



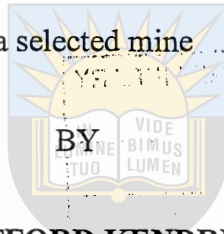
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FACULTY OF MANAGEMENT & COMMERCE

DEPARTMENT OF INDUSTRIAL PSYCHOLOGY

Employer and Employee perceptions on the implementation of health and safety regulations

at a selected mine



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A dissertation submitted in fulfilment of the requirements for the degree

Master of Commerce in the

Department of Industrial Psychology at the University of Fort Hare

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NOVEMBER 2011

ABSTRACT

Employer and Employee Perceptions on the Implementation of Health and Safety Regulations at a Selected Platinum Mine in Mpumalanga Province, South Africa.

BY : Hlatywayo Clifford Kendrick

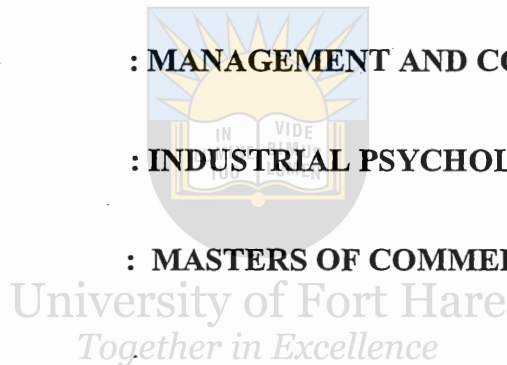
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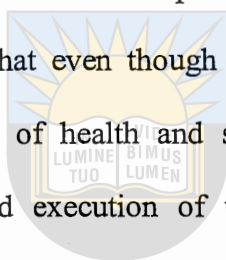
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South Africa is the largest producer of platinum. Safety in mines has and is always a concern; no matter how much is being done incidents still occur. The ability to improve the health and safety regulations is dependent on safety culture, or the norms surrounding reactions following an error, the learning that takes place, and the proactive strategies in place to prevent future errors. Effective implementation of health and safety regulations requires an environment in which employees are empowered to make decisions about their conditions of work. Very little literature, if any, could be found on the subject particularly as it applies in platinum mining. In the light of this research, do incidents occur because health and safety regulations are not being implemented effectively or are they due to employee negligence? South African unions propose that the government should enact new health and safety regulations to compel mining companies to uphold higher safety standards and prevent avoidable mine accidents and deaths. Is this to say that current legislations is ineffective or

that there are loopholes that must be closed. Is this a case in which employees are not well informed or are employers simply not abiding by health and safety regulations or are the health and safety regulations ineffective. The following study looked into the perception of employers and employees on the implementation of health and safety regulations at a selected platinum mine in Mpumalanga. Two instruments were distributed to the respondents. There were 153 questionnaires returned for employees as well as 22 for employers. Random sampling was utilised. The data was subjected to a number of statistical analyses including T-tests, and analysis of variance on the difference in perception of the groups under study. Findings from the research indicated that even though employers and employees have a positive perception on implementation of health and safety regulations, there is still a mismatch between implementation and execution of the policies. Consequently, many suggestions are not always turned into actual action to maintain the safety and health of employees.



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DECLARATION

I declare that “Employer and employee perceptions on the implementation of health and safety regulations at a selected platinum mine in Mpumalanga, South Africa,” is my own original work and has never been submitted to any university for a degree. All the sources I have used have been indicated and acknowledged by means of complete references. It is being submitted for the completion of a Master degree in Industrial Psychology at the University of Fort Hare.



SIGNATURE



30/11/2011

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ACKNOWLEDGEMENT

I would like to thank God for giving me strength, wisdom, courage and for protecting me throughout the whole process.

- My supervisor Mr André Nel and co-supervisor Mr Chan Murugan thank you very much for encouraging me from the start through to the end.
- I thank Mr R Dlamini. Without your support, this would have not been possible may God continue to bless you.
- Mr Benjamin Ntuli, may God continue to bless you for the support, assistance and guidance you gave to me. Without your help data collection would have not been easy.
- To the employees of Two Rivers Platinum Mine, thank you very much for taking your precious time to respond to the research instrument. Thank you Mr Jakes Jacobs, the SHEQ Leader for the consent, the staff from the Standard department (Lebo, Stuart and Ben) thank you for providing a homely work station for me.
- I thank Mr Jubane from the department of statistics at University of Fort Hare for the statistical analysis.

DEDICATION

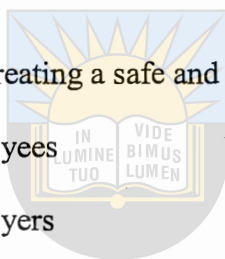
This work is dedicated in memory of John Percival, and to Angeline, Belinda and Tsepo.



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ACRONYMS

NUM	National Union of Mineworkers
DMR	Department of Mineral Resources
WHO	World Health Organisation
GDP	Gross Domestic Product
MSDS	Material Safety Data Sheets
ILO	International Labour Organisation
NOSA	National Occupational Safety Association of South Africa
MNC	Multi National Cooperation

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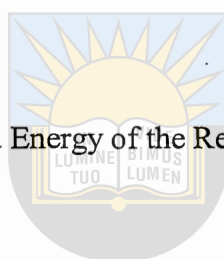
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CHAPTER 1

BACKGROUND OF THE STUDY

1.1 Introduction

Several hazards affect the mining industry and render it one of the most dangerous worldwide. These include explosions (methane, coal dust, or other), fires, rock and roof falls, landslides, blackdamp and toxic gases outbursts, and water inrush/sudden inundations (Saleh & Cummings, 2011). Demaret *et al.* (2004) as cited by Malik (2010) presented the facts of the article on the worker's Memorial Day 2004, that more people are killed during work than wars. Each year about 270 million accidents are recorded out of which 350,000 are fatal. Annually, throughout the world, an estimated 271 million people suffer from work related injuries, and 2 million die from these injuries. According to the World Health Organisation (WHO), 160 million new cases of occupational diseases are caused annually by exposure and dangerous conditions at the work place; 30-40% of them can be expected to lead to chronic diseases and about 10% are likely to result in permanent disability (Motbainor, 2007).

WHO contributes an idea that the workplace can be place where accidents & diseases are prevented and health is protected. Furthermore, workplace is capable of providing a surrounding for improvement or formation of good health. Healthy workers are industrious and lift up healthy families. Healthy worker plays a vital role to overcome poverty. The safe environments of workplaces contribute to develop sustainable development in country (Malik, 2010).

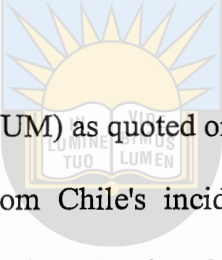
Together with construction and agriculture, mining belongs to the three of most hazardous industries. Mining involves the physical strength (Weidman, 2002). Past and current records reveal numerous fatal workplace accidents that resulted in damages and casualties. Why do accidents occur despite vigorous training in safety and health especially in the mining industry?

Eweje (2005) contends that the mining industry has a long reputation for being negligent with respect to health and safety issues. Too many fatal accidents occur so as to bring the behavior of multinational companies (MNC) into question. In recent years there has been increasing public interest in the subject of health and safety in relations to employee rights. The right of employees to be informed about health hazards in the workplace has become a major issue in occupational health policy, especially in developed countries. Leger (1990) contends that many workers have an intuitive feeling that to work in South African factories and mines is dangerous. For effective action against hazardous work, accident statistics can be very useful to help focus campaigns on the most dangerous industries and jobs. They are vital for analyzing trends and for making comparisons with other countries and can assist unions in their negotiations around specific health and safety issues.

Wilson, Willis & Du Plessis, (2004) contend that the South African platinum industry has grown rapidly, particularly during the past decade. This period has seen the development of new mines and extensions to existing mines. There is also an increasing realization that productivity, in its broadest sense, must continue to improve if South African mines wish to remain globally competitive and attractive to investors. This realisation has motivated the introduction of various

forms of mechanisation, the most significant being trackless equipment and conveyor belts for rock handling.

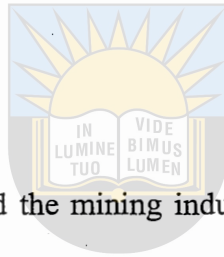
With the economic recession that hit industries and resulted in job losses and a fall in commodity prices, the priority was on making it through tough times. Employees are made to work in unfamiliar conditions because the job can be given to someone else who is willing to work under the prevailing conditions. Accidents can be prevented if there are effective safety and health regulations to be complied with in different industries considered as most hazardous.



National Union of Mineworkers (NUM) as quoted on News24.com (2010-03-14) contend that government should draw lessons from Chile's incident in which miners were trapped underground for 69 days in a collapsed mine. South Africa has a dire mining safety record compared with that of the industrialised world, partly because it has some of the deepest mines. In 2009, 165 miners died in South African mines. NUM proposed that the government should enact new legislation to compel mining companies to uphold higher safety standards and prevent avoidable mine accidents and deaths. South Africa, the world's largest platinum producer, has mining companies more concerned about making big profits than to ensuring safety for their workers. All stakeholders hope that the industry is on track to achieve the 2013 health and safety milestones agreed to by government, industry and labour in 2003. Unfortunately, the trend of continuous improvement, especially with respect to safety, was interrupted in 2006 and even worsened in 2007, and this has resulted in all stakeholders reconsidering whether enough is being done to improve safety and health (www.bullion.org.za). This research will look into the knowledge and practice of employers and employees relative to health and safety regulations in

the platinum mining sector at a selected platinum mine in Mpumalanga province of South Africa. In view of the worrying statistics the researcher is concerned about the high accident rate in the mining industry. The statistics raise more questions such as: Are the labour inspectors doing their job? What is the major cause of such accidents? Does management abide by the health and safety regulations? Are the minimum safety requirements being met? Are accidents being caused by employees fatigue and negligence? What is being done to ensure that all accidents are reported? Does the problem lie with the state being the sole legislator?

1.2 Statement of the Problem



Accidents seem to happen all around the mining industry regardless of the mineral under extraction. Many stakeholders have insufficient knowledge of the provisions of health and safety legislation, while others see them as burdensome and a source of administrative work and red tape. Occupational health and safety can only be addressed in the full light of knowledge; it is only when one knows what legislation does that the provisions of the legislation can be realized in actual workplace policies and practices (Mischke & Garbers, 1994). Published studies on mine safety are usually based on research related to accident statistics and hazard identification with risk assessment within the mining industry (Lilić, Obradović, & Cvjetić, 2010). The aim of the research is to investigate the perception of employers and employees both as to whether health and safety regulations are being implemented effectively in the place of work.

1.3 Research Objectives

The researcher seeks to determine whether employees feel that employers abide by the Occupational Health and Safety regulations. The aim is

- To assess the knowledge and practice of mine workers relative to occupational health and safety regulations in their place of work, and
- To investigate whether employers follow up on proper procedures pertaining to safety in the mine.



1.4 Hypothesis

Considering the statement of the problem, it is hypothesized that:

- Employees are not well informed on health and safety regulations, and that
- Employers do not abide by the provisions of the health and safety regulations.

1.5 Significance of the Study

The rationale behind this research is to increase an understanding of the role that employees and employers can play to ensure a safe working environment and to reduce the number of accidents that take place in the work environment. The research is also meant to contribute to strategies that organisations can use to reduce the accidents in the place of work. The mining sector is one controlled by Multi National Cooperations (MNC) and these are known for their emphasis on profit maximisation. Failure to address occupational health and safety

issues will result in employees showing low job commitment, job insecurity, and survivors trust (those that survive the accidents) which are some of the significant growth drivers in most organisations.

1.6. Theoretical Perspective

1.6.1 Social Exchange Theory

Safety researchers have become increasingly interested in understanding how social exchange processes help shape the safety related perceptions and behaviors of employees (De Joy, Schaffer, Wilson, Vandenberg, & Butts, 2004). Social exchange theory suggests that employees develop an exchange relationship with their supervisors; high-quality relationships will create perceived obligations for employees to reciprocate and behave in positive and beneficial ways (Michael, Guo, Wiedenbeck, & Ray, 2006).

De Joy *et al.* (2010) suggest that much of the interest can be traced to the accumulation of findings showing that management commitment plays a fundamental role in the formation of safety climate perceptions among employees. Social exchange theory further posits that resources or favorable treatment received from others are more highly valued when employees believe them to be based on discretionary action rather than on specific mandates or external requirements. Social exchange relationships between employers and employees are increasingly important to the performance of safety management systems (Lee, Wu, & Hong, 2007). Social exchange theory states that employers should seek to engage employees in the effective implementation of health and safety regulations. Within the work context, employees do weigh

costs against benefits of performing work and they consider all alternatives available to them. Employees' safety performance should improve when they have a clear understanding of safe operating procedures and of the consequences of unsafe behaviors and when their safety behaviors are supported by their supervisors (Michael *et al.* 2006).

1.7 Literature Review

Much safety research has been conducted in industries such as nuclear, air transport, marine, construction and automobile (Pyoos, 2008). Very little, if any, can be found on employer and employee perceptions concerning the implementation of health and safety regulations in the platinum mining industry. Complexity of health and safety regulations requires a high level of expert knowledge and vast experience, knowledge of which represents a formalisation of the expertise knowledge in the mine safety field (Lilić, Obradović, & Cvjetić, 2010).

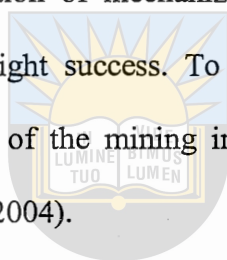
Stellman (1998) was of the opinion that presently, there is no handbook, manual or other single source which contains the essential data on the various occupational hazards which exist in specific occupations, as a result, quite frequently, an occupational safety and health worker comes to the workplace without adequate preliminary technical preparation. Safety data published by the Department of Minerals and Energy only includes data on fatalities and injuries that result in workers being away from work for at least 14 consecutive days. In short, the data are restricted to serious accidents and these are mainly associated with falls of ground (30%), transportation (20%), and machinery (7%), for the year 2006. Most countries do not have comprehensive indices of occupational health data. Much of the data is fragmentary and, taken

together, incomplete. Exposure data, which can be predictive of disease, are particularly scarce and unreliable (Hermanus, 2007).

In all fields of human activity accidents will occur unless appropriate action is taken to reduce or prevent it. Rock falls are a major contributor to fatal accidents in the South African mining industry. Rock fall fatalities, however, occur predominantly in the gold, coal and platinum mining environments (Brink, Fourie, & Zaniewski, 2008). The approach to safety and accident prevention starts by foreseeing the chances of harmful consequences and ways to prevent them (Dickinson & Gwyn, 2006). In industrialised countries the mining industry remains as highly dangerous as in the developing world. Workers deaths are usually due to two reasons, diseases and accidents. Mining is extremely dirty and difficult work causing both accidents and diseases. Due to structural changes and mining activities do involve suggesting that there is a need to make work healthier and safer (Weidman, 2002). A major type of accident is in the form of mining or chemical plant explosions that cause miners to either suffer in physical injury or black lung disease due to the inhaled chemicals (Trumka, 2009). Furthermore, for fear of losing their jobs, miners often over-work causing reduced strength and alertness (Weidman, 2002). Also, the majority of the world's workforce does not have access to occupational health services. Only 5 to 10 percent of the workforce in developing countries and 20 to 50 % of the workforce in developed countries have access to some kind of occupational health services (Motbainor, 2007).

Willis, Dixon, Cox, & Pooley, (2004) noted that South African traditional methods of mining are well entrenched after more than a century of mining. For the traditional methods to be

successfully changed an integrated holistic approach that considers all aspects of a mining operation, including the setting of objectives, the selection of personnel, recruitment, training and remuneration policies, organizational design, mine design, equipment selection, maintenance philosophy, standards and procedures, and monitoring and control is required. Given the backdrop of an emerging South Africa, there are high expectations of historically disadvantaged people with respect to, a strong rand, improved safety, lower cost of production, more efficient operations and mechanization (Croll, 2004). The South African mining industry faces the unique challenge to the successful implementation of mechanization. There are many examples of failures but very few examples of outright success. To increase the success rate, which is essential to the long-term sustainability of the mining industry, new thinking in technology transfer practice is required (Willis *et al.* 2004).



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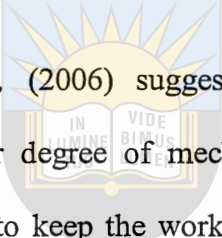
Maiti, Chatterjee & Bangdiwala, (2004) argued that in spite of stringent regulations and a focus on reducing risks in the physical environment, the mining industry continues to be associated with high levels of accidents. Prevention is appropriate unless coupled with focused attention to the attitudes and behaviours of the mineworkers in coping with the inherent physical, technical and situational risks. Traditional approaches to the prevention of accidents or injuries in mines reached their limit of effectiveness in improving safety performance and a fresh approach is required (Paul & Maiti, 2007). The Mining weekly (2010-10-04) highlighted that South Africa is considered to have one of the most unsafe working cultures in mining globally. The Department of Mineral Resources (DMR) is working with a number of institutions to strengthen its health and safety monitoring and evaluation initiatives. The DMR is working on increasing the capacity of the inspectorate. DMR is also working through the Mine Health and Safety

Council, the Council for Scientific and Industrial Research and other research councils on a programme of research to deal with some of the pressing challenges of safety and health. There is an ongoing programme of research on falls of ground, seismicity, noise reduction and workplace exposure, including exposure dust and silica.

On average, one worker dies in the South African mining industry every working day, and about 16 are injured in mine-related accidents (Van Wyk, 2006). South Africa had an average of 11 deaths per month in 2009. South Africa's mining sector is described as one of the world's most unsafe working cultures. Under the leadership of Minister Susan Shabangu, the DMR aims to rectify this image and is determined that 2010 will be the year that government tightens regulation to enhance its vision of a fatality-free industry and to wash away the image of an industry benefiting from blood money (www.miningweekly.com). Mines in the North West are the deadliest of all in South Africa. The number of mining fatalities has dropped in seven of the nine provinces from the previous year, but most of the mining deaths still occurred in the North West with 34 fatalities, followed by Gauteng with 20 fatalities, and Free State with 17 fatalities (<http://www.miningweekly.com>).

