momentarily alignment of system flaws** resulted in the accident. Again, does this exempt the employee for being found guilty for negligence in that he failed to comply with the safety rules?

The Occupational Health and Safety Act (85 of 1993) stipulates that the employer and the employee are jointly responsible for the health and safety of the workplace: the employer has the responsibility to provide a safe work environment, as far as reasonably practicable, and in turn, the employee has the responsibility to interact with the environment in a safe way (working interface). Therefore, the employee must take responsibility for his/her actions and must be held accountable for negligent behaviour or risk-taking behaviour.

In conclusion, with regard to behaviour-based safety, it is important to understand that behaviour is never random and inspired by a desirable outcome. To understand this, the employer has the advantage to be able **to predict** and **foresee** unwanted behaviour. Behaviour-based safety allows the employer to perform hazard identification and risk assessment to promote safe behaviour, safe operating procedures and to ensure compliance with rules and regulations. Psychosocial risk

management is important for sound human resource management and supports labour relations management in that it relies on ***reinforcements, rather than punishment*** (refer to the studies of FW Skinner). By performing a proper risk assessment, analysing the physical and psychosocial environment allows the employer to ***foresee wrongful conduct on the part of others*** (negligence), and to ***change*** the predicted ***behaviour***. Therefore, it is concluded that the psychosocial risk environment has an advert effect on labour relations management.

METHODOLOGY

SAMPLE

For the purpose of this quantitative research study, a structured questionnaire was used to collect the data. This section describes the sampling method, research participants and study population, questionnaire and statistical analysis conducted.

Study population and research participants

The research was conducted at one of South Africa's largest factories in the manufacturing industry. The research participants consist of adult employees employed by this specific manufacturing company in different departments and at different levels. This industry is deemed appropriate due to the nature of business found in the manufacturing industry where it is expected that occupational risks, as well as health and safety hazards will be present to some degree. Simple random samples of 280 employees, out of a total of 816 employees employed at the same manufacturing company on a full-time basis, including senior management, middle/line management, office staff, and operator's level, responded to the questionnaire. However, after revision, only 251 answer sheets were accepted by the researcher. The questionnaire was issued with a cover letter and included with the participants' payslips. The questionnaire was promoted as voluntarily and anonymous. Permission was obtained to conduct the study at the factory. The purpose of the study was explained verbally and in writing to management and to the workers. The participants have been assured that no negative consequences will emerge for those who participated in the research process. The final report will be made available to both management and the workers.

The majority of respondents were male (89.5%), while female respondents represented 10.5%. This is consistent with the fact that the majority of employees employed at the factory are male employees.

The research questionnaire:

The questionnaire was drafted from the Dutch Musculoskeletal Questionnaire (*TNO Work and Employment, 2001*), Ergonomics Risk Identification and Assessment Tool, (*CAPP and CPPI Ergonomics Working Group, 2000*), HSE Safety Climate Survey Tool (*Health and Safety Executive, 2002*), Survey Ergonomics in the Workplace (*National Seafood Sector Council, 2005*). The questionnaire was divided into subsections addressing 1) **health**, including physical fitness, strength and endurance; 2) **work**, including type of work, rotation, repetitiveness and workload; 3) **employee wellness**, including job satisfaction, exhaustion and work-home balance; 4) **organisational culture**, including management commitment, expectations, perceptions and organisational climate; and 5) **labour relations**, including the employment relationship between employer and employee and behaviour. The validity of the questionnaire was tested in order to ensure a suitable and appropriate measuring battery to answer the specific research objectives and will be discussed in more detail below.

STATISTICAL ANALYSIS

The statistical analysis of the data was conducted through the assistance of different statistical techniques, carried out by the SPSS program (SPSS Inc, 2007). The analysis was done in three stages: a factor analysis, a cluster analysis, and an analysis of significant differences between two group clusters of employees working at the manufacturing plant.