Bailey (1997) as quoted by Vinodkumar (2010) showed that in plants that had low injury rates, the employees' perception of management commitment to safety is highly positive. On the other hand, in plants where injury rates were high, the employees' perception of management commitment to safety was negative there the major focus of management's safety efforts was on Occupational Health and Safety Act compliance with limited employee involvement. O'Toole (2000) conducted a two year study evaluating the effectiveness of a managerial training program to enhance corporate compliance with statewide safety and health regulations. The findings were

that there is little information about the effectiveness of statewide initiatives in promoting occupational safety and health. Employees' perceptions of management's commitment to safety, of fellow employees' participation in safety, and of the effectiveness of education and training efforts on the part of management have demonstrated a positive impact on safety outcomes. Along these lines, McKinlay (1975), as cited by Stokols *et al.* (2001), observed that "one stroke of effective health legislation is equal to many separate health intervention endeavors and the cumulative efforts of innumerable health workers over long periods of time."



Biffi, Stanton, Rose, & Pienaar, (2006) suggested that modern platinum mining operations are characterized by a higher degree of mechanization. Machinery is employed primarily for safety purposes and serves to keep the worker away from the danger zone. One type of behavior that can have an effect on safety performance is compliance with and adherence to organizational rules, regulations and procedures, even when they are not being monitored (Podsakoff, MacKenzie, Painea & Bachracha, 2000). Safety compliance is defined as rule-following in core safety activities (Griffin & Neal, 2000) and has been demonstrated to be related to the safety climate. Additionally, Mearns *et al.* (2001, 2003) found that higher levels of safety violation, in other words, noncompliance, is significantly associated with increased incident involvement at both the individual and worksite level. Hickman & Geller (2003) investigated the role of self-management in safety-related work practices in mining operations. These studies, following a behavioral approach, focused on feedback on safety performance generated by workers themselves as a primary motivating factor in subsequent safety performance (Mearns *et al.* 2010). Few would challenge the need for regulation of occupational health and safety in the mining industry. The industry is hazardous, and its long history of preventable industrial

accidents and mining disasters suggests that voluntary approaches alone will be insufficient to achieve an acceptable level of occupational health and safety (Gunningham, 2006).

1.8 Research Methodology

1.8.1 Research Design

The researcher intends to follow an explanatory research design, which is quantitative in its approach to research. Quantitative research seeks to explain variables. It also involves the discovery and reporting of relationships among different aspects of the phenomenon under investigation for example that variable A causes variable B (Bailey, 2002). The researcher seeks to investigate employer and employee perceptions about the implementation of health and safety regulations in the platinum mining sector in a selected mine. The researcher utilised this methodological approach because it is most appropriate for use in attitudinal research.

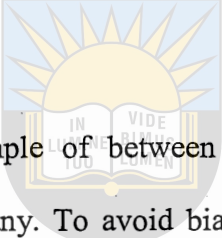
1.8.2 Data Collection Instruments

The researcher intends to use a survey method of collecting data. A questionnaire, consisting of a series of questions pertaining to employee perceptions about the implementation of occupational health and safety regulations will be used. It will consist of a collection of statements pertaining to occupational health and safety regulations at the workplace. The responses to which will be ranked according to the Likert scale.

1.8.3 Population

The population involved will consist of both male and female employees in selected platinum mine in the Mpumalanga Province of South African. The population will consist of both employees who occupy low level positions or grades in the organisational hierarchy and management representing the employer. The number of employees is estimated to be 5 000 employees.

1.8.4 Sample and Sampling procedure



The researcher will draw a sample of between 300-500 from the employees and management of a selected mining company. To avoid bias a probability sampling probability sampling method in which each person in a population has the same known chance of being selected will be used. Random sampling using of random numbers is a probability sampling method giving each element in the population a known chance or probability of being selected as a sample subject. Respondents for this study will be randomly selected from the platinum mining organisation. This technique will ensure a fairly representative sample of the population in this study so as to ensure generalisability to the population.

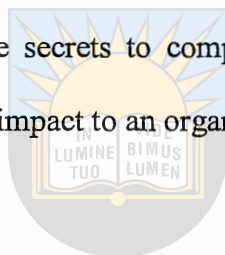
1.8.5 Data analysis

An assumption of quantitative research is that if a quantitative method of data collection is used a quantitative method of analysis should be used as well De Vous (2005). The researcher intends to utilize descriptive statistics for demographic data to assess the knowledge and practice

of mine workers relative to occupational health and safety regulations in the place of work. Further analysis will include inferential statistical method to investigate whether the employers follow up on proper procedures pertaining to safety conduct in the mine.

1.9 Limitations

Limited time and funding have restricted the research to just few platinum mines, not all of them. Management has a tendency of not allowing independent individuals of conducting research due to the fear of loss of trade secrets to competitors or there might be damaging information which might have a negative impact to an organizations reputation.



1.10 Ethical Considerations

Permission to conduct this research was obtained from the University of Fort Hare. Mining management was also approached for their consent. Informed consent was also obtained from respondents to participating in the study. Confidentiality was maintained by respecting the anonymity of respondents and the assurance that this research is strictly for academic purposes.

1.11 Chapter Outline

Chapter 1: Background of the Study

Chapter 2: Historical Benefits of Mining to the South African economy.

Chapter 3: Concept of Occupational Health and Safety in the Workplace

Chapter 4: Legal Framework the South African Context

Chapter 5: Theoretical Perspective

Chapter 6: Research Methodology

Chapter 7: Presentation of Data

Chapter 8: Discussions, Limitations and Recommendations



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CHAPTER 2

HISTORICAL BENEFITS OF MINING TO THE SOUTH AFRICAN ECONOMY

2.1 Introduction

The previous chapter highlighted the central issues to be addressed in this research. The purpose of this chapter is to show the importance and historical background of the mining industry as whole. This chapter will also define the key terms of the study.

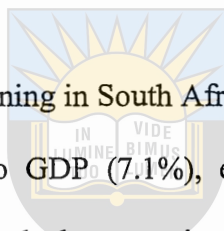
2.2 Input of Minerals to South Africa



The mining industry is essential to contemporary societies and economies, which cannot meet many basic needs without the minerals that mines supply (Coetzee & Van Staden, 2011). The Chamber of Mines report for 2010 stated that the South African mining sector had a total income of R332 billion and contributed 19% of Gross Domestic Product (GDP). In the same financial period the mining sector employed 491 922 employees and mining accounted for 6% of total non agricultural formal employment in the economy and 7.8% of total private sector non agricultural formal employment (www.bullion.org.za/Publication/FactsandFigures).

Although there are occupational hazards this industry also employs a significant number of workers and contributes to the GDP of the nation. In South Africa mining is considered as the most powerful source of industrial development of the country. Arnold (2000) noted that South Africa has been a storehouse of minerals with gold, diamonds, and the platinum group and coal dominating the sector and of 26 leading minerals South Africa is a leading producer of 14

(chromite, copper, gold, diamond, iron ore, crude steel, lead, manganese, nickel silver, uranium, phosphate rock, elemental sulphur and coal). South Africa is in the number one position in the export and production of high volumes of platinum, chromium, manganese and vanadium. This has allowed South Africa to establish itself as a world leader in mining and exploration (http://www.ussas.com/sa_diamonds.html). South Africa is the dominant producer of platinum and in 2006 accounted for 78% of new platinum mine supply (www.gs-harper.com/documents/mining/FF2006).



Swart, (2003) noted that formal mining in South Africa is more than 100 years old. South African mines contribute significantly to GDP (7.1%), exports (34% of value) and formal employment (6.5%). Haggett (2002) contends that ever since the late 19th century mining was the most important activity in South Africa. This is so as gold and platinum mines in the North West province and Gauteng account for the employment of high volumes of workers. The multiplier effect of mining to the economy when taken into consideration raises the contribution of mining to the GDP to up to 12% (<http://www.bullion.org.za/Publications/Other/segal>). South Africa has relied and still relies heavily on mining activities to generate wealth that could be translated into economic development, infrastructure and employment (Swart, 2003). Given the importance of mining to employment and the economy, there is good reason to address health and safety systematically in this industry (Hermanus, 2007). Mining has been the backbone of the local economy for the past century. The industry employs 1 million people, half of them directly and half of them indirectly, hence safety must be a priority (Delonno, 2011). The discovery of world class diamond and gold deposits in the latter half of the 19th century laid the foundations for the transformation of South Africa from an essentially agricultural to a modern industrial economy

(<http://www.bullion.org.za/Publications/Other/segal>). The growth of the mining industry is historically intertwined with the growth of the South African economy. Mining has and will continue to be the mainstay of the South African economy (<http://www.info.gov.za/view>).

2.3. Impact of Mineral Discovery

The discovery of major minerals in South Africa has impacted on the nation and the globe. It resulted in investor influx since the early 1800s and also caused the growth of towns, as labour sources. The discovery of minerals also impacted on organization demographics in that those who occupied senior positions were of a different race than the labourers in the mining industry. Black people were already used extensively as labourers and tenants on prosperous white owned farms and could survive off the excess of their employers' harvests. However, when the authorities passed a law that limited the number of tenants on a farm to 5, large numbers of Black left the farms for the mines (www.sahistory.org.za/pages/governance/pass-laws.htm).

2.3.1 Development of Towns

The growth of mining also led to the establishment of new towns to accommodate the huge influx of people. The growth of Kimberley town is attributed to the mining of diamonds which began in 1873 (<http://www.south-africa-tours-and-travel.com/history-of-south-africa.html>). Other towns that also grew due to the exploitation of diamonds were Koffiefontein and Jagersfontein, so as to accommodate diamond diggers. The discovery of gold in the eastern

Transvaal (Pilgrim's Rest, Mac-Mac Waterfalls and Barberton) led to a similar process taking place. Richards (2009) added by noting that the growth of the town of Emalahleni in 1905 was due to the rich coal deposits and power stations.

Feinstein (2005) argued that the system of migrant labour was central to the operation of mines. Farming areas such as Elandsfontein, Turffontein and Roodepoort were proclaimed public diggings. These diggings later became suburbs of Johannesburg. (<http://www.south-africa-tours-and-travel.com/history-of-south-africa.html>). By 1893 there were already 14 suburbs in the new town. The year 1896 saw the population of Johannesburg to more than 100 000 of which a third was made up of foreigners



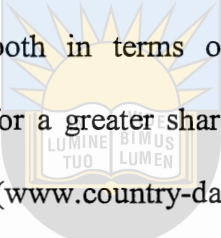
2.3.2 Conglomerate inception

The most powerful source of industrial development in South Africa is considered to be mining. This is so as most of the countries industries are developed around mining (<http://www.mapsofworld.com/south-africa/economy/mining>). People came from all over the world to stake their claims in the diamond fields. In 1867, diamonds were discovered at Hopetown and in 1871, more diamonds were discovered in the vicinity of Kimberley. A company, "De Beers Consolidated Mines" was established under the leadership of Cecil John Rhodes. This company went from strength to strength and is still in existence today (<http://www.south-africa-tours-and-travel.com/history-of-south-africa>).

Major mining companies are owned by transnational companies. From the start Black populations were served as a labour pool. In 1988, many formerly competitive mines were merged to form the De Beers Consolidated Mines Ltd, a company many associate instantly with

diamonds. From the first, capital was required to develop deep underground mines (http://info.goldavenue.com/info_site/in_mine/in_min_sa_his.htm).

Mining operations expanded to include other minerals soon after the European gold and diamond rush of the late 19th century. The mid-20th century saw South Africa being ranked as the largest producer of minerals such as gold, diamond, platinum, coal, iron ore, silver limestone, asbestos, fluorspar, manganese, vanadium and manganese. The period of 1970s saw most mines being managed by large corporations. The mining sector has been gradually surpassed by manufacturing and financial services, both in terms of national output and labor force participation. The mines still accounted for a greater share of export revenues than any other single economic activity during the 1990s (www.country-data.com/cgi-bin/query/r-12148.html).


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2.3.3 Effects on Labour

The discovery of minerals did not only attract investors but also local labourers. Apartheid aimed to control black labor; South African citizens were required by law to live in the particular geographic areas set aside for them. Blacks were to reside only in their homelands, under their own political structures and with responsibility for their own separate institutions and economic development (Horwitz, 1999). Mining companies gave employment to foreigners as well as to locals, as more and more people streamed into the area (<http://www.south-africa-tours-and-travel.com/history-of-south-africa.html>). South African mines since this inception have sourced labour from the neighbouring countries of Mozambique, Botswana as well as Lesotho.

This has always been reinforced by the recruitment of workers from the rural areas South Africa (Mine Health & Safety Audits 2008).

The exclusion of workers from certain occupations forced them into others occupations. Blacks were deprived of land ownership, not to mention mine ownership. All they could do was to provide the much needed labour for labour intensive tasks. They were housed in compounds, had to carry passes and were separated from their families, who were not allowed to visit them. It meant that, black females were excluded from being labourers in the mining industry. Black inhabitants of Southern Africa had been mining and working gold for centuries before the arrival of European colonisers. Laws relating to the new mining industry were immediately put in place and specified that no Coloured, Black or Indian person could work or live on a mine except as the servant of a White man. Apartheid was a political system that legally separated the people of South Africa into different racial categories white, black, Asian, and colored which circumscribed various aspects of their lives. Laws were enacted with the purpose of maintaining and elevating the position of the politically dominant group, the whites. The whites controlled the vast majority of the nation's wealth through the apartheid laws. The Group Areas Act and other laws had socio-spatial effects in the government's social engineering (Snyder, 2004).

Mines were infrequently visited by Department of Health officers and before the mid-1950s few records were kept of employees. Most miners were black and under the sway of apartheid the state inspectorate had little interest in protecting them from occupational injury. There are hundreds of un-reclaimed mines in South Africa that have made large areas of the

Northern Cape permanently hazardous. The situation in South Africa, generally from 1948, labour relations were shaped by apartheid, was not much better (Mcculloch, 2003).

In 1991, the government repealed the social engineering laws (Snyder, 2004). June 2002, the government issued a new policy, “Proposed Broad- Based Socio-Economic Empowerment Charter for the South African Mining Industry.” This policy is known as the “Mining Charter” and with revisions the government released the new “Broad-Based Socio-Economic Empowerment Charter for the South African Mining Industry” with the signing of the Bill. The focus of the Mining Charter is on human resources.



The objectives of the charter were to:

- Promote equitable access to the nation’s mineral resources to all the people of South Africa;
- Substantially and meaningfully expand opportunities for Historically Disadvantaged South Africans including women, to enter the mining and minerals industry and to benefit from the exploitation of the nation’s mineral resources;
- Utilise the existing skills base for the empowerment of Historically Disadvantaged South Africans;
- Expand the skills base of Historically Disadvantaged South Africans in order to serve the community;
- Promote employment and advance the social and economic welfare of mining communities and the major labor sending areas; and
- Promote beneficiation of South Africa’s mineral commodities (Snyder, 2004):

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The researcher is also keen to see if there have been significant changes from the historic demographics in which blacks were employed at the lower level of the hierarchy, and to see if the male dominated industry has become more balanced gender. Safety management has historically been very reactive in the South African mining industry, with measures of improvement only happening after the root causes of major accidents were clearly identified. The trend in the last six years has been towards a more preventative approach, with the introduction of baseline risk assessment, formalised task observation, on the job training, and behaviour safety programs (Pyoos, 2008). The South African Platinum Mining Company employs unskilled labour, resulting in a 'have and have not's syndrome. Illiteracy is commonplace in the South African Platinum Mining Company of 50% of employees is commonplace. In most western northern hemisphere countries, where the majority of MNC companies exist, illiteracy is almost unheard of. South Africa's history still affects the working environment, and culturally the South African Platinum Mining Company operates in diverse environments, ranging from distinctly socialistic to democratic (Van Den Berg, 2008).

2.4 Safety History South Africa

When mining started on an industrial scale in the 1880s, miners faced very high levels of risk to both safety and health. Over the years the safety performance of mines has improved, but not at the same rate as at in other major mining countries such as Australia, Canada and the United States of America. It is difficult to compare health performance (Hermanus, 2007). The Leon Commission's inquiry into safety and health in the South African mining industry identified four major hazard categories that it prioritised for urgent and immediate attention. The top two of these hazard categories were: falls of ground (noted by the Commission to be

responsible for 61, 7% of deaths and 30, 8% of serious injuries in all gold mines in 1993); and mining equipment and transport (noted by the Commission to be responsible for 12, 7 % of deaths and 21, 4 % of serious injuries in all gold mines in 1993) (Squelch, 2001). Given that miners account for less than 4% of the total workforce in South Africa, a disproportionately high percentage of occupational deaths, 15% of the estimated total for the country, are associated with mining. Globally, the sources of data on occupational disease are fragmentary and incomplete and exposure data is scarce and unreliable (Hermanus, 2007). For many years the safety of people working in South African mines and quarries was controlled by the Mines and Works Act 1956, and subsequently the former Minerals Act which was replaced by the Minerals and Petroleum Resources Development Act 28 of 2002. Several incidents in mines in recent years indicate that this legislation needed to be updated and revised. The findings of the Leon Commission of Inquiry into Health and Safety in the Mining Industry in April 1994 led to the drafting of new legislation, which resulted in the Mine Health and Safety Act, 29 of 1996, which has subsequently been amended by Act 72 of 1997, or the Mine Health and Safety Act (<http://www.exxaro.com>). When threatened with regulation, the bigger companies always threaten to close their mines, especially in areas of high unemployment (Mcculloch, 2003).

The mine owners' association, the South African Chamber of Mines, was formed in 1889 to represent the industry in dealings with the government. In the 1990s, the Chamber of Mines included six major mining finance houses, with thirty-six gold mines, twenty-two coal mines, and sixteen diamond, platinum, antimony, asbestos, manganese, lead, and copper mines. Together they account for 85 % of South Africa's mineral output. The Chamber of Mines negotiates labor concerns on behalf of mine owners, administers training programs for mineworkers, trains mineworkers in rescue and safety procedures, oversees pension and benefit

funds, coordinates research programs, and refines and processes some minerals before sale (www.country-data.com/cgi-bin/query/r-12148.html).

2.5 Value of Statistics in Mining

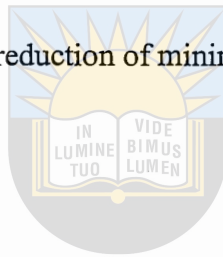
The literature on the effectiveness of health and safety regulation has focused on the enforcement of occupational safety and health regulations. There is a consensus that health and safety regulations have had little demonstrable effect on safety (Kniesner & Leeth, 2004). The state of safety in South Africa's mining industry has been placed under the spotlight after a number of fatalities caused an outcry among mine workers (Pyoos, 2008). Accurate accident statistics are necessary to measure safety performance at the national, regional and sector levels, to identify accident causes for prevention initiatives by government, management and labour organizations, and to identify occupational groups exposed to above average risks (Leger & Macun, 1990). Coleman & Kerkerling, (2007) examined the distributions and summary statistics of all injuries reported to the Mine Safety and Health Administration from 1983 through 2004. Over the period studied (1983–2004), there were 31,515,368 lost workdays associated with mining injuries, the equivalent of 5,700 person-years lost annually. The results showed that the probability of an injury having 10 or more lost workdays was 0.52 for coal mine cases versus 0.35 for metal/nonmetal mine cases. In addition, a comparison of injuries involving continuous mining machines over 2001–2002 versus 2003–2004 showed that the ratio of average losses in the later period as compared to those in the earlier period was approximately 1.08, suggesting increasing risks for such operations. The best opportunities to reduce these rates are not revealed by retrospective analysis of injury and illness data. Instead, a proactive approach is needed that

accounts for risks due to specific hazards that can be abated by engineering or behavioural interventions (<http://www.cdc.gov>).

The South African Mines Reportable Accident Statistical System database indicates that 25% of all accidents in the mining industry are within the transportation and machinery area. Of the 25%, some 7% is in the conveyance area of transportation, which includes vertical and incline conveyance systems (Wilson, 2004). Mining in the United States remains one of the most hazardous industries, despite significant reductions in fatal injury rates over the last century. Coal mine fatality rates, for example, dropped almost a thousand-fold since their peak in 1908. While incidence rates are very important indicators, lost work time measures offer an alternative measure for evaluating job safety and health performance (Coleman & Kerkerling 2007). The United States reported 26 fatal accidents at its mines in 2007, and 23 in 2008, according to the United States Mine Safety and Health Administration. Australia had four mine deaths in 2007/8, 13 in 2006/7 and 11 in 2005/6, according to the Mineral Council of Australia. Meanwhile, Canada had eight mining fatalities in 2008 and six the previous year (<http://www.consultancyafrica.com/:death-in-the-name-of-profit-south-africas>).

Ural & Demirkol, (2007) compared safety performance indices in mineral-extracting industries in Turkey with those of other major mine-producing countries so as to enable authorities to develop strategies in order to take the relevant precautions and eventually improve mining industries in Turkey. Mineral-extracting industries of Turkey had the highest incident rates and highest fatality-to-injury ratio of all the major mine-producing countries. Low accident ratio is caused by serious consequences of accidents. Head and main body were the most affected

body parts. The most common fatal accident/injury types occurred with blasting operations, powered haulage and fall of face/high wall. Employees under the age of 40 were at more risk of injuries than older ones in the Turkish surface mines. Comparison of yearly mining accident statistics over time indicates that mining accidents have been diminishing continuously since the beginning of the last century, although some minor deviations from this trend have been observed. Ramani & Mutmanský, (1999) as quoted by Ural & Demirkol, (2007) point to United States progress in mine health and safety since the beginning of the 20th century. They reflected the effects of mine regulations and their enforcement, new technology and equipment and, change in applied mining methods on the reduction of mining accidents and fatalities over time.



2.6 South Africa's Mine Safety Record

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Despite significant reductions in mining injuries, incidence rates remain high compared to other industries (Komljenovic, Groves, & Kecojevic, 2008). Inadequate or insufficient training is often cited as a root cause for many mining fatalities. On average, one worker dies in the South African mining industry every working day, and about 16 are injured in daily mine-related accidents (Van Wyk, 2006). In 2009, some 165 people lost their lives in mining accidents in South Africa. This marked an improvement on the 171 people who died in the country's mines in 2008, and the 220 fatalities recorded in 2007, and is a significant improvement on the 309 people who lost their lives in the country's mines in 1999. Further, in the first six-and-a-half months of 2010, some 67 people died, indicating the likelihood that the full year figure would be an improvement over 2009. However, this level of fatalities represents very poor performance when compared to safety benchmarked countries, such as Australia, Canada and the United States (<http://www.consultancyafrica.com/death-in-the-name-of-profit-south-africas>).

2.7 Platinum Mining

Mining is very dangerous; one of every four of the platinum mining incidents or accidents occurs within 5 metres of the face (Pickering & Moxham, 2006). The South African platinum industry finds itself in the midst of a rapidly evolving society that is no longer characterized by the apparent stability of the previous decades. The features of this society include increasing global competition, rapid technological innovation, a declining skills pool, major political transformation, a more challenging working environment as the mines reach deeper into the earth's crust and a greater concern for human welfare (Read, 2006). Change is inevitable in today's world, and the ability of an organization to adapt rapidly will influence the South African Platinum Mining Company as it progresses into the future. Its companies are going to have to deal with a more diverse multicultural workforce, accelerated influx of learners at high levels, enhanced education, and ever present technology, thus changing the way work is done. Structures will be flatter, wider, and workers will have to be more self managed and performed teams, economic shocks may become more evident, competition will be ever increasing, and social and political trends will be changing. The South African Platinum Mining Company will require greater proactivity, to respond rapidly to market changes (Van Den Berg, 2008).

Change in the form of different technology requires change in mining methods and their best match. At the end of the day the outcome from change in the stopping systems has to be safer and more profitable mining systems (Pickering, 2004). The need for mechanization in the platinum mines is driven primarily by the recognition that it is getting more difficult to recruit hand-held rock drill operators. The job involves hard physical effort and has lost the 'macho' status it once had (Pickering & Moxham, 2006). To successfully change from traditional

methods requires an integrated holistic approach that considers all aspects of a mining operation including setting of objectives, selection of personnel, recruitment, training and remuneration policies, organizational design, mine design, equipment selection, maintenance philosophy, standards and procedures, and monitoring and control (Willis *et al.* 2004).

The South African Platinum mining industry is uniquely challenged to successfully implement mechanisation. There are many examples of failures but very few examples of outright success. To increase the success rate, which is essential to the long-term sustainability of the mining industry will require new thinking in technology transfer practice (Willis, 2004). It is recognized that the implementation and application of new technology in the mining industry is a difficult process and has often been unsuccessful (Pickering, 2004). People who make decisions about acquiring technology for mines do not choose technology per se; they choose the beneficial results of the technology. In all the known successful cases, the technologies were highly recommended by competent and respected third parties other than suppliers or mines (Willis *et al.* 2004). It is well known that safe production can only be achieved with a combination of the right equipment, trained people, and appropriate operating procedures. The purpose of any technology implementation plan or technology transfer process must be to ensure that these objectives are achieved (Pickering, 2004).

2.8 Definition of Key Terms

2.8.1 Employee

For this research the term refers to people who place their personal services at the disposal of their employers to further the employer's business interests (Grogan, 2008). In the mining environment most labour is provided subcontractors. Since these individuals further the employer's business interests and are involved in the operations of the mine they qualify as employees.

2.8.2 Employer

For this research the term refers to those that receive employees into service. The principal duties being

- ✓ to receive employees into service
- ✓ To pay employee
- ✓ To ensure working conditions are safe and healthy

Employers are further obligated to accord employees their rights in terms of the applicable contracts of service, collective agreements, and legislation, as well as to adhere to certain statutory duties imposed in the interest of employees (Grogan, 2008). For our purpose the term includes supervisors, middle managers, senior management, directors and owners.

2.8.3 Knowledge and Practice

Knowledge reflects what the individual/worker knows about safety information (labels, symbols, signs, pictograms, guidelines, manuals) meant to ensure safe activity in the work place (Motbainor, 2007). Controversy over lack of knowledge arises because the effects of

occupational health and safety risks are not completely known. Within the workplace the current state of knowledge about a particular hazard may not be appreciated, or knowledge is used to the political advantage of one party most often the better resourced (Motbainor, 2007). Practice reflects what the workers actually do given the safety information.

2.8.4 Safety

Safety refers to the state for which the risks are judged to be acceptable (Motbainor, 2007). In many mining companies the term 'safety' implies an organizational function that may include safety and occupational health and/or occupational hygiene. The primary focus of management today is safety, or preventing negative, generally irreversible, events of acute impact. The outcomes of safety-related events are usually visible and can evoke strong emotions if the results are severe (Badenhorst, 2004). Therefore, safety overrides health in mining because occupational ailments take years to develop and management observes less physical trauma, if they witness anything at all.

2.8.5 Perception

Kreitner & Kinicki, (1995) define a perception as a mental process that enables us to interpret and understand our surroundings. Perception is the set of processes by which individuals become aware of and interprets information about the environment. Selective perception is the process of screening out information that we are uncomfortable with or that contradicts our proffered behaviour (Moorhead & Griffin, 1998). Perception surveys can also be used to determine ways to improve occupational health and safety systems. In an occupational health and safety setting, the perception survey is a tool that reveals influences on employee

behaviour such as peer or production pressures. A health and safety management system is only as good as the employees perceive it to be (Sheppard, 2001).

2.9 Conclusion

The purpose of this chapter was to highlight the history of mining and the major minerals that drive the South African economy and also to define key terms. It should be noted that the issues of health and safety had always been around and that things in the industry began to change after 1994 when the system of apartheid was removed. Since the sector was established well before there was equality in the labor market, the state is faced by a situation in the mining sector in which should see improvements but through policies that should not turn away investors. South Africa after independence belongs to all those who live in it and not only to the owners of capital, the previously advantaged communities and the incorporated black middle classes and elites (Edigheji, 2007).

CHAPTER 3

CONCEPT OF OCCUPATIONAL HEALTH AND SAFETY IN THE WORK PLACE

3.1 Introduction

The previous chapter highlighted the history and importance of mining, defined terms and pointed to the risk involved in the extraction of minerals. The purpose of this chapter is to consider the importance of occupational health and safety in the workplace. Its importance accounts for the increasingly extensive legal framework that governs health and safety at work.



3.2 Why Occupational Health and Safety

The social and economic impact of working conditions affects communities even across borders (Mine Health & Safety Audits 2008). The workers health status in every country has an immediate and direct impact on the national economy (Malik, 2010). Occupational health and safety law exists to ensure that all workers are provided with a safe and healthy workplace and states of work, and are protected from work hazards (Buxton, 2003). According to Badenhorst (2004) occupational illnesses and diseases are chronic and generally characterized by temporary or permanent physical dysfunction. With the exclusion of some symptoms, they generally become visible. Due to the fact that safety is overridden by health in mining occupational ailments it takes a lot of time to develop and management does not notice much physical trauma, if at all. Occupational health issues must be addressed systematically, and they encompass all aspects of the interaction of employees within the work environment. People are at the concern of health and safety. As research and experience indicate, most safety incidents are behavior

related. It has been said that safety is a continuous battle with human nature, but a fight that can be won with an appropriate investment in understanding people with all their capabilities, limitations, and behaviours. As such, successful health and safety management must be centered on people both labour and management (Badenhorst, 2004). However, the human element is very complicated and dynamic, requiring constant attention and feedback. Komljenovic, Groves & Kecojevic (2008) carried out a systematic risk analysis to thoroughly characterize injuries for the 10-year period from 1995 to 2004. Their results showed decreasing injury frequency for all categories over the period examined. However, a “serious” level of risk for fatal and non-fatal days-lost injuries, and a “moderate” level of risk for no-days-lost injuries still exist. Their findings emphasize the need for continued efforts to reduce mining injuries and should be helpful in prioritizing control strategies. Banfield & Kay, (2008) noted that many organisations also take a strategic view of health and safety, in which annual safety plans are informed by experience and new developments in the field. Such plans clarify what actions are to be implemented over the next 12 months and what resources are to be made available to meet the plan. This ensures that actions can be assigned to individuals and that these can be in-cooperated into objectives set through the appraisal system.

3.3 Occupational Health and Safety Information in the Workplace

Employees who positively engage in safety-related communication with their leaders should have a better understanding of safety issues (such as safe operating procedures and guidelines, outcomes of unsafe behavior safety equipment handling, and emergency procedures). Researchers have used a variety of approaches to clarify the relationships between communication and safety related issues. Hofmann & Stetzer, (1998) as cited by Michael *et al.*

(2006) conducted some of the more noteworthy work. They showed that better employee-supervisor communication tends to produce employees who are more likely to raise safety concerns.

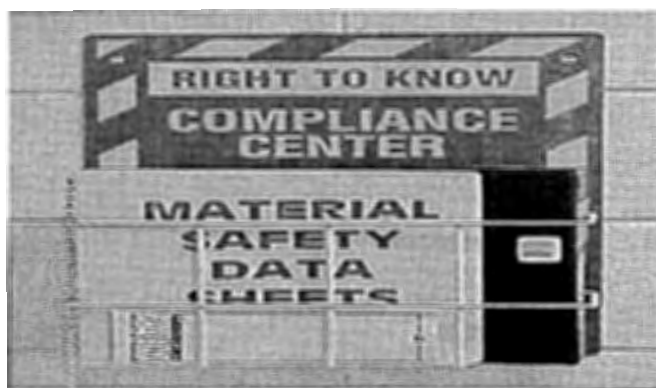
Employers throughout the world provide a vast amount of safety information to workers both to encourage safe behaviour and to discourage unsafe behaviour. These sources of safety information include, among others, relations, codes and standards, industry practices, training courses, Material Safety Data Sheets (MSDS), written procedures, safety signs, product labels, and instruction manuals. Occupational safety information (sign, label, and symbol) contains specific information that is relevant for various activities and handling stages. It is the users' responsibility to read and understand the label when buying, working, storing and handling as well as disposing (Motbainor, 2007). Material safety data sheets are used in workplaces to communicate to workers the hazards of chemical products (Nicol *et al.* 2008).

Occupational health and safety information may consists of signs, symbols, pictograms, written safety manuals, material safety data sheets, working procedures, guidelines, instructing labelling and whatever provides the necessary information for the workers and others who come across the working environments. Safety and health at work signs are signs referring to a specific object, activity or situation and providing information or instructions about safety and/or health at work by means of a signboard, a colour, an illuminated or acoustic signal, a verbal communication or a hand signal, as the case may be (Motbainor, 2007). Safety in industry is a compromise between conflict elements institutionalized in industrial organizations. Engineers' designers are paid primarily to improve profitability through technological advancement

(theoretically within limits set by legislation and social mores). Communication theory is ideally suited to advance systematic forms of knowledge about workplace safety (Real, 2008).

3.3.1 Material Safety Data Sheets (MSDS)

MSDS are an essential part of making the workplace a safer environment. The material safety data sheet is an integral part of a worker's evaluation for suspected occupational diseases (Bernstein, 2002). The Occupational Safety Health Act hazard communication standard specifies that employers must have a MSDS in the work place for each hazardous chemical used. The standard requires the MSDS to describe; the physical and chemical characteristics of the hazardous chemical; and its potential for fire, explosion, and reactivity. Health hazard information, including signs and symptoms of exposure and health conditions potentially aggravated by the chemical, and, the name, address and telephone number of the party able to provide other additional information about the chemical (Motbainor, 2007).

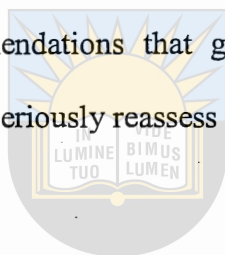


MSDS need to be:

- Readily accessible

- User friendly
- Current
- Secured upon receipt of the chemical

(www.scribd.com/doc/13743795/11-Occup-Health). Nicol *et al.* (2008) contend that despite the fact that health and safety studies varied in methodology and spanned a period of more than 15 years, a number of common themes emerged regarding inaccuracies, incompleteness, incomprehensibility and overall low use of MSDS. The results of the literature review suggest that there are serious problems with the use of MSDS as hazard communication tools. Nicol *et al.* (2008) concluded with the recommendations that governments, regulatory bodies, and occupational health and safety personnel seriously reassess the ways in which MSDS are written, monitored, regulated, and used.



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3.3.2 Warning signs, labels and tags

Prior research indicates that many warning symbols are poorly understood (Lesch, 2007). Research also indicates that accident scenarios could be used to improve comprehension of warning symbols. Other standards provide very specific recommendations regarding the design of warning signs, labels, and tags. These include particular signal words and text, colour-coding schemes, typography, symbols, arrangement and hazard identification. Among the most popular signal words recommended are: 'Danger' to indicate the highest level of hazard; 'Warning' to represent an intermediate hazard; and 'Caution', to indicate the lowest level of hazard. Colour coding methods are to be used to consistently associate colour with particular levels of hazard (Motbainor, 2007). Warnings alert users and consumers to the existence and nature of product risks so that they can prevent harm either by appropriate conduct during use or

consumption or by choosing not to use or consume. Instructions inform persons how to use consumer products safely (Ross, 2008).

A. Notice signs

Notice signs may include information about procedures, operating instructions, maintenance information, information about rules, or directional information. Notice signs are never used for safety related information or warnings. They are only used to provide general information (<http://www.graphicproducts.com/signprinters/danger-signs.htm>2005).

B. Caution signs

Wogalter (2006) says caution signs are intended to be used for less severe hazards. A caution sign indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury. Caution signs are used in areas where potential injury or equipment damage is possible, or to caution against unsafe practices (<http://www.campus.manchester.ac.uk/healthandsafety>).

C. Danger signs

Danger signs indicate an immediate hazard and they inform people about special precautions that are necessary. Occupational health and safety regulations state that there is to be no variation in the type of design of signs posted to warn of specific dangers. Wogalter, (2006) as quoted by Croll, (2004) states that danger signs are intended to be used for severe hazards.

It is the employer's responsibility to provide information, training, and equipment for new employees or when employees changes position or uses a different chemical. Best practice transfer and reviews establishing a knowledge sharing and best practice culture through the establishment of best practice communities and technical meeting structures building a library of knowledge for personnel to access. Specialist support should be constantly available to assist operations with specialist advice and support.

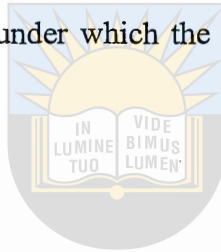
3.3.3 Environment

Environment refers to the physical workspace including the materials and mechanisms found in it. Materials and mechanisms are the elements of mining that can be seen and must be controlled, or at least understood, to the point of predicting how they will affect work and workers (Motbainor, 2007). It must be realized that studies indicate that behaviour contributes to the vast majority of accidents, but almost without exception, environmental conditions also play a contributory role (Karmis, 2001).