Firstly, a principal axis factor analysis, using an Oblimin rotation with Kaiser normalisation, was performed to explain the variance-covariance structure of a set of variables through a few linear combinations of these variables. The Kaiser-Meyer-Olkin measure of sampling adequacy was used to determine whether the covariance matrix was suitable for factor analysis. Kaiser's criteria for the extraction of all factors with eigenvalues larger than one were used because they were considered to explain a significant amount of variation in the data. All items with a factor loading greater than 0.3 were considered as contributing to a factor, and all items with loadings less than 0.3 as not correlating significant with this factor (Steyn, 2000). Any item that cross loaded onto two factors with factor loadings both greater than 0.3 was categorised in the factor where

interpretability was best. A reliability coefficient (Cronbach's alpha) was computed for each factor to estimate its internal consistency. All factors with a reliability coefficient above 0.6 were considered as acceptable in this study. The average inter-item correlations were also computed as another measure of reliability, and lie between 0.15 and 0.55 (Clark & Watson, 1995). Secondly, a cluster analysis, using Ward's method with Euclidean distances, was performed. A cluster analysis is a multivariate interdependence technique, which primary objective is to classify objects into relatively homogeneous groups based on the set of variables considered, and it is mostly an exploratory technique (Hair, Bush & Ortinau, 2000). Hierarchical clustering makes no assumptions concerning the number of groups or group structure. Instead, the members are grouped together based on their natural similarity (Johnson & Wichern, 2007). This research did not take an *a priori* view of which data points should fall into which segment. Rather, a hierarchical cluster analysis was used to explore the natural structure of the data, by means of Ward's method of Euclidean distances. Thirdly, independent t-tests, two-test frequency tables, and chi-square tests were used to investigate any significant differences between the clusters. The p-value was analysed to consider the statistical significance of the results. A small p-value (< 0.5) is considered as sufficient evidence that the result is statistically significant (Ellis, 2003). In many cases, it is important to know whether a relationship between two variables is particularly significant. The statistically significance of such a relationship is determined with the Chi-square test, to conclude the *effect size*:

(a) Small effect: $w=0.1$, (b) medium effect: $w=0.3$, large effect: $w=0.5$

A relationship with $w \geq 0.5$ is considered as particularly significant (Ellis & Steyn, 2003).

RESULTS AND DISCUSSION

This section discusses the results of the factor analysis and presents the results of the t-tests and cross-tabulations with chi-square tests to investigate significant differences. The two clusters represent the lower-skilled respondents, including operators, forklift-/Crane operators, artisans, and other floor workers (cluster 1) in relation to higher-skilled respondents, including support staff, line -, middle -, and top management (cluster 2). Cluster 1 further represents the majority of employees working at the manufacturing plant, while cluster 2 represents the smaller group of people employed at the manufacturing plant. The respondents from cluster 1 are more exposed to

the physical work environment and interaction between the man-machine environment and more likely to perform physical- and tiring tasks.

Table 4: T-test result for employee physical-/mental health and work input factors in two clusters

		N	Mean	Std. deviation	Std. error mean	Effect size (w)	t-value	P
<i>Health status</i>	Cluster 1	161	3.609	.6242	.0492	0.09	.624	.534
	Cluster 2	65	3.554	.5871	.0728			
<i>Fitness status</i>	Cluster 1	152	3.257	.8178	.0663	0.21	1.416	.159
	Cluster 2	65	3.077	.8716	.1081			
<i>Work requires strength</i>	Cluster 1	159	3.277	.6927	.0549	0.78	5.628	.000
	Cluster 2	65	2.600	.8624	.1070			
<i>Work requires endurance</i>	Cluster 1	141	3.199	.6784	.0571	0.34	2.342	.021
	Cluster 2	61	2.918	.8225	.1053			
<i>Health complaints</i>	Cluster 1	157	1.764	.8559	.0683	0.10	.817	.415
	Cluster 2	65	1.677	.6640	.0824			
<i>Suffering from tension at work</i>	Cluster 1	155	2.335	1.0768	.0865	0.37	-2.949	.004
	Cluster 2	65	2.738	.8529	.1058			
<i>Feeling nervous at work/anxiety</i>	Cluster 1	153	2.000	1.0942	.0885	0.06	.437	.662
	Cluster 2	65	1.938	.8817	.1094			
<i>Feeling tired in the mornings</i>	Cluster 1	156	2.269	1.0370	.0830	0.06	-.476	.635
	Cluster 2	63	2.333	.8424	.1061			
<i>Feeling physically tired at the end of a working day</i>	Cluster 1	159	3.119	.8669	.0687	0.32	2.270	.025
	Cluster 2	64	2.844	.8012	.1001			
<i>Feeling mentally tired at the end of a working day</i>	Cluster 1	157	2.720	1.0429	.0832	0.31	-2.453	.015
	Cluster 2	65	3.046	.8372	.1038			

As Table 4 shows that lower-skilled workers and higher-skilled workers differ significantly based on their experience of physical- and mental work input and health status ($w \geq 0.3$). In general, employees feel that their health status is good. Employees who are more exposed to the physical environment of the manufacturing industry (cluster 1) have a better perception of their own fitness status, in that their work requires more physical strength, while higher-skilled employees from cluster 2 feel that their work requires more endurance (patience or persistence).

In correlation with this statement, it is showed that higher-skilled workers experience more frustration and tension at work, while the level of work anxiety is experienced relatively the same between both groups. Lower-skilled workers are physically more tired at the end of a working day, while higher-skilled workers are mentally more tired at the end of a working day.

Table 5: T-test result for employee wellness – home/work balance factors in two clusters

		Group statistics						
Skill		N	Mean	Std. deviation	Std. error mean	Effect size (w)	t-value	P
<i>Experience of psychosocial stress</i>	Cluster 1	156	2.3553	.63774	.05106	0.29	2.172	.032
	Cluster 2	64	2.1682	.55490	.06936			
<i>Experience of job satisfaction</i>	Cluster 1	155	2.8817	.60339	.04847	0.37	-2.900	.004
	Cluster 2	64	3.1042	.47559	.05945			
<i>Experience of workload</i>	Cluster 1	156	2.4295	.52365	.04193	0.67	4.921	.000
	Cluster 2	64	2.0807	.45715	.05714			

In relation with Table 4, Table 5 further shows that lower-skilled workers and higher-skilled workers differ significantly based on their experience of psychosocial stress, job satisfaction and experience of workload ($w \geq 0.3$). However, in this section, it was found that workers, who are more exposed to the physical environment of the manufacturing industry, suffer on average more with psychosocial stress, perceive less job satisfaction and experience a higher rate of workload.

Table 6: T-test result for organisational culture/-climate at the manufacturing plant in two clusters

		Group statistics						
Skill		N	Mean	Std. deviation	Std. error mean	Effect size (w)	t-value	P
<i>Experience of social support</i>	Cluster 1	156	2.6092	.66496	.05324	0.27	-2.264	.025
	Cluster 2	64	2.7891	.47175	.05897			
<i>General perception of the employer</i>	Cluster 1	156	2.7217	.73902	.05917	0.21	-1.725	.087
	Cluster 2	64	2.8766	.54039	.06755			
<i>General perception of safety at work</i>	Cluster 1	153	3.072	1.0007	.0809	0.19	-1.609	.109
	Cluster 2	62	3.258	.6512	.0827			
<i>General perception of tolerance for safety violations</i>	Cluster 1	153	1.895	1.1480	.0928	0.19	1.367	.174
	Cluster 2	62	1.677	1.0207	.1296			
<i>General perception of management's safety image</i>	Cluster 1	151	3.099	.9644	.0785	0.20	-1.597	.112
	Cluster 2	62	3.290	.7103	.0902			

Table 6 shows a small to medium effect ($w < 0.3$) or difference between lower- and higher-skilled workers, indicating that the general perception of the organisational safety culture is perceived relatively the same between the two groups.* The importance of safety at work is viewed as a high priority at all levels of the organisation. However, cluster 2 (higher-skilled workers) experiences a higher level of social support, has a more positive view of the employer, and has a better perception of management's safety image. These differing perceptions between the two groups relating to the organisation's safety culture, image and climate may form a basis of differing expectations and needs, subsequently influencing the labour relationship between employer and employee. Table 7 below shows the effect of these differing views and expectations on the labour relationship and favourable behaviour.