3.3.4 Systems

Karmis, (2001) defines systems as the processes by which things get done. They include health and safety regulatory compliance activities, production and maintenance methods, interaction between entities within the organization, proactive and reactive health and safety practices, social processes and programmes, human resource activities, communication mechanisms, intrinsic and extrinsic rewards, and measurement systems. Organizations are designed for the results they obtain, whether it's production, safety or quality. Results are

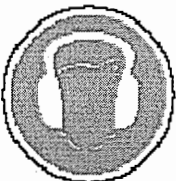
determined in large part by the systems that have been implemented based on the organization's design and how those systems are managed. In addition to design, a major failing of many otherwise effective systems is the lack of a renewal/reviewing phase or process. To be successful, systems must periodically be re-evaluated to determine if they are adding value, addressing problems and contributing to continuous improvement. Proper feedback provides a mechanism to enhance systems, to correct those yielding poor results and to eliminate those that are ineffective. The mining system includes the physical confines and characteristics of the mine, the equipment in the mine, the individuals and the organization that operate the mine, as well as the processes and regulatory constraints under which the mine operates (Saleh, & Cummings, 2011).



3.4 Labeling

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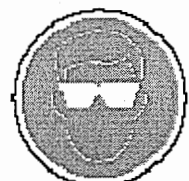
Mining remains one of the most hazardous occupations worldwide and underground mines are especially notorious for their high accident rates (Saleh, & Cummings, 2011). The employer must ensure that all hazardous chemicals are properly labeled. Containers of hazardous chemicals must have labels which identify the material and warn of its potential hazard to employees (www.scribd.com/doc/13743795/11-Occup-Health).



Ear protection must be worn



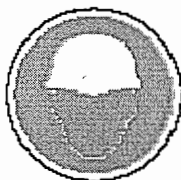
General danger



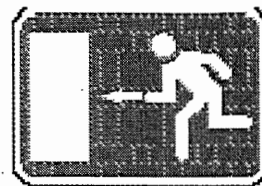
Eye protection be worn



No access for pedestrians



Safety helmets must be worn



Escape



No Smoking



Marking For Dangerous Locations



Explosive



Radioactive

<http://www.hse.gov.uk/pubns/indg184.htm>

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Motbainor (2007) conducted a study on four different companies in Namibia which showed that the employees were not trained in chemical safety including procedures and measures to prevent exposure during mixing and application of chemicals. Almost all employees interviewed were not aware of material safety data sheets of the chemicals. Where the safety data

sheets were available, only employers' representatives were aware of them. Employees felt they should have access to material safety data sheets on all chemicals. Of the employees interviewed, an average of 90% of the employees could correctly identify two of the hazard symbols, particularly the "toxic and flammable" symbols.

Loewenson, quoted by Motbainor, (2007) reported in 1992 that of the 100 employees interviewed, the majority could not put the Zimbabwe warning symbols in the correct order. However, 90% of employees' recognised international toxic and "flammable" (69%) symbols while the "harmful" symbols were least known (15%). Except for a few major, reputable, public and private industrialists are not sensitized about the importance of occupational safety in their industries. In the Indian Oil Corporation a public industry, work related injuries constitute 35% of all injuries reported in their hospital while burns were about 6% of all injuries. Inadequate information and lack of education and training, about workplace safety and health greatly concern workers. The culture and attitudes of workers, supervisors, and companies about health and safety often disregard risk taking and unsafe work practices, passing "bad" habits from one generation of workers to the next. A study, by a national institute of occupational safety and health showed that 31% of workers when first assigned to a task are not sure how to do it (Ramanakumar, 2005).

The Roben's report influenced the thinking of the International Labour Organisation (ILO), and the design of legislation in countries, like Britain, Australia, New Zealand, Norway and Sweden. In South Africa, the Leon Commission of inquiry into Safety and Health in the Mining Industry, which published its report in 1995, was also influenced by Roben's report. The

Leon Commission recommended that legislation be promulgated to address occupational health in mines, and that mine employers take urgent steps to improve monitoring standards and practice, medical surveillance, and the control of health risks (Hermanus, 2007).

3.5 Occupational Health and Safety in Mines

Worker participation in occupational health and safety generally achieve better outcomes than do unilateral management initiatives. But in a 'cold' industrial relations climate, meaningful participation is increasingly difficult (Gunningham, 2008). Unsafe working conditions, if unchecked, lead to tremendous human suffering (Mine Health & Safety Audits 2008). Mining companies face a range of challenges in the adoption and utilisation of mining technologies. The benefits possible through technology are preconceived often without interest in the management changes required to properly integrate new technologies. This phenomenon may be due to the nature of the mining businesses and commodity markets. Mining is a capital intensive business with large barriers to entry into markets. These operations produce standard products such as copper cathodes, zinc concentrate or gold bullion. Product innovation doesn't take place in operating mines as the product itself cannot be improved upon. This begs the question: how does a mining company gain a competitive edge (Jordaan & Hendricks, 2009).

From the earliest written records on human occupation, mining has been characterized as a dangerous trade with a high probability of injury, illness, or worse. Life was always fragile for those who removed and processed ore. Regrettably, mining accidents were often viewed as one of the tragic costs of extracting the materials necessary for the development of modern life (Badenhorst, 2004). The accident and ill-health record in the mining sector compares poorly to

that of other economic sectors such as manufacturing, construction and transportation, leading to mining's reputation as the most hazardous industrial sector (Hermanus, 2007).

3.6 Occupational Health and Safety Globally

Safety training in mines is an international issue and the positive results obtained by using interactive simulations in the South African mining context indicate that such simulations can be globally useful (Van Wyk, 2006). Read (2006) contends that we are living in a boundary-less, worldwide community in which human performance will increasingly become the determinant of business success. There are a number of international standards or guidelines concerning on suitable structures for occupational health and safety. Examples of these are the British Standards Institute (BS8800) 'Guide to Occupational Health and Safety Management Systems', the joint Australia/New Zealand standard 'Occupational Health and Safety Management Systems Specification with Guidance for Use'; 'Occupational Health Safety Act 18001'; and the ILO document 'Guidelines on occupational health and safety management systems'. All of these have a very similar approach and the choice of any particular standard for the individual operation would be determined by the fit with the existing management system and the local legislation. Others, such as the International Organisation for Standards Range of Standards, are much more formalized and available for all businesses. A key requirement for any standard is for it to be auditable, i.e. the organization's compliance with the standard is supported by the availability of verifiable evidence.

Research into multiple national health and safety management standards has indicated that all successful systems incorporate five generic elements, namely:

- A comprehensive occupational health policy
- Dynamic organizing and careful planning
- Effective implementation and operation
- Monitoring and corrective action; and
- Conscientious management review.

3.6.1 United States of America

Mines Safety Health Authority of Department of Labour develops and enforces safety and health legislation in all United States mines. Federal Mine Safety and Health Act of 1977. Mines Safety Health Act is quite prescriptive. The Act applies to all mines and mineral processing operations regardless of size, employee numbers or method of extraction. Enforcement is done by the Coal Mine Safety and Agency and Metal & Nonmetal Mine Safety and Health Agency for non coal mining throughout United States. Penalties are in the form of fines and production stoppage. The Mines Safety Health Authority conducts overall inspections quarterly.

3.6.2 United Kingdom

There is one legislative framework the Health Safety at work Act of 1974. Regulation is seen to by the Health Safety Council and Health Safety Expert with specific statutory functions arising from the Health Safety Council. The Health Safety Expert is appointed by the Health Safety Council to enforce Health Safety law. Inspectors provide advice; enforcement notices and recommends prosecution where necessary to ensure compliance.

3.6.3 Canada

Each Canadian province has its own independent Health Safety legislation. The British Columbia prevention officers regulate and inspect workplaces and issuing written orders. After repeated orders for non-compliance with regulations penalties do follow. Manitoba Health Safety officers are appointed to enforce Work Health and Safety Act regulations.

3.6.4 Australia

Health and safety in Australia is governed by various regulatory bodies and by mining and labour legislation. The mining industry is governed by the Mines Safety and Inspection Act, 1994, and the Mine Safety and Inspection Regulation, 1995. Employers and employees are bound by a “Duty of Care” that outlines the rights and responsibilities of the various parties with respect to the safety of both themselves and others. At State level, safety and health in Western Australia is regulated by the Occupational Safety and Health Act, 1984, and the Occupation Safety and Health Regulations, 1996, which is supported by the on-mine codes of practice (www.exxaro.com/pdf/icpr/u/pdf/section10). Australia is a federal state that its Health and Safety administration is almost entirely non-federal, and thus the Commonwealth government does not intervene in Health Safety regulation or standard setting. Each Australian state and territory implements its own system of health and safety regulations. Australia uses Robens ‘duty to care’ approach to mining and the six states have separate legislation and administration Mine Safety and Inspection Act 1994 which provides for the appointment of inspectors. They can:

1. At all times enter, inspect and examine any mine
2. Conduct examinations and inquiry where necessary and provide information to any person for the purpose of compliance

The Australian mining industry embraced risk-based management strategies across the entire spectrum of applications, from feasibility studies and mine planning and design, through to new equipment and technology implementation (Hebblewhite, 2009).

3.6.5 India

The Mines and Minerals Development and Regulation Act, 1957 and the Mines act 1952, constitute the basic laws. For mining Health and Safety is governed by Mines Rules 1955, created under the Mines Act. Enforcement of Health and Safety rest with the Director General of Mines Safety, who drafts legislation and appropriate standards, oversees compliance and promotes awareness programmes in the mines. A Chief Inspector and Inspectors are appointed to:

1. conduct inspections and inquiries
2. examine the state and condition of any mine to ensure the Health and Safety of miners.

3.6.6 Finland

Here Health and Safety is based on the concept of a good working environment, which also covers terms of employment and the psychic well being of the employees. An employer has to take into account everything as regards to the quality of work, working conditions, an employee's age, gender, skill to reasonably protect employees from injuries and occupational health. The Occupational Health Safety Inspectorate and Occupational Safety & Health department of the Ministry of Social affairs (with 8 inspectorates) enforces legislation for compliance. Inspectors have the right to visit any workplace to inspect documents, redress

defects and make statements on the plans concerning working premises and working methods (Masekoa, 2008)).

3.7 Occupational Health and Safety in South Africa

Occupational health management is about managing the relationship between work and health. It is about assessing each individual to establish whether or not he or she is fit to carry out the tasks required, and it is about controlling the task and working environment to ensure that they do not have a long term adverse effect on the health of the employee (Banfield & Kay, 2008). To date, little information exists about the effectiveness of the statewide initiative to promote occupational safety and health (Stokols *et al.* 2001). Comparison of Australian and South African accident and disease rates suggests that miners are 4–5 times more likely to lose their lives in mine accidents in South Africa than in Australia (Hermanus, 2007). South Africa's deep gold mines are the most dangerous, accounting for some 46 fatalities so far this year (2010), while 24 deaths were caused by accidents at platinum mines. Meanwhile, Solidarity has noted that the number of mining accidents also dropped by 31%, from 2 613 accidents from January to September last year (2009), to 1 801 accidents in the same period in 2010, and 54% of this year's accidents occurred in the North West Province (<http://www.miningweekly.com/article/south-africas-mining-fatalities>). The Mine Health and Safety Council and the Chamber of Mines of South Africa (Employer Summit 2006) estimated that the safety performance of the South African mining industry must improve by at least 20% per year to match by 2013, the average performance of Australia, the United States, and Canada (Ontario). ILO estimates the annual number of work-related fatalities that occur worldwide. Among the figures published by the ILO are estimates of the number of work-related fatalities in South Africa. According to the ILO

1 908 workers have died in work related accidents in 2001(www.ilo.com). In the same year, 288 workers died in mine accidents (www.dme.co.za).

Masekoa (2008) contends that the role of occupational health and safety regulations in South Africa is:

1. To promote a culture of health and safety;
2. To provide for the enforcement of health and safety measures;
3. To provide for appropriate systems of employee, employer and State participation in health and safety matters;
4. To establish representative tripartite institutions to review legislation, promote health and enhance properly targeted research.



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Most mining related diseases in mining are caused by the noise of machinery and exposure to dust.

3.8 Noise exposure

Exposure to noise is a widespread problem in mining because of the use of heavy equipment; drilling and rock breaking, transferring, sorting and milling of rock and the confined working environment. Available data for noise exposure for South African miners suggest that nearly half the workforce is exposed to deafening noise, and of these workers more than 90% work in zones in which noise exceeds the 85 decibel. Up to 11% of working zones are averaged

to, noise levels even higher (Hermanus, 2007). Controlling noise has proven difficult in mining and noise-induced hearing loss remains common (Donoghue, 2004).

3.9 Dust exposure

Studies of South African underground mines show that individual dust control measures can achieve reductions of between 25 to 50% of respirable dust. A range of control measures that act together to reduce exposure to risks is necessary. These could include methods for minimizing dust levels by reducing dust generation and methods of dilution, suppression, capture, and containment. Current guidelines on addressing airborne pollutants emphasize the importance of identifying and characterizing all sources of airborne dust, both primary and secondary, and properly integrating control interventions into procedures for choosing and maintaining equipment, and into the daily work cycle (Hermanus, 2007). The South African government is committed to significantly reduce the prevalence of silicosis by 2015 and to eliminate it by 2030, in line with the Global Programme for the Elimination of Silicosis of the ILO and WHO (Matomela, 2011). Although Mine Safety Health regulations enforcement efforts may have an immediate effect on the frequency or severity of accidents, they are unlikely to change the immediate incidence of health related problems such as hearing loss or black-lung disease (Kniesner & Leeth, 2004).

3.10 Comparison with Other Parts of the World

In South Africa, all regulatory instruments relative to mining such as regulations and codes of practice tend to be framed as outcomes statements. In contrast in Britain, where

performance-based approaches were pioneered, the approach of the Health and Safety Executive is more nuanced. All countries studied have health and safety legislation for their mining industry. Most countries have an inspectorate to enforce compliance. Except for the United States of America most countries have health and safety legislation that is outcome based not prescriptive. South Africa and the United Kingdom formulate pass national legislation and disseminate it throughout regions. The United States of America has an intermediate approach; with the Mine Health Safety Act being nationally prescriptive legislation on behalf of the Department of Labour, yet individual states have powers to modify legislation in their area of jurisdiction, thus compromising uniformity South Africa, Mine Health Safety Institute ensures uniform standards in the mines (Masekoa, 2008). Mining legislation in South Africa and elsewhere has developed piecemeal, usually in response to disasters involving loss of life and multiple injuries. The fact that safety risks are more manifest in the workplace than health risks has also skewed legislation towards safety and physical hazards. In the long-term, however, more deaths and disability are associated with health risks than with safety risks (Hermanus, 2007).

3.11 Benefits of Occupational Health Safety

There is substantive evidence to suggest that safe work behaviour is supported by a positive safety culture. Aspects of organisational culture in industries with hazardous installations relates to safety. Pyoos (2008) quotes Parker (2006) who states that the beliefs and values related to health and safety form the subset of organisational culture referred to as safety culture. Today, mining is among the safest industries in the world as reflected by comparable industry fatality and injury rates. These improvements are the result of a number of factors, including improved mining methods, such as increased automation and other procedures, which

have limited the interaction between man, machine, and mined material, routine general education and specialized hazard training for workers, broader understanding and application of health and safety management systems and techniques, greater recognition of the moral imperative to protect the industry's greatest asset its people (Badenhorst, 2004).

From the descriptions of corporate and mine site based champions, it is clear that champions are scarce individuals, often thinly spread across any organisation, in the labour market that has prevailed in the mining industry over the past few years. Without individuals committed to good mining, the introductions of new technologies will not achieve its full potential benefit. The equipment components of technology alone will not solve any problem, but requires an enabler. From the primary definition of technology, only when knowledge is properly applied do we realise the promise or potential of technology. Passionate, skilled and committed people are required to apply this technology to generate value and solve problems (Mallett & Orr, 2008).

Thus, in order to formulate appropriate control methods to reduce the occupational or work place incidences, it is necessary to assess the knowledge and practice factory workers relative to occupational safety and design appropriate intervention methods, make the workers safe while they are engaged in different activities (Motbainor, 2007). Improvement in workplace conditions and decrease or elimination of illness and disability require to actions within the workplace and follow upon the implementation of risk prevention and control measures. However, success may only be visible months or years later and may require interventions that have to be maintained over prolonged periods. It demands continuous, co-ordinated effort to

ensure sustainability of diverse occupational health programmes and the relevant management systems (Badenhorst, 2004). Other improvements in the mining industry are being promoted through government incentives. The phasing out of mining houses has created openings for consulting engineers to be involved in projects which formerly were the sole preserve of mine owners. There is also government support to accommodate small mining companies, and to create opportunities for junior operations to start up. Emphasis has also placed upon black empowerment within the industry and has resulted in several black or union owned firms becoming major players (http://www.ussas.com/sa_diamonds.html). Following the transition to democracy in 1994, there have been further efforts to diminish reliance on socially disruptive business practices, especially as they contributed to the world's highest injury and death rates in mines (Commission of Inquiry into Safety and Health in the Mining Industry, 1995) (Hamann & Kapelus, 2004). The ability to improve the health and safety statistics is dependent on the safety culture, or the norms surrounding reactions following an error, the learning that takes place, and the proactive strategies in place to prevent future errors.

3.12 Pitfalls

Kniesner & Leeth (2004) suggest that an increase in the expected cost of violations raises a mine's economically optimal level of health and safety capital thereby reducing the number of accidents. To discover what influences people's behaviour and determine ways to address discrepancies between knowledge and action, behaviour research specialists use perception surveys Implementation of workplace changes and remedial measures intended to improve health and safety within organisations are not always successful. It has been suggested that such

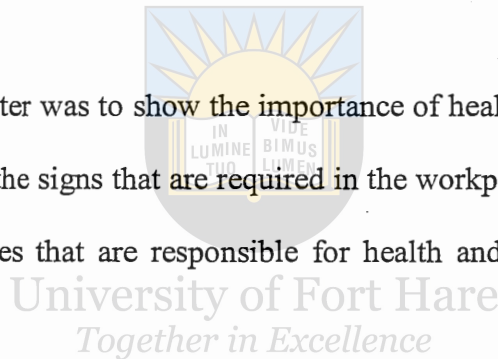
interventions might benefit from a more explicit, stage-specific approach, which takes into account individual and organisational readiness to change (Barrett *et al.* 2005). Although these improvements are laudable, miners continue to be injured, develop occupational disease, and die on the job (Hethmon & Doane, 2001). The fact that human loss continues in the industry also indicates that no single correct health and safety method has been defined and no absolute consensus has been established (Badenhorst, 2004). However, if implementation is to be successful, the primary focus must be on the human and organizational factors (Willis, 2004).