** Refer to literature; all levels and people from different backgrounds and perceptions experience the same safety culture, where a safety culture exists in a given organisation.*

Table 7: T-test result for labour relations perceptions and favourable behaviour at the manufacturing plant in two clusters

Group statistics								
Skill		N	Mean	Std. deviation	Std. error mean	Effect size	t-value	P
General perception of accident causes	Cluster 1	153	3.0268	.69368	.05608	0.48	-3.757	.000
	Cluster 2	64	3.3625	.55649	.06956			
Attitude towards unsafe behaviour	Cluster 1	154	1.6380	.52023	.04192	0.10	-.667	.506
	Cluster 2	64	1.6927	.56380	.07048			
General perception of responsibility and discipline	Cluster 1	154	3.3598	.49897	.04021	0.27	-1.832	.070
	Cluster 2	64	3.4974	.50722	.06340			
General feeling towards a high risk work environment	Cluster 1	150	2.847	.9177	.0749	0.34	2.492	.014
	Cluster 2	64	2.531	.8159	.1020			
General perception of management's responsibility	Cluster 1	146	2.363	1.0627	.0880	0.36	2.540	.012
	Cluster 2	62	1.984	.9494	.1206			
General perception of the employer's influence towards accidents	Cluster 1	142	2.155	.7746	.0650	0.50	3.705	.000
	Cluster 2	64	1.766	.6605	.0826			
Perception of the employer-employee safety relations	Cluster 1	147	2.367	.8996	.0742	0.21	1.455	.148
	Cluster 2	63	2.175	.8714	.1098			

As Table 7 shows, lower-skilled workers and higher-skilled workers differ significantly based on their perception of the employer's responsibility in terms of safety and their experience or views

of accident causes in the organisation ($w \geq 0.3$; $w \geq 0.5$). Cluster 2 (higher-skilled workers) more significantly agreed that accidents in the workplace occur as a result of unsafe behaviour, unsafe interaction with the environment and failure to obey safety rules, in relation with the response from cluster 1 (lower-skilled workers). However, both groups strongly agreed that safety rules may never be compromised or broken. This perception supports the finding in Table 6 above that the safety culture is perceived relatively the same between the two groups. Nevertheless, cluster 2 (higher-skilled workers) felt stronger that it is ***fair to discipline*** unsafe behaviour or violations of safety rules. Cluster 1 (lower-skilled workers) ***experience more anxiety in a high risk work environment*** and is more likely to believe that the employer is responsible for their safety.

It may be concluded that workers who are exposed to a higher risk work environment experience a greater fear in terms of safety in their areas of work based on their physical interaction with the environment. These workers are more likely to believe that accidents are the result of an unsafe workplace or work environment opposed to unsafe behaviour. Furthermore, this group of workers are more likely to expect the employer to ***foresee*** safety risks and hazards (as stated afore, p. 23) and holds the employer responsible for their safety at work; whereas the higher-skilled workers (junior-, line-, middle- and top management) expect the workers to ***interact with the environment*** in a safe way, and are more likely to believe that most accidents occur from unsafe behaviour, poor performance or misconduct and failure to adhere to safety rules.

CONCLUSION

The aim of this article was to explore occupational risk and the dynamics of unsafe acts, unwanted behaviour and misconduct. The assumption was made that the psychosocial risk environment could influence employee behaviour and subsequently the labour relationship between employer and employee. The unique nature and commonness of negative acts, such as unsafe behaviour, human errors, poor performance and negligence, also referred to as unsafe practice, were explored in correlation with system flaws, safety culture, leadership, perceptions, expectations and organisational behaviour as a whole. Case studies were used as examples to answer and explore the question why incidents and accidents in the workplace occur within the working interface dynamic. The literature review investigated the nature of psychosocial risks and the origin of negative acts or unsafe behaviour. It was concluded that behaviour is not random and does not occur without some thought process preceding it (Kruger & Wyngaard, 2009).