The daily operations and maintenance that are directly involved when something goes wrong are largely managed by middle-range administration. Those responsible for operations and maintenance are likely to be blamed for a mishap, tend to be relatively low in the corporate hierarchy or in the body charged with the unit's safety. Operator error is the most frequently cited type of human error. In fairness, responsibility for the original decision to locate a hazardous operation in a densely populated area or to approve a high-risk procedure, rests with the senior policymakers of the firm. So too, responsibility for badly designed facilities or poor quality equipment which operators run, usually rests with high level policy-makers. In the final analysis, the chief executive officer is responsible for everything that takes place within his firm. If it is a subsidiary of a larger multinational corporation, then the parent firm may be held responsible, with the head of the subsidiary answerable to it. It is possible, however, that in large hierarchical organizations, lapses in direct operation or maintenance may only be revealed when something has gone wrong (Granot, 1998). Burke, Sarpy, Smith-Crowe, Chan-Serafin, Salvador, & Islam (2006) sought to determine the relative effectiveness of different methods of worker safety and health training aimed at improving safety knowledge and performance and reducing

negative outcomes (accidents, illnesses, and injuries). Their findings challenged the current emphasis on more passive computer-based and distance training methods within the public health workforce. Middle-range administration is responsible for evaluation and improvement of operations, including safety. Hazardous conditions must be reported to policy makers and it is good administrative procedure to document such reports. Failure to report on deficiencies in safety arrangements for whatever reason must be regarded as neglect of a vital duty.

3.13 Conclusion

The purpose of the chapter was to show the importance of health and safety regulation in the workplace and also to note the signs that are required in the workplace. The next chapter will highlight the relevant authorities that are responsible for health and safety regulations in the mining industry.



CHAPTER 4

LEGAL FRAMEWORK SOUTH AFRICAN CONTEXT

4.1 Introduction

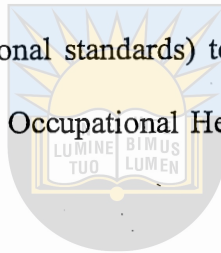
The previous chapter looked into the importance of health and safety regulation in the workplace. This chapter will focus on the relevant authorities that are responsible for health and safety regulations in the mining industry. Despite the South African mining industry's aim to improve safety statistics by 20% each year between 2003 and 2013, there was actually an increase in fatalities between 2006 and 2007, with the number of those killed on the mines rising from 199 to 221. According to many in the industry, the problem is a typically South African disregard of risk to be solved only by a hard to achieve change of culture (Peacock, 2008). Breaches of health and safety regulations can involve both criminal and civil liability.

4.2 Legal Framework

Gunningham (2006) is of the opinion that Occupational Health and Safety law incorporates four main, conceptually distinct, types of standards aimed at influencing behaviour through a variety of techniques. These are prescriptive, general duties, performance-based and systematic process-based standards. This classification is now well recognized.

- A *prescriptive approach* tells duty holders precisely what measures to take and requires little interpretation on their part. Such a standard identifies “inputs”, that is, the specific preventive action required in a particular situation.

- *General duties* (sometimes referred to as ‘goal setting’ regulation) set out principles which duty holders must follow, such as ensuring health and safety as far as practicable, leaving it to the discretion of the duty holder how to achieve those principles or goals.
- A *performance standard* specifies the outcome of the Occupational Health and Safety improvement or the desired level of performance but leaves the concrete measures to achieve this end open for the duty holder to adapt to varying local circumstances.
- *Process based standards* identify a particular process, or series of steps, to be followed in the pursuit of safety, and range from the requirement to identify hazards and assess and control risks (found in many national standards) to the more ambitious requirement to engage in a systemic approach to Occupational Health and Safety at the organizational level.



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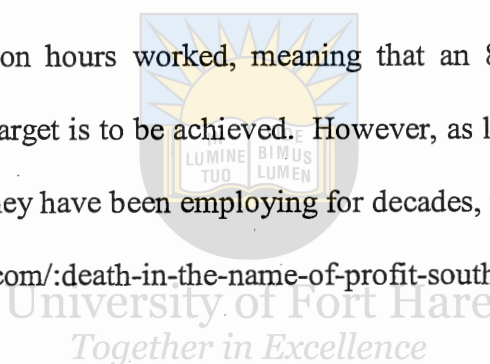
The road to regulatory reform is long and torturous and the current provisions should be regarded as important steps along the road rather than the end of the journey. No state has yet fully ‘mainstreamed’ its mine safety legislation by incorporating it fully within a general Occupational Health and Safety statute that applies to all industries (Gunningham, 2006). The management of health and safety is an area that every organisation needs to take very seriously. The physical and psychological consequences to an individual that result from either an injury in the workplace or work related ill health can be traumatic and have serious long term consequences. Employers have both legal and moral responsibilities for their health and safety, and should ensure that people are not injured as a result of work (Banfield & Kay, 2008). A well recognized standard for effective occupational health and safety has been an objective of the health and safety community globally for many years (<http://employment.alberta.ca/>). Under

common law, it is the employer's obligation to provide employees with reasonably safe and healthy conditions. Early legislation focused on 'surface rehabilitation' and the primary emphasis of mining was on its economic gains (Swart, 2003). The need for improved worker safety training programmes, as a means to reduce accidents in South African mines is being emphasized by all industry stakeholders and is driven by legislation (Squelch, 2001).

For the South African mining industry, the legislator has recognized the need to identify health and safety hazards and assess the risk associated with every activity or process, as stipulated in Section 11 of the Mine Health and Safety Act (29/1996). Cognate legislation can be found for South African Industry in the Occupational Health and Safety Act (85/1993). The Mine Health and Safety Act 29 of 1996 came into effect on 15 January 1997, replacing the Minerals Act as the legal basis for regulating occupational health and safety in South African mines (Badenhorst, 2004). Legislation, in the form of the Mine Health & Safety Amendment Act of 2008, signed into law in 2009, has been developed to improve mine safety performance. The legislation includes measures to ensure that chief executives, mine managers, agents and senior employees could be held criminally liable for accidents if they were found to have been negligent. However, these aspects of the legislation were suspended, ostensibly to resolve concerns about constitutionality and to ensure the drafting of appropriate administrative guidelines and regulations. It is believed that this suspension was a result of behind-the-scenes lobbying (<http://www.consultancyafrica.com/:death-in-the-name-of-profit-south-africas>).

Minister Susan Shabangu noted that government would introduce much tougher obligations on industry and its stakeholders to cut the unacceptably high death rate, and on

investors so that they value being part of a far greater focus on workplace occupational health and safety (www.miningweekly.com/south-africa-mine-safety-regulation). DMR chief inspector of mines Thabo Gazi told Mining Weekly that a review process of the mine health and safety regulations was under way. The review was part of an ongoing process of improving mine health and safety standards (www.miningweekly.com/south-africa-mine-safety-regulation). At a summit in 2003, the Government, organised labour and South Africa's Chamber of Mines, agreed that the local mining industry's safety record should reflect the international benchmark of one death for every 33-million hours worked by 2013. In 2009, South Africa reported one death for close on seven-million hours worked, meaning that an 80% improvement will be required over four years if the target is to be achieved. However, as long as companies continue to use the same practices that they have been employing for decades, this seems an unlikely goal (<http://www.consultancyafrica.com/death-in-the-name-of-profit-south-africas>).



4.2.1 Occupational Health and Safety Act 83 of 1993

In South Africa, the Occupational Health and Safety Act 83 of 1993 which replaced the Machinery and Occupational Safety Act 6 of 1983 is the current legislation governing health and safety in the workplace. The Act imposes a general duty for employers to provide a reasonably safe and healthy working environment, to provide protective equipment and such information, training and supervision as is necessary to ensure health and safety, and to report to an inspector any incident in which a person dies or is injured or when a dangerous situation arises (Grogan, 2008). Swanepoel *et al.* (2008) contend however that certain employers are, excluded from the ambit of the Occupational Health and Safety Act. These include parties covered by the Merchant

Shipping Act and people employed in mines, mining areas or any works as defined in the Mine Health and Safety Act 29 of 1996.

4.2.2 Mine Health and Safety Act of 1996

In South Africa, the Mine Health and Safety Act of 1996, the Mine Health Amendment Act of 1997 and the Mine And Petroleum Resources Development Act of 2002 constitute a relatively complete mine health and safety regulatory system (Li, 2008). The role of the Act is to provide for protection of the health and safety of employees and other persons at mines and, for that purpose, to promote a culture of health and safety. The Act seeks to provide for the enforcement of health and safety measures and to provide for appropriate systems of employee, employer and State participation in health and safety matters. The Act seeks to entrench the right to refuse to work in dangerous conditions, to give effect to the public international law obligations of the Republic relating to mining health and safety and to provide for matters connected therewith.

Since 1998, an amendment to the Mine and Health Act requires employers to issue each employees with a medical certificate on exit, stating whether the employee has an occupational disease or not (Nel *et al.* 2007). The Mine Health and Safety Inspectorate was established in terms of the Mine Health and Safety Act of 1996, and is responsible for safeguarding the health and safety of people working at mines or affected by mining activities (www.dmr.gov.za/MineSafety/Overview.html).

The activities of the inspectorate are geared to achieving the following strategic objectives: reduction of occupational injuries and ill-health; development and maintenance of an effective policy and legislative framework; improvement of information management; and supporting cross-cutting initiatives of government relating to economic empowerment, human resource development, employment equity, poverty alleviation and combating of HIV/Aids pandemic.

Most mines have, as a result of the requirements of Section 11 of the Mine Health and Safety Act (Act 29 of 1996), established risk management systems, which include elements such as hazard identification, risk quantification, training, audit, feedback and a management system. A formal ergonomics programme should ideally be attached to an integrated in existing risk management system (Schutte, 2005).

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4.2.2.1 Importance of the act

This legislation requires businesses not only to report and evaluate accidents, but also to actively promote health and disease prevention at the workplace (Stokols *et al.* 2001). The main reasons why the duty to carry out assessments is explicitly included in the Mine Health and Safety Act are:

- To ensure that the same systematic approach is adopted for all work involving health hazards (whether in progress or to be started): identifying precautions which are correctly matched to the risk; and

- To provide a basis for the effective and consistent communication of the information collected and the decisions reached to everyone who may need to know them at any time (Badenhorst, 2004).

In general, legislation does not suffice to address those problems as many organizations continue to experience problems in managing health and safety in the workplace. This is due to the “people” element that tends to engage in safe as well as unsafe behavior, the latter can cause accidents (Abdullah *et al.* 2009). Gerard & Brett, (2004) in their study focused on the promotion of industrial safety and health in most mining companies. Employees were encouraged to participate in the development of safety programs and accident prevention plans. There was also the facilitation of safety education and training for employees. Mine Safety Health regulations enforcement efforts can improve miner health and safety by encouraging mines to eliminate mine hazards prior to inspections, as a deterrent, and by forcing mines to rectify dangers found during inspections, to ensure abatement. The more violations of the Act are discovered and the greater penalty for violation health and safety standards the more these effects will be noticeable (Kniesner & Leeth, 2004).

4.2.3 The Compensation for Occupational Injuries and Diseases Act 130 of 1993 (COIDA)

This statute ensures that employees and for their dependants who have suffered injury, illness or death arising from the performance of work are compensated from a fund specially created for that purpose. The act excludes soldiers, policeman, domestic workers and contract workers. Compensation is payable only if the accident which caused the injury, illness or death

occurred within the scope of the employee's employment and was not predictable. No payments are made in respect of temporary disabilities of three days or less, or those resulting from willful misconduct by employees or for non physical damages like pain and suffering (Grogan 2008). The Constitutional Court in March 2011 ruled that, an employee (Thembekile Mankayi) at a mine owned by AngloGold Ashanti from 1979 to 1995 and contracted tuberculosis, could sue the company for damages if the employer had failed to provide a safe and healthy environment (Matomela, 2011).



4.3 The Regulating Mining Bodies

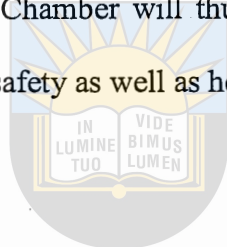
4.3.1 The Department Of Minerals and Energy of the Republic of South Africa

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The Department of Minerals and Energy is the component of the government that establishes and implements the government's mineral and energy policies (Kossouth, 2004). The Department Of Minerals and Energy and associated institutions are responsible for the administration of the mining laws and for promoting the development of the industry. The key performance areas are to adopt world-class mining environmental health and safety standards, increase percentage of mines with effective occupational health and safety, environmental management systems; percentage of mines with implementation plans and strategies to address specific occupational health and safety and environmental concerns and hot spots, and finally to measure enforcement activities, such as the number of audits, inspections and environmental management plans (Nel *et al.* 2007).

4.3.2 Chamber of Mines

The mining sectors leadership takes safety very seriously, and has launched various initiatives to ensure that their commitment is translated into action. The Chamber of Mines vision is of zero harm in the place of work. The leadership of the industry has developed a roadmap to put the vision into effect, and the Chamber of Mines is actively engaged in the implementation of the roadmap. One of the issues dealt with in the roadmap is compliance. The Chamber is of the view that the release of the Presidential Audit is an opportune time to focus on compliance in the mining industry. The Chamber will thus work with its members to ensure compliance with provisions that promote safety as well as health (Nel *et al.* 2007).



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4.3.3 National Occupational Safety Association of South Africa (NOSA) statistics

The National Occupational Safety Association of South Africa is a leading supplier of occupational risk management services and products; NOSA provides certification, consultation and training services that are tailor made for specific organization needs and risk profiles, and it concerns include areas such as occupational health and safety, hygiene, the environment, quality, behavior, HIV and AIDS, social responsibility and sustainability. NOSA has a five star system based on the Pareto's principle, participation and recognition. The primary objective of the Five Star System is to provide world class occupational safety, health and environmental risk. This system covers areas such as occupational hygiene, risk management, safety management and environmental risk management. Its criteria include hazard identification and risk assessment,

standards and procedures and development of compliance with procedures standards and national legislation compliance (Nel *et al.* 2007).

In addition to the above, the NOSA collects statistics on "disabling injuries" (accidents resulting in one shift or more off work) and hours of exposure from affiliated companies. These statistics are of limited value. No details are collected about the severity of injury, for example whether an accident resulted in one day off work or death, the cause of injury or the location of injury. Further, the NOSA data are limited to only 4 727 out of a total of 60 196 industrial enterprises. NOSA targets large companies for their schemes and claims that their affiliates have lower accident rates than the average. This is hardly surprising because it is a well established fact that larger companies have lower accident rates than smaller ones. NOSA keep their data confidential making it impossible to undertake any meaningful assessment of accident trends at the enterprises concerned or of the claims made by NOSA (Gerard & Brett, 2004).

4.4 Value of Regulation

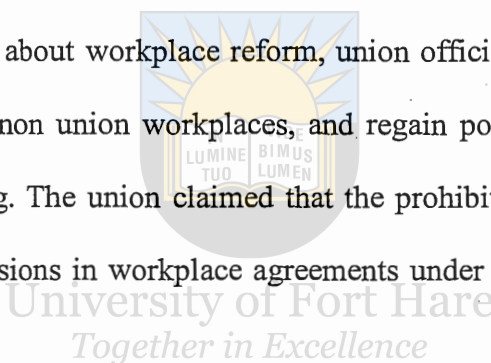
It is important that potential constraints to regulatory compliance be identified and removed to enhance the efficacy of occupational safety and health programs (Stokols *et al.* 2001). Greene's (2006) article focused on the negative publicity about safety features in America's mining industry in 2006. The Mine Safety and Health Administration together with several government officials pushed through a series of state legislative measures on mine safety and established the Mine Improvement and New Emergency Response Act of 2006 after the Sago incident as well as subsequent fatalities at other coal mines in Kentucky, West Virginia and Utah accounting for 21 fatalities. Such regulation is essential because it establishes uniformity in

the sector and the minimum standards that should be met in order for production to take place. The stage-specific approach assists in identifying individual and organisational readiness to change. Tailoring intervention accordingly should enhance the likelihood that acceptance and long-term success of improvements will be realised (Barrett *et al.* 2005). Granot (1998) states that the regulatory role of government in industrial safety is a relatively recent development coming fairly late in industrialisation. Some see the development of governmental regulation as reaction to catastrophe (Hood, 1994; Schon, 1973). Legislation is said to be inconsistent and spotty because it is usually enacted to plug a specific hole revealed by some tragedy. Government regulation contributes somewhat to the establishment of standards for such contingency planning, but much depends on the mature social responsibility of industry itself.

4.5 The Role of Trade Unions and their Representatives

It should be noted that the South African labor market is characterized by a tripartite relationship in which the state, employers and unions partake. A feature of British legislation on employee representation in health and safety is its restriction to recognized trade unions. New legislative provisions are under consultation and are likely to widen the existing Safety Representatives and Safety Committees Regulations. The approach of the proposed regulations raises a number of questions about the determinants of effectiveness of worker representation in health and safety. The significance of trade union support for representation in health and safety is shown to play an important role in determining the effectiveness of health and safety representatives, both through the role of trade unions within the workplace and through their ability to provide support for representation through training and information (Walters, 1996). Unions are there to ensure that the rights of their workers are not taken for granted. The mining

industry has a long history of industrial conflict and of acrimonious relations between companies and their associations on the one hand, and workers and their unions on the other. This history makes any co-operative approach to issues of workplace safety very difficult to achieve. While statutory provision for worker consultation and (where they exist) broader statutory rights for workers and/or their representatives to stop work or issue notices in particular circumstances are important, they can only ever provide a partial solution (Gunningham, 2006). The Issues paper (2006) for the Australian Chamber Of Commerce Industry said Australian trade union movement embarked on a public campaign against the March 2006 workplace relations reforms. The objective of that campaign was about workplace reform, union officials would get control over workplace bargaining, even in non union workplaces, and regain political power in a national government more to their liking. The union claimed that the prohibition of union occupational health and safety training provisions in workplace agreements under Work Choices would lead to falling standards.