Furthermore, it was established that accidents do not always follow automatically from risk-taking behaviour. Within the working interface dynamic, the key components include: the human; the machine and the method of interaction between the components. When the method is flawed, for various reasons, it can create terrible consequences for individuals and the organisation as a whole (Health and Safety Authority, 2004; Germain, Bird & Labuschagne, 2011). Therefore, it can be concluded that the overall dynamics of the organisation's activities, systems, and organisational behaviour play a significant role in safe operational efficiency. Furthermore, in correlation with this statement, the **impact of (safety) culture** was viewed in particular and to the highest degree as an important component (Reiman & Oedewald, 2002). According to Germain *et al.* (2011), it is how people perceive, understand and commit to 'safety at work', and can be measured by observing the vision, values and commitment of **people at all levels**. Attitudes are a key element of a safety culture, and research has revealed that factors, such as attitudes and behaviour, are much more capable of predicting employees' safety performance at work (Psych Press 2009 – Talent Management Psychologists). The findings of the statistics drawn from the research questionnaire also portray comparisons between **unsafe behaviour and psychosocial risk factors**:

Employees who interact more directly with the physical work environment of the manufacturing plant perceive their work to be physically tiring and that it requires more physical strength, while higher-skilled employees feel that their work requires more endurance, patience or persistence. In correlation with this statement, it is showed that higher-skilled workers experience more frustration at work, and experience more tension as a result of higher expectations and based on the level of job responsibility. Despite these differing expectations and levels of responsibilities and exposure, the intensity of work anxiety is experienced relatively the same between both groups (lower- and higher-skilled worker). Therefore, it can be concluded that occupational stress is a relative term, independent or free from the level of work or responsibility and physical or mental outputs of employees. Lower-skilled workers are physically more tired at the end of a working day, while higher-skilled workers are mentally more tired at the end of a working day, but the level of work stress/-anxiety was **psychologically** experienced to the same degree at both levels. It is important here to understand that the term 'psychological' is different from 'psychosocial', and refers more narrowly to **thought processes and behaviour** of individuals (Burton, Kendall, Pearce, Birrell & Bainbridge, 2008). Psychosocial risks are **organisational factors** that affect the psychological safety and health of employees (Gilbert, 2010). Psychosocial

factors include the way the work is carried out (deadlines, workload, work methods) and the context within which work occurs, including relationships and interactions with managers and supervisors, colleagues and co-workers, and clients or customers (Guarding Minds at Work, 2012).

Within this context, it was found that workers, who interact more directly with the physical environment of the manufacturing industry, suffer on average more with **psychosocial stress**, perceive less job satisfaction and experience a higher rate of workload. According to Newell (2002), certain jobs are more demanding than others and certain features will generate high levels of psychosocial pressure, including unpleasant and dangerous physical conditions; monitoring of devices or materials; as well as repeated exchange of information with others. These are typical examples of activities that the lower-skilled workers will perform on a normal day-to-day basis at the manufacturing plant. Bowin and Harvey (2001) also include factors such as little control over the work environment; lack of participation in decision-making; sudden reorganisations and unexpected changes in work schedules; and not enough time to do expected duties. This finding superbly reflects the dynamic differences between superiors and subordinates. Furthermore, higher-skilled workers experienced a higher level of social support, have a better impression of the employer, and have a better and more positive perception of management's safety image. These differing perceptions between the two groups relating to the organisation's safety image and -climate may form a basis of differing expectations and needs, subsequently influencing the labour relationship between employer and employee. Furthermore, the higher-skilled workers felt stronger in terms of disciplining unsafe behaviour or violations of safety rules, while lower-skilled workers believe that the employer is responsible for their safety. Furthermore, higher-skilled workers feel that accidents in the workplace occur as a result of unsafe behaviour, unsafe interaction with the environment and failure to obey safety rules, as opposed to the response from lower-skilled workers, as stated before.

Finally, it can be concluded that the problem statement and research questions are accepted in that ***the psychosocial risk environment will either provoke desirable or undesirable behaviour from the individual employee, subsequently influencing the trust relationship between employer and employee and the organisation as a whole (Labour Relationship).***

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COVER LETTER TO PARTICIPANTS

Dear participant

Thank you for taking the time to complete the following research questionnaire. Your co-operation is dearly appreciated. Please be assured that this questionnaire will remain anonymous and confidential. All information obtained will be treated with the utmost sensitivity. The analysis of data will solely be used for the purpose of the research study and will not be exposed for any alternatives.

I am convinced that this research study will benefit all employees working at this manufacturing plant in that important information will be brought to light, which can assist management in making informed decisions, subsequently improving health and safety and the general environment we are all working in every day.

This questionnaire is divided in six subsections:

1. General information questions
2. Health related questions
3. Work related questions
4. Employee wellness (Work-Home Balance) questions
5. Organisational culture / climate related questions
6. Labour relations related questions

Furthermore, the outcome of the study will be made available on request, in order to share the benefits with all interested parties.

I thank you for making this research study possible.

Kind Regards

Jacqueline Swanepoel

For more information please contact J. Swanepoel at 083 62 99 795

or email to jlegrange@bridgestone.co.za.

ERGONOMIC RISKS AND SAFETY BEHAVIOUR QUESTIONNAIRE

DO READ THIS FIRST:

This Questionnaire addresses your work and your health.

Most Questions can simply be answered by YES or NO, or by choosing the right answer from a multiple choice.

Please do not think too long about each question and do not consult with your colleagues.

You should only mark one answer, even if choosing between the possibilities given may be difficult. In that case, choose the answer that in your opinion is best. Try to answer all questions.

EXAMPLE HOW TO COMPLETE THE QUESTIONNAIRE:

Do you have headaches regularly

YES

☐

NO

☒

If you have made a mistake, correct it as indicated here:

Do you have headaches regularly

YES

☒

NO

☒

In case you doubt the answer to be given, try to choose the possibility that nears best reality.

Do never mark yes and no at the same time, or something in between.

Your answers will be treated in the strictest confidence. Apart from the researcher, no one will ever have access to the data without your permission. In the report about this study your personal data cannot be recognised.

Thank you very much for your co-operation.

Jacqueline Swanepoel
(Researcher)

SECTION A

1. GENERAL QUESTIONS

Please read the explanation on the previous page before answering the questions below.

1. What is your job category:

Please select **one** out of the following:

Machine Operator or Builder	1
Serviceman or Artisan	2
Quality – or Final Inspector	3
Forklift Driver or Crane Operator	4
Support staff (finance, HR/IR, Risk, Engineering, etc)	5
Foreman	6
Production Manager / EXCO	7
Other: _____	8

2. Years of Experience:

Please select one out of the following:

< 1 year	1
1-5 years	2
6-10 years	3
11-20 years	4
21+ years	5

3. Work area / Department:

Please select **one** out of the following:

Receiving / General Stores	1
Administrative work / Office bound	2
Mixers / Tubers	3
Stock Preparation / Steel Stock Prep	4
PSR - / TBR Building	5
Curing / Final Inspection	6
Plant 2 / Bead Room	7
Engineering workshop / Mould shop	8

4. Gender:

Please select one out of the following:

Male	1
Female	2

5. Are you currently on medication?

Yes	1
No	2

6. How do you usually travel to work?

On foot	1
Car	2
Public Transport	3
Other	4

SECTION B

2. HEALTH

Please read the explanation on page 2 before answering the questions below.