4.6 Factors Influencing Occupational Health and Safety

Deaths between January and April 2011 in South Africa increased by 27% as compared with the same period in 2010 (Delonno, 2011). Delonno (2011) further went on to state that it was difficult to know whether it was managers or employees who failed to keep up safety standards. No law is likely to be effective in the absence of effective enforcement (Gunningham, 2006). Mining technology aimed at increasing productivity and safety has seen a rapid increase in adoption over the last few years and many of the large mining houses are showing an interest in the significant benefits of automation. A totally autonomous mine may be the end objective for some; however for the majority of operations there remains an opportunity to capitalise on

the ability of existing mining technologies that have been used extensively for over 10-years. The use of heavy technology and heavy machinery means that the employees need to know how to execute their duties effectively; this can be achieved through training. Given the historical background of South Africa it also essential to look at other factors influence health and safety regulations in the workplace (Jordaan & Hendricks, 2009).

4.6.1 Technology, Equipment, Knowledge and Know How

Employees in the mining industry tend to be less. Technology refers to products, processes, tools, methods and systems applied or employed in the creation of goods and services and comprise four components (Khalil, 2000). The introduction of technology among less literate workers in mining requires extra vigilance by management in familiarising employees with it. Equipment is the physical structure and logical layout of equipment used to perform a required task. Knowledge may refer to how to use equipment in performing a required task to knowledge of cause and effect relationships and the reasons for applying technology in a particular manner; and to acquired knowledge and technical skill in doing things well. The latter three components of technology can be described as the human factors of technology. Many human controlled processes or actions utilize some form of technology (Jordaan & Hendricks, 2009). Key here is the need to use neutral third parties (honest brokers). Technology suppliers obviously have vested commercial interests; while mining companies have employees whose future careers and indeed current jobs may be at stake, depending on the success of mechanization (Willis, 2004).

4.6.2 Mechanization and Mining

Mechanized mining can be experienced as a symphony by substituting the instruments for the different machines that each perform their own function and thus have different sounds. To produce a symphony is to have the ability to put together all the pieces. Today's managers have to apply this harmonic way of thinking to make the system of mechanized mining work (Strong *et al.* 2006). Continuous monitoring and quantification of the appropriate parameters allows a mine to optimize its mine process, to dynamically assess the safety and health risk to people and equipment and to quantify exposure to potential health hazards such as dust, gas or noise (Brink *et al.* 2008). The mining production cycle begins with the drilling, sampling and blasting of the raw product. An optimal fragmentation consistent with loading, hauling and processing equipment is sought (Jordaan & Hendricks, 2009). A mine, however, is quite different from a traditional factory in the way it is managed. While the preceding steps in the mining cycle are neatly characterised, they are typically undertaken with comparatively minimal monitoring and generally poor quality control. The mining workforce is also challenged in terms of skills and physical environment. South African firms are among the world leaders in mining explosives, drilling equipment and abrasives, metallurgical processes and plants, and delivering knowledge-based services to mines everywhere. It is also one of the few fast-moving technology spheres where a significant number of South African companies are at the frontier of innovation. South African firms are active in the specialised mining supply industry (<http://www.bullion.org.za/Publications/Other/segal.PDF>).

4.6.3 Importance of Training

Sheppard, (2001) says that when it comes to health and safety, what we see (or think we see) often influences what we do (or think we should do). People who have the necessary equipment, training, skills, knowledge, procedures and experience to perform tasks safely do not necessarily follow through on the job. Legislated change may only be very partially effective in influencing the culture of the organization itself, or of a particular work site (Gunningham, 2006). Considering the fact that the mining industry is machine or technology intensive there is need for organizations to put in place effective training programs from induction process to the introduction of new technology in a changing local context where the majority of workers were increasingly disenfranchised, unorganized, excluded from skilled work, and predominantly rural (Braun & Kisting, 2005). Employees contribute a different skill set than conventional mine management and technical personnel. The change management required to successfully introduce and engrain mining technology systems is often underestimated by mining companies and is not recognised as a critical success factor. Before any commitment to technology, a specification of all components of technology needs to be developed as foundational to a total systems approach: commissioning, training, operation, and maintenance. The next step will be to conduct a gap analysis on each of the components of technology throughout the life cycle. This process needs to be facilitated by an on mine champion and the sizes of the intangible (human element) gaps will determine the probability of the technology being applied successfully (Jordaan & Hendricks, 2009).

The tangible or equipment gaps can be easily bridged with capital and the only time constraint once the go ahead has been given will be the time to produce and deliver the

equipment to site. The intangible gaps will require capital to be bridged, depending on the state of current skills and learning curve, the aptitude and time required to master the newly demanded skills or to draw in such suitable skills (Mallett & Orr, 2008). Decision makers today have the option to choose either 'proven' technology with lower efficiency or to take the 'risk' of new technology with better economic prospects (Knecht & Patzelt, 2004). Occupational health and safety training is something that should apply universally in all workplaces (www.acci.asn.au). Safety training in mines is an international issue and the positive results obtained by using interactive simulations in the South African mining context indicate that such systems can be globally applied (Van Wyk, 2006). The high incidence of accidents and fatalities in the South African mining industry (Krige, 1995), in particular those associated with falls of ground in the gold and platinum mines, is often attributed to ineffective and/or inappropriate training methods and material (Plimmer, 1996).



Traditionally, research into reducing fall of ground accidents has concentrated on improved support units and systems and improved mining layout design. An additional approach being promoted in the Mine Health & Safety Act 29 of 1996, however, is to improve the level and effectiveness of training given to underground workers. This recently introduced legislation requires that all mine workers receive appropriate and effective training to enable them to operate safely in their given mining environment (Squelch, 2001). In the case of the mining industry, the low levels of education and literacy among mineworkers in South Africa are seen as a hindrance to effective safety training and as contributing to the poor safety record (Hilton-Barber, 1997). In addition, Schutte & Van Graan, (1996) state that 'conventional classroom training techniques achieve little success, especially where the trainer has to compete with

factors such as illiteracy and lack of employee enthusiasm to be trained'. A solution proposed by Schutte & Van Graan (1996) to address this problem is with the aid of various simulation techniques, to present the training in a 'fun-filled, exploratory and exciting manner' as quoted by Squelch, (2001).

Prior studies have documented the significance of human factors in many mining accidents. These studies have stimulated progress with the help of universities, mining companies, and providers of training and have resulted in interactive simulation training exercises on various mine safety health topics (Murphy 1997). Education and training will rapidly increase in World 2 (resources in balance) and World 3 (underdeveloped countries). They will invest heavily in funding their brightest to achieve education, training and expertise to champion future national development (Read, 2006).

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4.6.4 Value of Communication in Mining

Establishing reliable communication is a very difficult task in underground mining due to the extreme environmental conditions (Yarkan *et al.* 2009). People in the mining industry rely heavily on word of mouth to gauge the effectiveness or otherwise of equipment trials. The training of people in the application of new technology requires a professional approach. People must be educated in the concepts on which the new technology is based. Unanticipated consequences during the introduction of new technologies can lead to failure of the technology transfer process. Technology suppliers should under promise and over deliver (Pickering, 2004).

Reliable, mine wide communication is fundamental to productive and safe underground mining. Mining disasters rendering existing underground communications infrastructure inoperable have led to the development of a truly mine-wide communication system that does not rely on underground cabling. The system was originally developed to provide a fast and reliable method of informing underground miners of emergency situations (Woodhall, 2007). Until now, no single communication system exists which can solve all of the problems and difficulties encountered in underground mine communications (Yarkan *et al.* 2009). Still Productivity Enhancement Device is an extremely effective emergency communication system. The ability to transmit actual messages is vitally important in not only allowing a warning to be issued, but in providing specific information regarding the situation (such as where a fire is, which evacuation route to take, etc). Where extensive mine monitoring is in use the information processed on the surface can be quickly and efficiently relayed back underground to relevant personnel (e.g. fire or high water alarms, low airflow, transfer bins full, etc). Such communication is the basis of improved productivity. A Productivity Enhancement Device in a mine is not just used in emergencies. The ability to send messages to personnel wherever they are underground means it is often installed as a day-to-day management tool for general communications (Woodhall, 2007). However, combining research with previous experiences might help existing communication systems to improve, even if it will not completely solve all of the problems (Yarkan *et al.* 2009).

4.7 Role of Management

A common problem in the mining division of companies is a lack of aligned business and technology strategies. Mining divisions need clear mandates and objectives to guide them in the selection of the technologies required to achieve their objectives (Jordaan & Hendricks, 2009). A number of role players with distinct responsibilities have been identified as integral to successful implementation. Respected leaders in the mining industry should take a more active role as champions of technology. Another important factor is the need for a structured communications strategy in technology transfer. Case studies support the view that, although technical problems are often blamed for technology transfer failure, they can be overcome relatively easily. However, if implementation is to be successful, the primary focus must be on the human and organizational factors (Willis *et al.* 2004).



Many managers are still in specific departments with their own departmental goals and objectives, with little understanding of the risk that may apply to their day-to-day business, particularly from outside. The primary focus of management today is safety, or preventing negative, generally irreversible, events of acute duration. The outcomes of safety-related events are usually visible and can evoke strong emotions if the results are severe. Experts now see that occupational illness and disease also result in significant emotional and financial toll to workers, their families and communities, and their employers. Effective health and safety management must include acknowledging the importance of occupational health hazards and the proportionate application of resources to address those issues. Improvement in workplace conditions and decrease or elimination of illness and disability are due to actions within the workplace and result from the implementation of risk prevention and control measures (Badenhorst, 2004).

Technology implementation problems are often attributable to ineffective information exchange between suppliers and users. Improved management of the information exchange is required to increase the success rate of technology implementation. It is also important to realize that no single best recipe exists in terms of the media that are utilized. Different types of technology and different circumstances might require different media. It is also important to make use of a variety of communication media to bring the message across. Whatever the mechanisms used to disseminate information, reduce the information overload. Focus on the end user who is generally not interested in how a solution was developed (Willis *et al.* 2004).

Successful mine site-based champions of technology typically have the following characteristics:

They

- ✓ Are strategically aligned and believe that the vision will be realised;
- ✓ Are in substantial decision making positions with the required amount of authority;
- ✓ Are non-transitory individuals who have worked at the specific mine-site for an extend period and will remain in place long enough to see to (i.e. champion) the realisation of the vision;
- ✓ Passionately believe in the ability of the technology to add value and/or improve safety;
- ✓ Have a can-do attitude;
- ✓ Have clear reasons and objectives for applying this technology and will challenge the users of the technology to validate / demonstrate (quantify) the benefits realised (Jordaan & Hendricks 2009).

However, success may only be visible months or years later and may require interventions that have to be maintained over prolonged periods. This demands continuous, co-ordinated effort to ensure sustainability of diverse occupational health programmes and relevant management systems (Badenhorst, 2004). Hsu, Lee, Wu, & Takano (2007) study of organizational factors relative to safety in Taiwan and Japan reported that the influence of organizational factors in both countries were different due to dissimilar culture. For example, they discovered that the Taiwanese leadership style was “Top-Down Directive” where top management communicated safety policies and involved in safety activities while Japanese safety leadership was more focused on “Bottom-Up Participative” with top management promoting employee participation in any safety activities. Besides leadership style, Marsh *et al.* (1995) noted that management commitment plays a vital role in all aspects of safety intervention. Management commitment to safety indicates the extent to which the organization’s top management demonstrates positive and supportive safety attitudes towards their employees’ safety (Hsu *et al.* 2007). Perception surveys provide insight not only into what is happening in a health and safety management system, but also into why it is happening. If managers don’t know why things are happening or not happening, how can they know what to keep and what to change (Sheppard, 2001)?

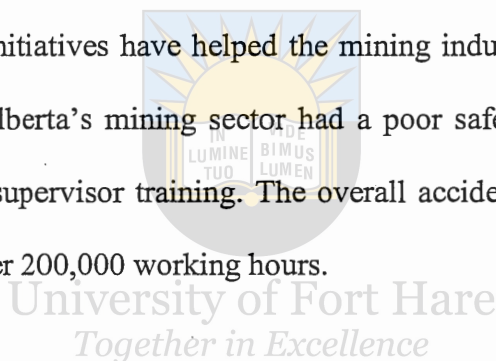
Yule, Flin & Murdy (2007) noted that employee perception of management’s commitment to safety resulted in accident reduction. The Occupational Safety and Health Council of Hong Kong conducted a study in the construction industry in 2001 and found that senior management had a positive attitude towards safety culture. Supervisors showed less positive attitudes while front line workers demonstrated the least positive attitude towards safety culture. Their study proposed the cultivation of a strong safety culture in the construction

industry, this industry being one of the most hazardous in Hong Kong. Supervisors also play an important role in ensuring safety in the workplace, as employees conform to safety rules and procedures when they perceive that the action of their supervisor shows concern for safety and fair treatment. By contrast they noted from a previous survey that supervisors who only want more work from their workers have a negative influence on the safety climate and supervisors who delegated job task motivated employees to acknowledge their safety accountability.

Management of core risks associated with particular mining systems, together with understanding critical technical procedures and technology risks is essential to achieving safety in mines. Key ingredients in management systems are good communications, education and training (Hebblewhite, 2009). Gunningham (2006) contends that risk assessment, hazard management plans and occupational health and safety management systems, which Head Office may have spent considerable energy developing and introducing, may have relatively little impact at site level. The challenge of identifying the best strategies through which a firm which is committed to achieving given occupational health and safety outcomes may best succeed, and of aligning individual manager and site goals with those of the corporation itself, is still not met by even some of the largest and most sophisticated organizations.

Corbett (2004) notes that health and safety concerns tend to focus on either the worker or the employer. The often forgotten person in the middle, the supervisor also plays a critical role in keeping the workplace safe. The supervisor is the on-the-job eyes and ears of the company. The supervisor is the employer's representative, as defined in The Occupational Health and Safety Act. So whatever is required of the employer is required of the supervisor. He or she makes sure

all legislation and regulations are adhered to, the company's health and safety policies and procedures are properly carried out and workers perform their jobs safely. The supervisor is also a health and safety go between, explaining new management policies to workers and passing employee concerns and suggestions up to management. Some supervisors are just not aware of their responsibilities in ensuring the health and safety of employees. There are still companies that are not familiar with what those responsibilities are, especially under updated regulations. These responsibilities include informing workers of their legal health and safety duties, dealing properly with hazardous activities, and appropriately handling and reporting (in writing) safety problems and incidents. Such initiatives have helped the mining industry significantly improve its safety record. In Canada, Alberta's mining sector had a poor safety record. Now it is best sectors in the province due to supervisor training. The overall accident frequency rate there in surface mines is less than one per 200,000 working hours.



4.8. Methods available for management

4.8.1. Occupational health risk assessment

An occupational health risk assessment is a systematic procedure to identify potential health hazards, evaluate the extent of exposure, subjectively and/or objectively, and to establish the need for, and the effectiveness of control measures (Schoeman, 1994). Furthermore, occupational health risk assessment is also intended to facilitate the drafting of occupational hygiene monitoring programmes, medical surveillance programmes (Goede, 1998; Van Der Merwe, 1998) and occupational health education and awareness programmes (Schoeman, 2001).

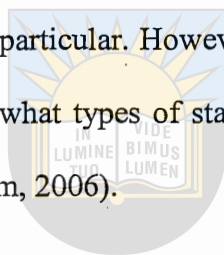
The purpose of an assessment is to enable a valid decision to be made about measures necessary to control health hazards arising from any workplace and/ or activity.

4.8.2 Risk management

Many workplaces have hazards. Hazards put employees at risk of injury or harm to health. Therefore health and safety issues need to be managed in a systematic manner (Fiedler, 2004). Risk management demands that, the employer looks at the risks that arise in the workplace and puts sensible health and safety measures in place to control them (Mearns & Hope, 2005). The purpose of conducting a risk assessment is to identify risks, to distinguish acceptable from unacceptable risks, and to develop the data required for an appropriate risk management plan (Akciil, 2006). The Northcott Society health policy contends that risk management plays a vital role in creating safer and healthier workplaces and assisting employers to meet their legislative responsibilities under the Occupational Health and Safety Act 2000 (hr.northcott.com.au/riskmanagement). It leads to appropriate action to reduce or even eliminate such risks. Risk management is the critical success factor in occupational health and safety. Risk management is an integral part of ensuring occupational health and safety (Fiedler, 2004). It is of the most importance to understand precisely what is meant by the terms hazard and risk. Hazard is the potential of a substance, situation or process to cause harm. Risk is the likelihood that harm will be caused. In order to understand the risk in a certain situation, it is necessary to understand the hazard and to be able to estimate how frequently actual harm will occur (Badenhorst, 2004).

Risk Management also enables the employer to demonstrate readily, that all the factors pertinent to the activities have been considered, and that any informed and valid judgment has

been reached about the risk posed by the hazards. Risk assessment should identify the hazards and identify controls necessary to remove the risk or reduce it to an 'acceptable' level. This should be a proactive approach. The alternative is a reactive approach whereby incidents of ill health and accidents are only investigated after they have happened. While this too should identify all the factors which contributed to loss of control, it can never undo the harm already caused (Badenhorst, 2004). There is broad agreement that mandatory standards, or at least some combination of imposed standards and self-regulation, will be necessary to ensure that employers and their employees take risk management decisions that are in the best interests of the community in general, and of workers in particular. However, what is less clear is the form that regulation should take and in particular, what types of standards should most appropriately be applied to ensure mine safety (Gunningham, 2006).



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4.8.3 Human Resource Management Approach

Organisations need to attract and retain effective employees for the good of the organisation (Cascio, 2006). Fontanna (2002) is of the opinion that the role of human resource management is to educate employees and provide them with the tools, data, incentives they need to make good decisions. Makoane (2002) contends that linking human resource strategy and business strategy has become a new major preoccupation for human resource practitioners. To keep pace with the change in technology, organizations must increasingly devote resources to training and retraining of employees to keep on using new technology. Human resource practitioners can lead the way making managers aware of the legal regulating environment that exists in the country of operation. Stevens (2004) adds that in order to keep workers safe human resources should be on the lookout for the most effective ways to achieve this goal. Technology

is relatively easy to develop but it is in the area of human resources that actual work needs to be done in order to enable technology to be successfully implemented (Croll, 2004).

All supervisors should be aware of their responsibilities as required by legislation and regulations. Since leadership and communication skills don't always come naturally, supervisors should receive sufficient on-the-job external health and safety training (Corbett, 2004). With effective human resource adequate resources may be given supervisors so that they can function well.