	Poor	Reasonable	Fairly Good	Good
1. How is your health status in general?	1	2	3	4
2. How is your physical fitness nowadays?	1	2	3	4

	Strongly Disagree	Disagree	Agree	Strongly Agree
3. My work requires a lot of strength.	1	2	3	4
4. My work requires endurance.	1	2	3	4

	Never	Rarely	Often	Almost Always
5. Have you had complaints about your health recently?	1	2	3	4
6. Do you feel tension at work?	1	2	3	4
7. Do you feel nervous when you are at work?	1	2	3	4
8. Do you regularly feel tired in the morning?	1	2	3	4

	Never Tired	Rarely Tired	Often Tired	Very Tired
9. How tired are you physically at the end of a working day?	1	2	3	4
10. How tired are you mentally at the end of a working day?	1	2	3	4

SECTION C

3. WORK

Please read the explanation on page 2 before answering the questions below.

1. This question addresses breaks. We are only interested in breaks in which you actually have or could take:	Never	Rarely	Often	Almost Always
1.1. Do you have enough breaks during your work day?	1	2	3	4
1.2. Do you feel rested after a break?	1	2	3	4
1.3. Can you choose the moment of a break yourself?	1	2	3	4
1.4. Do you regularly work over time?	1	2	3	4

2. These Questions address rotation / repetitiveness in you work.	Never	Rarely	Often	Almost Always
2.1. Do you carry out the same work the whole day?	1	2	3	4
2.2. Does your work vary from day to day?	1	2	3	4
2.3. Does the work rotate between you and your colleagues?	1	2	3	4
2.4. Do you carry out your work at the same workplace(s)?	1	2	3	4

3. This question addresses workload. We are only interested in physical work strains.	Never	Rarely	Often	Almost Always
3.1. Do have to lift, carry, push or pull heavy loads more than 5kg in your work?	1	2	3	4
3.2. Do you have to lift, carry, push or pull heavy loads more than 20kg in your work?	1	2	3	4
3.3. Do you have to lift objects in an uncomfortable position?	1	2	3	4
3.4. Do you have to lift the load with a twisted trunk?	1	2	3	4
3.5. Do you have to lift objects that is difficult to grab hold of?	1	2	3	4

4. This question addresses your work area. We are only interested in how you are operating in your specific work area:	Never	Rarely	Often	Almost Always
4.1. Do have to reach with your arms or hands forward in your work area?	1	2	3	4
4.2. Do you have to hold your hands above shoulder level in your work?	1	2	3	4
4.3. Do you have to work in uncomfortable postures?	1	2	3	4
4.4. Do you slip or fall during your work?	1	2	3	4
4.5. Do you have to hold vibrating tools in your work?	1	2	3	4

5. Do you in your work have to:	Never	Rarely	Often	Almost Always
5.1. Stand for long periods?	1	2	3	4
5.2. Sit for long periods?	1	2	3	4
5.3. Walk for long periods?	1	2	3	4
5.4. Work kneeled / squatted for long periods?	1	2	3	4
5.5. Work in the same posture for long periods?	1	2	3	4

6. Are you much hindered in you work by:	Never	Rarely	Often	Almost Always
6.1. Noise?	1	2	3	4
6.2. Lack of fresh air?	1	2	3	4
6.3. Dry air?	1	2	3	4
6.4. Extremes of temperatures?	1	2	3	4
6.5. Bad smells?	1	2	3	4

7. This Question addresses your working time. We are only interested in how you are operating your work in your specific work area.	Never	Rarely	Often	Almost Always
7.1. Do you work under high rate of pressure?	1	2	3	4
7.2. Do you struggle to finish all your work in time?	1	2	3	4
7.3. Are there enough resources available for you to carry out your work in time?	1	2	3	4
7.4. Can you control your work pace yourself?	1	2	3	4

SECTION D

4. EMPLOYEE WELLNESS – HOME/WORK BALANCE

Please read the explanation on page 2 before answering the questions below.

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I feel empty at the end of a working day.	1	2	3	4
2. I feel tired at the start of a new working day.	1	2	3	4
3. I feel burnt out by my work.	1	2	3	4
4. I feel frustrated by my job.	1	2	3	4
5. I think that I have too much to do at work.	1	2	3	4
6. I feel that things are too much for me to handle.	1	2	3	4
7. I find my work interesting.	1	2	3	4
8. I have enough variety in my work.	1	2	3	4
9. I consider my work too simple.	1	2	3	4
10. I have received enough training to perform my tasks.	1	2	3	4
11. I enjoy my work.	1	2	3	4
12. There are circumstances in my work that adversely affects my private life.	1	2	3	4
13. There are circumstances in my private life that adversely affects my work?	1	2	3	4

SECTION E

5. ORGANISATIONAL CULTURE / - CLIMATE

Please read the explanation on page 2 before answering the questions below.