4.9 Benefits of risk assessment

Risk assessment provides insight about the risks to be prioritised to mitigate their harmful potential (Fiedler, 2004). Successful management of risks associated with mining consequently requires a systematic approach (Gunningham, 2006). The main benefit of a risk assessment should be a reduction in the risk, and therefore greater protection of the work force. The main consequences of inadequately controlled risk are

- Trauma, disease and death of workers

4.9.1 Legal

Risk assessment is a statutory requirement under the Mine Health and Safety Act. A breach of statutory duty may result in the mine being involved in criminal proceedings. Penalties may include imprisonment or unlimited fines. Loss of production may result from the issue of prohibition or improvement notices. The image of the mine may also be damaged as a result of adverse publicity.

4.9.2 Economic

Accidents and ill health cost money, both direct (insured) costs and indirect costs. The latter include investigation time, lost time of employees, payments to injured persons, medical costs. There is also a tendency of insurance costs to increase, or indeed for insurance to be refused, in the absence of adequate risk assessments.

4.9.3 Moral

Risk assessment occasions a greater awareness of the quality of life and the environment, and there is a growing belief that it is morally unacceptable to put the health and safety of others at risk.



4.10 Role of the State

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The state must support the enforcement capability of the regulatory agency, with a proper legal framework, enforce compliance with the safety standards, deter or redress safety violations, and if need be, prosecute repeated safety violations (Saleh & Cummings, 2011). Prescriptive law may lead to apathy on the part of both workers and management and a reliance upon 'going by the book' so as to encourage a minimum compliance mentality which militates against the development of a culture in which safety is everybody's responsibility (Gunningham, 2006). Through the University of the Witwatersrand the DMR is developing modules for the training of inspectors. There is also a group of students who have, for the past two years, been receiving training at the Gold Fields Academy exposing them to the actual work environment (www.miningweekly.com/south-africa-mine-safety-regulation). Consulting firm Deloitte said that South African mining companies were under increased pressure to operate safely and ensure

a zero-harm environment. "Mining companies really need to understand and establish the root causes of accidents to achieve safety targets. When an accident has occurred, it needs to be established whether this was due to machinery not being serviced often enough, worker fatigue, insufficient or inadequate training or lack of experience in the team. "Actuarial and analytical expertise can enable companies to understand the drivers of mine health and safety concerns and to project the expected future trends in these drivers," concluded Deloitte director Ashleigh Theophanides ([http://www.miningweekly.com/article /south-africas-mining-fatalities](http://www.miningweekly.com/article/south-africas-mining-fatalities)). In 1999 Queensland (Australia) engaged in substantial regulatory reform such that the gap between mine specific and mainstream Occupational Health and Safety legislation was substantially narrowed. Although these reforms did not abolish mine-specific legislation, the new approach embraced a risk based strategy coupled with a variety of process and systems based standards, consistent with those adopted in mainstream industry during the 1990s (Gunningham, 2006). Delonno, (2011) quoted mining law expert Willem Le Roux who said at a mine and safety seminar said that a zero fatality rate in the mining sector was unrealistic. So the state should enact legislation that minimizes the risk of hazards and ensure that it is complied with.

4.11 Safety versus Occupational Health

In many industries, the term 'safety' implies an organisational function that may include safety and occupational health and/or occupational hygiene. The primary focus of management today is on safety, or the prevention of negative, generally irreversible, events of acute duration. The outcomes of safety-related events are usually visible and can evoke strong emotions if the results are severe.

Occupational illnesses and diseases tend to be chronic and are generally characterized by temporary or permanent physical dysfunction. With the exception of some symptoms, they are not generally visible. Therefore, safety leads to override health in many companies because occupational ailments take years to develop and management is less aware of physical trauma, if they witness anything at all. This long-held bias is slowly disappearing. Experts now see that occupational illness and disease do result in significant emotional and financial toll to workers, their families and communities, and their employers. Effective health and safety management must include acknowledging the importance of occupational health hazards and requires a proportionate application of resources to address those issues (Badenhorst, 2007).

If 100 health and safety professionals are asked what they understand and believe to be the core elements of effective health and safety management, 100 different answers may well be given. The question of what represents the most effective method is a subject of ongoing debate because the fundamental nature of injuries and illness in the mining industry involves the convergence of many factors including:

- Geology
- Extractive and processing technologies
- Individual and organizational characteristics and behaviour
- Micro- and macroeconomics.

The fact that loss of human continues in the mining industry also indicates that no single correct health and safety method has been developed and that no absolute consensus has been reached

about it. However, there are obvious predominate patterns in the types of activities conducted in almost all mines to safeguard employees and those who support them, such as contractors and vendors (Badenhorst, 2004).

4.12 Benefits of Training Personnel in Hazard Recognition, Control and Work Practices

For other institutions and community groups, improved education and technology exposure has led to changing values, particularly among different generational cohorts (Twenge, 2010). The high incidence of accidents and fatalities in the South African mining industry, in particular those associated with falls of ground, is often attributed to ineffective and/or inappropriate training methods and material. Recently introduced mine health and safety legislation in South Africa also requires that all mine workers receive appropriate and effective training to enable them to operate safely in their given mining environment. There can, therefore, be no doubt that methods to provide effective training, in particular safety related training, are urgently required in the South African mining industry (Squelch, 2001).

The education (general knowledge and information) and training (specific instruction) of new employees, and managers, should include:

- Health and safety responsibilities
- Standard work practices (code of safe practice plus job safety analysis)
- Rules and procedures
- Specialized training and periodic refresher training to renew skills and knowledge

This ensures that employees recognize the health and safety hazards to which they may be exposed and understand the processes and systems that are in place to prevent injury or ill health. Cheyne, Oliver, Tomas & Cox, (2002) conducted a study on employee attitudes towards safety in the manufacturing sector in United Kingdom. The study identified safety standards and goals, and safety management, which includes personal involvement, communication, workplace hazards and physical work environment as factors that enhance safety activities in an organization. The study found a good physical working environment and employee involvement to be key factors that contribute to safety activities in organizations. Safety training and safety policy are also essential determinants of safety performance. Safety training is defined as knowledge of safety given to employees in order for them to work safely and with no danger to their wellbeing (Law, Chan & Pun, 2006). Lin & Mills (2001) found that clear policy statements and safety training played an important role in reducing accident rates. Earlier studies discovered the link between safety training and increased safety performance (Huang *et al.* 2006).

Consequently, effective training helps workers to have a sense of belonging and to be more accountable for safety in their workplace. In addition, company objectives and communication of the objectives to all workers is a crucial aspect of effective health and safety management as lack of communication may limit employee involvement (Vassie & Lucas, 2001). Even previous research indicated that high rates of injury and accidents are due to unsatisfactory or non-existent health and safety systems (Lin & Mills, 2001). Vassie & Lucas's (2001) survey of health and safety management in the manufacturing sectors indicated that empowered workers who play an active health and safety role could result in health and safety performance improvements even where the empowerment was limited. Although employee

participation and involvement are crucial, accountability and responsibility in safety and health must be shown by senior management according to the Occupational Health and Safety Act.

The sharing of values, empowerment, responsibility, accountability, attitude, co-operation, and reinforcement among all levels of an organization from the Chief Executive Officer to the most junior position democratizes health and safety. This establishes that the necessary culture and understanding of expectations and actions necessary for effective health and safety management. However, it would be grossly simplistic to suggest that these three elements in and of themselves offer sufficient guidance for health and safety management. Research and anecdotal experience both suggest that effective health and safety management involves all personnel, regardless of position or experience. It must be recognized that some activities have more impact than others (Badenhorst, 2004).

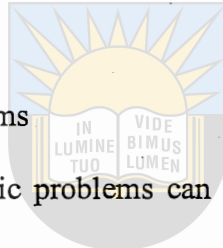
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4.13 Ergonomics

Ergonomic hazards are common in mining as miners generally handle heavy equipment and do heavy work, often in cramped conditions. In some instances ergonomic hazards, which are associated with poor engineering design, contribute to increased safety risks. When mining started on an industrial scale in the 1880s, miners faced very high levels of risk to both safety and health. Over the years the safety performance of mines has improved in South Africa, but not the same rate as at in other major mining countries such as Australia, Canada and the United States of America (Hermanus, 2007). Ergonomics is a science concerned with the 'fit' between people and their work. It puts people first, taking account of their capabilities and limitations. Ergonomics aims to make sure that task, equipment, information and the environment suit each

worker (Mearns & Hope 2005). Ergonomics promotes human reliability and improved health and safety. It ensures that equipment, tasks and the physical work environment are designed to take account of the capabilities and limitations of people (Thorley & Burger, 2004).

Ergonomics can play a key part in efforts to identify the main causes of accidents, injuries, low productivity and low work quality (Shahnavaz, 2001). Applying ergonomics to the workplace has the following benefits: it reduces the potential for accidents; reduces the potential for injury and ill health; and improves performance and productivity.



Identification of ergonomic problems

There are many ways in which ergonomic problems can be identified. These can range from general observations and checklists to quantitative risk assessment tools.

Ideally, several approaches should be used:

- ✓ Talking to employees and seeking their views. Employees have important knowledge of the work they do, any problems they have, and their impact on health, safety, and performance;
- ✓ Assessing the work system by asking questions such as: Is the person in a comfortable position? Does the person experience discomfort, including aches, pain, fatigue, or Stress? Is the equipment appropriate, easy to use and well maintained? -Is the person satisfied with their working arrangements? -Are there frequent errors? -Are there signs of poor or inadequate equipment design, such as plasters on workers' fingers or 'home-made' protective pads made of tissue or foam?

- ✓ Examining the circumstances surrounding frequent errors and incidents where mistakes have occurred and people have been injured. Use accident reports to identify details of incidents and their possible causes;
- ✓ Recording and looking at sickness absences and staff turnover levels. (Mearns & Hope 2005).

Employers throughout the world provide a vast amount of safety information to workers both to encourage safe behavior and to discourage unsafe behavior. These sources of safety information include, among others, relations, codes and standards, industry practices, training courses, MSDSs, written procedures, safety signs, product labels, and instruction manuals. Occupational safety information (sign, label, and symbol) contains specific information that is of interest at various activities or handling stages. It is the users' responsibility to read and understand the label when buying, working, storing and handling as well as disposing (Lekei *et al.* 2004).

The most general approach to ergonomics is to consider a person interacting with technology. In the past, the focus has always been on the performance, productivity, efficiency, effectiveness and quality of the machine itself while it is forgotten that improvement in health, safety, comfort, satisfaction and convenience of the operator leads to less absenteeism and labour turnover, more involvement and commitment and increased motivation and overall well-being, and thus profitability for the organization. Complaints, accidents, fatalities, occupational diseases, drops in both productivity and quality, increased running costs add high down time are just some of the

consequences of the poor design of any product that does not take man and his role as a factor of reliability and safety into account(Thorley & Burger, 2004).

4.14 Badenhorst Occupational Health Risk Assessment Model

Badenhorst (2004) proposed a health risk assessment model. The objective of the model was to provide guidance for various required inputs into the occupational health risk assessment process, the principles of the occupational health risk assessment process, and the various outputs from the assessment process so that those developing their own approaches are aware of the key ingredients and some potential pitfalls. What matters most is that the model must assist the mining industry in producing suitable and sufficient occupational health risk assessment through a simplified, but scientifically sound, systematic process.

The model consists of 9 phases which are

- Phase 1: Planning the occupational health risk assessment, Consulting with the Health and Safety Committee;
- Phase 2: Anticipation, nomination and selection of an assessment team;
- Phase 3: Recognition, Research, Walk-through survey;
- Phase 4: Hazard identification;
- Phase 5: Risk evaluation, Exposure assessment, Dose-response assessment, existing controls vs required controls, recommended controls need to be recorded as well;
- Phase 6: Risk characterization and rating;
- Phase 7: Reporting and recording;

- Phase 8: Risk communication;
- Phase 9: Review.

4.15 Conclusion

The purpose of this chapter was to highlight the relevant bodies that monitor the mining sector to ensure that this sector values health and safety in the place of work. In South Africa there is a tripartite relationship unions are always at loggerheads with employers when it comes to health and safety regulation. In the light of this research, with such sound health and safety regulation why is it that the mining environment is still considered to be one of the most hazardous in South Africa. Are the regulating bodies doing enough to ensure the full implementation or are the regulations ineffective? The chapter also highlighted the methods available to organisations to ensure full benefit from health and safety regulations. The next chapter will consider the relevance of the social exchange theory.

CHAPTER 5

THEORETICAL PERSPECTIVE

5.1 Introduction

The previous chapter focused on the relevant bodies that monitor the mining sector to ensure that this sector values health and safety in the place of work, and on measures that can be put in place to improve health and safety. The purpose of this chapter is to show how social exchange theory can be used to explain the phenomenon under investigation. Hundreds of studies document the direct and indirect benefits of healthy working environments for individuals and organisations. We know healthy jobs and workplaces contribute to an individual's physical, psychological and social well being. These benefits ripple across the entire organisation through higher job satisfaction, lower absenteeism and turnover, improved job performance, lower accident rates, and reduced health benefits and worker compensation costs (Lowe, 2004).

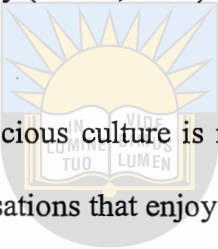
5.2 Social Exchange Theory Defined

Searle (1990) says that social exchange theory evolved from Thorndike's (1932, 1935) work on the development of reinforcement theory and Mill's (1923) marginal utility theory. Modern influences have filtered through from the work of sociologists such as Homans (1950, 1961), Blau (1964), and Emerson (1972).

Social exchange theory is comprised of five central elements:

1. Behaviour is predicated upon the notion of rationality.

That is, the more a behaviour results in a reward, the more individuals will behave that way. When employees are rewarded for safety behaviour there are more likely to contribute to a safe working environment. However, the more an individual receives a reward, the less valued it becomes, and the individual seeks alternative rewards through other behaviours or from other sources. In order to keep the employees motivated management should keep on introducing more efficient methods of getting jobs done safely (Searle, 1990).



Achieving a proactive, safety conscious culture is not easy, nor is it linked to any one particular management system. But organisations that enjoy low accident rates share a systematic approach to identification and elimination or reduction of risk. Assessment is of an everyday operation so that decisions are made constantly with a view to minimising risk in all activities (Banfield & Kay, 2008).

2. Relationship is based on reciprocation.

Each individual in the relationship will provide benefits to others so long as the exchange is equitable and the units of exchange are valued by the respective parties. An exchange between two individuals must be seen as fair by both for the relation to continue, or at least to continue as strongly. This shows that it is not only important to respond fairly, but also with something (not necessarily material) deemed to be important by the other person. If employers provide the available resources for implementation and show the benefits of health and safety regulations, then employees will comply for they see how they benefit from a safe working environment.

3. Social exchange is based on a justice principle.

Each exchange should be guided by the norm of fairness. That is, the exchange must be seen as fair when compared to the wide context or to third and fourth parties. This notion of distributive justice goes beyond the equity between the two principals' contribution. It involves each person comparing his reward with that of others for similar contribution.

4. Individuals will seek to maximize their gains and minimize their costs in the exchange relation.

It is important to understand that the notion of costs does not relate exclusively to financial issues; rather, costs can be incurred in form of time and energy invested in a relationship.

5. Participate in a relationship from a sense of mutual benefit rather than coercion.

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Coercion should be minimized. Using quantitative techniques requires multivariate analysis to accommodate the various, but inter-related, effects of the variables on the decision to cease or continue participation. Instrumentation in quantitative research would require the development of a taxonomy of needs (or the use of existing instruments), a scale to measure their importance and rank, measures of source of motivation, perception of relative benefits vis-a-vis the costs of participating, and a measure of satisfaction with the programme (integrating the concepts of reciprocity and distributive justice). The development of indicators for each of these variables, coupled with information on the objectives set out in the publicity advancing organized programmes, would make it possible to assess programme effectiveness and assist sponsors in recognizing the diversity of participants they may attract with one type of

programme. Moreover, using the social exchange model may increase the sensitivity of programme sponsors to the demands of the marketplace and, therefore, improve their services.

Social exchange theory, according to Miller, (2005) is a psychological and social perspective that explains social change and stability as a process of negotiated exchanges between parties. This theory posits that all human relationships are formed by the use of a subjective cost-benefit analysis and comparison of the alternatives. For example, when a person perceives the costs of a relationship as outweighing the perceived benefits, then the theory predicts that the person will choose to leave the relationship. The significance of this theory on the impact of employee training and development on service delivery is highlighted by Settoo *et al.* (1996); Cropazano & Mitchell, 2005 as quoted in Nel *et al.* (2008) who contend that when organizations train and develop their employees they invest in their employees and in return employees tend to reciprocate in positive ways. Kuvaas & Dysvik (2009) state that when organizations offer organisational inducements in the form of developmental opportunities, employees become socially motivated, that is, they desire to expend effort to benefit the organisation.

Research on exchange relationships within work organizations generally focuses on the concept of reciprocity (Cole, Schaninger, & Harris 2002). From the perspective of general social exchange theory (Blau, 1964), this means that an individual who provides a service for another does so with the expectation that there will be some future positive return for them based on this action. Extending this reasoning to workplace safety, when managers and supervisors demonstrate their commitment to and support of safety, employees should reciprocate by expending greater effort to follow safe work practices and other safety-related recommendations.

Inherent here is the idea that management actions in support of safety help to create a positive psychological environment that raises safety expectations and motivates good safety behavior (Neal & Griffin, 2004). Under such circumstances, this behavior may extend beyond mere compliance to include safety citizenship behavior; that is, doing more than what is simply required by safety rules and regulations (DeJoy *et al.* 2010).

5.2.1 Justification of theory

Employees have expectations of organisations as the relationship is one of mutual obligation (Ladd *et al.* 2010). People, however, play a key role in causing disasters, must cope with them when they occur, and bear the consequences of their aftermath. At every stage of its occurrence, industrial disaster is truly about people and their behavior (Granot, 1998). Employees measure corporate commitment to health and safety by what management does. They look at what management pays attention to, what management condones or ignores and what management measures: productivity, quality, service, safety and so on. Perception is reality, and what managers do shapes what employees see (Sheppard 2001). Within occupational settings, behaviour and actions of managers, supervisors and workers are influenced by underlying knowledge, attitudes and beliefs. These traits have a significant bearing on what ergonomists and health and safety professionals can achieve within organisations when providing assistance with problems (Barrett *et al.* 2005). Individuals need to take responsibility for reducing their health risks and employers support this through a range of health promotion programs. However, the biggest sustainable gains in employee health and productivity result from changing the work environment (Lowe, 2004). Evaluation of program impact is needed to show the worth of a program. The educational lessons alone produced a significant increase in knowledge and hand washing after using the restroom. With supervisor post lesson enforcement, hand washing before

work and after breaks also increased significantly. No effect of the monetary incentive was observed. Thus, training must be followed by supervisory personnel enforcement of behavioral rules. Management support of the supervisory role will increase the success in any health and safety program within the industry (Nieto-Montenegro *et al.* 2008).