	Never	Rarely	Often	Almost Always
1. Do you see your manager make visits to site?	1	2	3	4
2. Does the company have health and safety meetings?	1	2	3	4
3. Are you annoyed by others at your work?	1	2	3	4
4. Do your superiors regard what you say?	1	2	3	4
5. Is the social atmosphere at work alright?	1	2	3	4
6. Does the supervision have a correct picture of you in your work?	1	2	3	4
7. Do your superiors provide enough support in your work?	1	2	3	4
8. Can you count on your colleagues for support at work?	1	2	3	4
9. Are you kept informed on what is going on in your company?	1	2	3	4
10. Do you consider the safety at work alright?	1	2	3	4
11. Do your managers tolerate violations of safety rules?	1	2	3	4
12. Do you see your managers conform to all safety procedures?	1	2	3	4
13. Do you have good prospects for the future with this employer?	1	2	3	4
14. Do you feel valued in this company?	1	2	3	4
15. Is your pay appropriate for the work you are doing?	1	2	3	4
16. Do you have the opportunity to develop new skills?	1	2	3	4

SECTION F

6. LABOUR RELATIONS/ PERCEPTIONS / BEHAVIOUR

Choose only the most correct answer from the options given below.

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I take my frustrations out on colleagues when I am stressed at work.	1	2	3	4
2. I feel less motivated when my hard work goes unnoticed.	1	2	3	4
3. It is allowed to take shortcuts to reach targets in time.	1	2	3	4
4. It is allowed to bend safety rules to reach targets in time.	1	2	3	4
5. Accidents in the workplace occur when workers are acting unsafely.	1	2	3	4
6. Accidents in the workplace occur when employees ignore safety rules.	1	2	3	4
7. Accidents in the workplace occur in unsafe work environments.	1	2	3	4
8. Accidents in the workplace occur when people are careless about their work.	1	2	3	4
9. Accidents in the workplace occur when people are not concentrating on their work.	1	2	3	4
10. It is fair to discipline unsafe behaviour.	1	2	3	4
11. Unsafe working conditions do affect the employee - employer relationship.	1	2	3	4
12. I ignore safety violations committed by others because it is none of my business.	1	2	3	4
13. I feel stressed in a high risk work environment.	1	2	3	4
14. My manager is responsible for my safety.	1	2	3	4
15. I am responsible for my own safety.	1	2	3	4
16. Accidents in the workplace are the company's fault.	1	2	3	4
17. My relationship with my employer is affected by health and safety problems.	1	2	3	4
18. Safety rules are very important and may never be broken.	1	2	3	4

The End

Thank you for your co-operation and inputs for the effectiveness of this research study.

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27th November 2013

Jacqueline Swanepoel

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School of Human Resource Sciences,
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Registration Fee: \$395(per attendee for a paper, \$445 after the deadline)

Registration Deadline: March 21, 2014

Reference ID: VIEN14-129

Dear Author,

The West East Institute is pleased to inform you that your paper "The experience of occupational risk and the handling of incapacity due to ill health and injury" has been selected for oral presentation at the WEI European Academic Conference in Vienna 2014.

The conference will be held in the RAMADA Encore Vienna City Center, Vienna, Austria from April 13 through April 15, 2014. All accepted papers/abstracts are double-blind peer reviewed and participation in the conference includes publication of your complete manuscript in the journal of the conference proceedings.

Congratulations on your successful research efforts, and thank you for considering the 2014 Vienna European Academic Conference as your research outlet.

Please use your reference number listed above in all future correspondence.

We look forward to seeing you at the WEI Conference in Vienna 2014.

Thank you,



Dr. Alexander Magill
Conference Chair