Occupational Health and Safety in South Africa is not driven by morality, humanitarian considerations or ethics, but rather by legislation. Although the mining and industrial sectors date back more than a century, it is obvious that every single milestone with regard to the control of asbestos coincides with the promulgation of new acts or regulations (www.nedlac.org.za). However, in a report presented to the Parliamentary Portfolio Committee, researchers suggested poor compliance with legislation in South Africa and stated that self-regulation is not enough to protect workers. There are too few inspectors to police regulations and they are poorly trained. A health and safety management system is only as good as employees perceive it to be. If employees believe that management values production over safety, some of the choices they make on the job site will lead to incidents. It is the culture that dictates how employees will conduct their work when the boss is not around. Culture includes things like shared beliefs, values, norms, attitudes, trust, credibility, commitment, leadership, rewards. Barrett *et al.* (2005) quote Winum *et al.* (1997) to say strategies to implement organisational change are often rejected because principles and knowledge about the psychology of change are violated or ignored. More specifically, Armenakis *et al.* (1993) suggested that the effectiveness with which interventions are implemented depends upon readiness to change. This refers to the perceived need for change amongst stakeholders (i.e. beliefs, attitudes and intentions related to the requirement for change) and an organisation's ability to implement change successfully.

In terms of perception of the need for change within occupational settings, it has been argued that behaviour at both individual and organisational levels is influenced by underlying attitudes and beliefs (Bentley & Haslam, 1998). In order to target intervention accurately and appropriately within organisations, it is important to recognise the distinctions between different roles and levels as well as the paths of influence between them (Barrett *et al.* 2005). A change in culture in this case from the way we do things now to the way we want to do things in the future does not happen overnight. In coal it has taken a long time to get the levels of productivity required and with these productivity outputs has come tremendous improvement in safety (Croll, 2004).



5.3 Theory in Mining Setting

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Ladd *et al.* (2010) say that in applying social exchange theory to the workplace, an organisation that acts positively towards employees creates reciprocity causing employees to respond in positive ways that are beneficial to the organisation. Given that employees, especially in a booming economy, have more power, options and discretion over whether they stay with an organisation, it seems likely that employees, who feel that the organisation has acted positively towards them, are more likely to be committed and remain with the organisation (Van Knippenberg & Sleebos 2006). Conversely, if the organisation has not acted positively towards an employee, the employee is less likely to want to remain (Chiu *et al.* 2005; Maertz, *et al.* 2007). In terms of mining mine supervisors were to post lesson enforcement personnel enforcement of behavioral rules it would make it easier to train educate employees on health and safety regulation. Hoemke (2008) discussed a holistic approach enhancing industrial health and

safety citing strategies for employee wellness and risk prevention through incentives. A rewards program was used to recognize employee achievement and encourage employees to report incidents. The health and safety of employees or the public at large is not governed by one single statute, but rather by a number of acts, regulations, ordinances and by laws.

It is unknown if either of the two dominant regulatory approaches (prescriptive and duties) commonly employed in the mining industry to oversee occupational health and safety is superior in terms of reducing workplace injuries. In an effort to answer this question, a study by Poplin *et al.* (2008) analyzed annual lost-time injury rates for bituminous coal mines and Queensland and New South Wales, Australia from 1996 to 2003. Using the available data sources, changes in the occurrences of accidents and injuries were compared between each of these regions. The relationship between secular trends in injury rates and changes in the Australian regulatory structure from compliance-based to a risk-based approach was examined to see whether implementation of risk-based regulatory systems may be associated with substantive improvement in employee safety. Generalized estimating equations were constructed to analyze rates of change in incident rate ratios of lost-time injury among coal mines. From 1996 to 2003, lost-time injuries per 100,000 miners declined 20% in the United States of America as compared with 78% and 52% in Queensland and New South Wales, and the adjusted incident rate ratios for each region decreased by 11%, 72% and 44%, respectively. The application of risk-based health and safety regulations in Australia provides one explanation for the differential decline in lost-time injury among Australian states as compared to the United States.

Miller & Haslam (2009) wanted to better understand the information that is used in good business cases for employee health activities. They carried out interviews with 18 occupational

health and safety professionals at major organisations in the United Kingdom to explore attitudes, motivations, behaviours and information needs about employee health investment. They found out that the occupational health and safety professionals interviewed for this study described how employee health issues are discussed in their organisations. Ethical arguments about it being the 'right thing to do' are common and are believed to have impact. Unsurprisingly legal compliance is stated to be the driver of most employee health activity. Higher-level activities and resource do require a good business case. Data on cost of illness (mostly expressed via sickness absence), direct health expenditure per employee and insurance premiums are also used. These data are mostly captured by existing sources and procedural systems, although sickness absence data especially is often thought to be unreliable. Data on staff retention and productivity were considered relevant but not currently used or analysed by this study. There was support for the notion that more robust empirical good business cases may help overcome some of the barriers that were identified, for example where costs are more quantifiable than benefits. They concluded that there is scope to make significant improvements to the business case for employee health investments in United Kingdom organisations through better measurement of impact on productivity and reputation risk and greater business-aligned communication by health professionals. More empirical good business cases that meet the needs of decision-makers are more likely to attract investment into employee health activities. Implementing social organisational support will help define the more employee friendly workplaces and aid attraction and retention to assist organisations become employers of choice (Ladd *et al.* 2010).

Coleman & Kerkerling (2007) conducted a study in which the first objective was to examine the distributions and summary statistics of all injuries reported to the Mine Safety and

Health Administration from 1983 through 2004. Over the period studied (1983–2004), there were 31,515,368 lost workdays associated with mining injuries, for an equivalent of 5,700 person-years lost annually. Their results showed the probability of an injury having 10 or more lost workdays was 0.52 for coal mine cases versus 0.35 for metal/nonmetal mine cases. The second objective addressed the problem of comparing safety program performance in mines for situations where denominator data were lacking. By examining the consequences of injuries, comparisons were made between disparate operations without the need for denominators. Total risk in the form of lost workday sums can help to distinguish between lower- and higher-risk operations or time periods. In addition, a comparison of injuries involving continuous mining machines over 2001–2002 versus 2003–2004 showed that the ratio of average losses in the later period to those in the earlier period was approximately 1.08, suggesting increasing risks for such operations. Zoller's (2003) case study through interviews at an automobile manufacturing plant, this essay examines employee attitudes to health hazards and to the discursive and regulatory mechanisms that exclude employee experiences from official reports of workplace injury and illness. The article tries to redress the lack of scholarly attention in the occupational health and safety literature to the role of discourse in defining and negotiating risk and in constructing norms about reporting health and safety issues among employees. The findings showed how employees themselves may participate in the construction of shared identity norms that act disciplinarily to shift responsibility for safety from management to individual workers. Understanding these hegemonic norms provides a basis for questioning occupational health and safety statistics, and present strategic points of intervention to improve worker health protections.

Mining companies in South Africa have advertised their benevolent concern for the health of their workers. However, there are legal, practical and political reasons to do so (Marks,

2006). The denominator-free safety measure will help the mining industry to more effectively identify higher-risk operations and more realistically evaluate their safety improvement programs. Attention to a variety of metrics concerning the performance of a job safety and health program will enhance industry's ability to manage these programs and reduce risk (Coleman & Kerkerling, 2007). Greene (2006) looked into the negative publicity over safety features in America's mining industry in 2006. The Mine Safety and Health Administration together with several government officials pushed through a series of state legislative measures on mine safety and established the Mine Improvement and New Emergency Response Act of 2006 after the Sago incident and subsequent fatalities at other coal mines in Kentucky, West Virginia and Utah accounting for 21 fatalities.



5.4 Employee Behaviour

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While supervisors' relations and communication with their subordinates are known to be important in influencing subordinates' behavior, little is known about how these two factors will impact on subordinates' safety. From a safety perspective, a supervisor's leadership style provides an opportunity to enhance workplace safety that goes beyond ergonomic design of facilities or implementation of physical changes to meet regulatory standards (Michael *et al.* 2006). Behavior modification among employees is the key to achieving employee health and safety. Unsafe practices of employees; Evidences of the success of this approach Challenges to this approach Foster (1998). Chaves *et al.* (2009) conducted a study which identified predictors for the degree to which a program that integrates occupational health surveillance with labor safety, and involves occupational health safety specialists, company management, and employees, is implemented. The ecological study evaluated companies implementing the

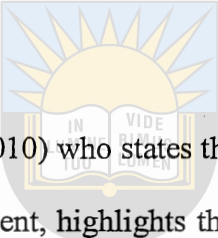
occupational health and safety program proposed by the state of Bahia's regional department of Serviço Social da Indústria (Social Services for Industry) during the 2005-2006 cycle. Of the 78 companies selected (3 384 employees), the degree to which occupational health and safety program was implemented was "advanced" in 24.4%, "intermediate" in 53.8%, and "initial" in 19.3%. Company-related, employee-related and specialist-related factors were positively associated with occupational health and safety program implementation. The most important factor overall was the program's financial autonomy. Bivariate analysis revealed that the degree of implementation was associated with the employees' level of health/safety knowledge and training and with communication between the occupational safety and the health team. These findings remained unchanged after adjustment for levels of education among managers and employees, salary/wages, company size, and risk.

The time and resources available for employees to dedicate to occupational health and safety, the integration and reinforcement of employee and manager training programs, and an improved relationship between occupational health and safety teams may contribute to the success of health and safety promotion efforts among employees (Chaves *et al.* 2009). Based on the social exchange theory the behavior of employees should be modeled in such a way that they see the benefits of an organizations health and safety regulations.

Nasab *et al.* (2008) used a planning model to guide the design of a randomized control trial to determine the effectiveness of tailored interventions to increase safe behavior and to decrease unsafe behaviors among petrochemical workers. The results showed that workers in intervention groups from baseline to follow-up show an increased percentage of safe behavior

(42.62 to 76.51). The mean unsafe behavior in the intervention groups from baseline to follow-up shows a significant decrease as compared with the control groups. Perception surveys assess what employees think and feel about a company's safety system and culture. They measure how employees' perceptions and attitudes differ from those of their managers and supervisors. Safety excellence only occurs when supervisors, managers and executives demonstrate their values through actions and then, being credible, ask hourly workers to help improve the system (Sheppard, 2001).

5.5 Leadership Crisis



Ladd *et al.* (2010) quote Tanner (2010) who states that the 2010 Intergenerational Report, commissioned by the Australian Government, highlights that Australia faces real challenges for maintaining its work force into the future (Australian Government 2010) and halting declining productivity. It's no accident that companies that lead their industry in health and safety also lead in productivity and quality. It is the corporate culture that influences a company's success in these areas, and culture is measurable (Sheppard 2001). Goldberg, (2006) focused on the crisis of selecting qualified successors for executive positions in the mining industry in Australia. It was stated that most of the country's companies fail to provide for a pool of qualified successors. An effect of this failure is the creation of the transactional chief executive officers. If there is a crisis in management then there is likely to be a crisis in drafting the long term policy of the organization. There is a need for grooming future leaders able to put in place health and safety regulations that are effective and in line with the organizations goals. According to the social exchange theory competent management is required to show the benefits of health and safety regulations' and also to draft such effective regulations. A recent study by the Institute for

Corporate Productivity in the United States identified line managers as playing the most critical role in facilitating and developing employees. To manage effectively managers need the skills to handle the more complex issues that which underpin the provision of social organisational support. Clearly, organisations need to understand the needs of, and the benefits desired, by individual employees. Therefore the authors define social organisational support as the organisation's ability to support managers in responding appropriately to the multiple demands of an employee's social needs and obligations to foster a beneficial, reciprocal relationship. Human Resource practitioners clearly have a role in facilitating social organisational support, but it seems imperative for good working relationships that these are fostered between managers and the staff they supervise (Ladd *et al.* 2010).



5.6 Social Exchange theory in the work context

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Employee expectations and social needs have changed and these changes impinge on organisations, so as to resulting in an increasingly complex and demanding workplace environment that has implications for the attraction and retention of talent (Ladd *et al.* 2010). It is recognized that the implementation and application of new technology in the mining industry is a difficult process and has often been unsuccessful. However, it is also important that we are able to learn from our previous experiences to ensure that the installation of new technology is more successful in future. It is well known that safe production can only be achieved with a combination of the right equipment, trained people, and appropriate operating procedures (Pickering, 2004). According to the social exchange theory it is essential that when technology is introduced employees are made to see the benefits rather than to resist or not get sufficient training that will result in the misuse of machinery which may have drastic effects to the plant.

Tucker *et al.* (2008) in their study, modeled 2 sources of safety support (perceived organizational support for safety and perceived coworker support for safety) as predictors of employee safety voice, in speaking out in an attempt to change unsafe working conditions. Drawing on social exchange and social impact theories, they hypothesized and tested a mediated model predicting employee safety voice using a cross-sectional survey of urban bus drivers in the United Kingdom. Hierarchical regression analysis showed that perceived coworker support for safety fully mediated the relationship between perceived organizational support for safety and employee safety voice. Their study added to the employee voice literature by evaluating the important role that coworkers can play in encouraging others to speak out about safety issues.



5.7 Conclusions

The purpose of this chapter was to link social exchange theory to health and safety regulations within the mining environment. It is noted that there is need for management and employees to find common ground on health and safety regulation for the greater benefits of both parties. For management, a safe working environment adds to the good name for the organisation notwithstanding the long-term benefits of goodwill. Employees may be highly motivated so that targets can be met with less resistance than in an unsafe working environment. Supervisors are an important part of organizations, and play an increasingly critical role in delegating job tasks, managing subordinate performance, and juggling competing demands for productivity, quality, and safety. They are also seen as having a key role in communications between management and hourly employees. Past research suggests that supervisors have an impact the attitudes and behaviors of subordinates in a variety of ways (Michael *et al.* 2006). Ladd *et al.* (2010) suggest that theory does not go far enough. While it does highlight the

importance of developing a relationship of mutual respect, this only occurs if employees believe their needs are understood and met. Based on the evidence more needs to be done to address the impact of personal and social issues in the workplace. Managers according to the present study generally agreed that this was a neglected area of the managers' role and an area where they felt vulnerable.



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CHAPTER 6

RESEARCH METHODOLOGY

6.1 Introduction

This chapter will look at the research design and the methods of collecting data for the purposes of this study. A structured questionnaire was used to source the primary data with regards to the perception of mine employers and employees on the effectiveness of health and safety regulations in the selected platinum mine. The first section looks at the overall design and structure of the research instrument (questionnaire). The second section focuses on the Likert five-point interval scale and explanation of the *modus operandi* followed in the pilot study. The last section will look at the target population (N) and the sample population (n). An explanation will be given with regards to the sampling method used and the chapter will close with a summary and conclusion.

6.2 Design and Structure of the Research Instrument

6.2.1 Background of the design of the questionnaire

Questionnaires are an inexpensive way to gather data from a potentially large number of respondents. Often they are the only feasible way to reach a number of reviewers large enough to allow statistical analysis of the results (Alexander, 2010). A well-designed questionnaire that is used effectively can gather information on both the overall performance of the test system as well as information on specific components of the system. If the questionnaire includes

demographic questions on the participants, they can be used to correlate performance and satisfaction with the test system among different groups of users. Questionnaires as research and/or measuring instruments to source primary data are associated with both positivistic and phenomenological methodologies (Alexander, 2010). Ludidi (2009) quotes Collis and Hussey (2003) who describe a questionnaire as a list of carefully structured questions, chosen after considerable testing, with a view to eliciting reliable responses from a chosen sample. Neville (2005), states that the validity (the extent to which the data accurately measures what they were intended to measure) and reliability (the extent to which the data collection method will yield consistent findings if replicated by others) of the data you collect depend on the design of the questionnaire and the words used.

For the purpose of this study, the questionnaire was used to source primary data in order to ascertain the perception of mine employers and employees on the effectiveness of health and safety regulations in the selected mine. Most of the statements in the questionnaire were adopted from Bennett, (2007). The questionnaire was comprehensively modified and expanded to address present-day requirements. The requirements of a well designed research instrument were considered in drafting the questionnaire and they include:

- Order and flow of questions should be logical to the respondent.
- Questions can be open or closed-ended
- There can be a low rate of return with questionnaires, so they need to be introduced carefully and courteously to potential respondents. This introduction may include the use of a covering letter, offering a prize or other incentives to improve the rate of return of questionnaires.

- Avoid ambiguous and negatively worded statements
- All questionnaires should be piloted, if possible, with a small group before the main research, to assess their value, validity and reliability (Neville, 2005).

6.2.2 Structure of the research instruments

The survey was conducted at a selected platinum mine in South Africa's Mpumalanga province. Two instruments were administered: one for management and the one for employees. Respondents were requested to express their opinions (perceptions) by means of a Likert Five point interval scale where 1 for example is 'strongly disagree' and 5 'strongly agree'.

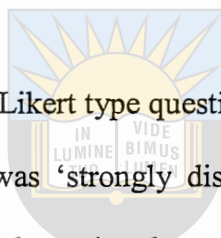
The research instrument for employees comprised of the following sections:

- Section A served to acquire demographic information and determined the age, sex, level of education, nationality, years in office and position occupied in the organizational hierarchy.
- Section B was comprised of five-point Likert type questions where respondents were required to rate their responses where 1 was 'strongly disagree' and 5 is 'strongly agree' on management safety commitment, perceptions of management commitment to safety issues in the workplace.
- Section C was comprised of five-point Likert type questions where respondents were required to rate their responses where 1 was 'strongly disagree' and 5 is 'strongly agree' on aspects pertaining to risk identification, training and communication in the place of work.

- Section D was comprised of five-point Likert type questions where respondents were required to rate their responses where 1 was 'strongly disagree' and 5 is 'strongly agree' on aspects pertaining to employee behavior on safety related matters.

A second questionnaire was distributed to management and it was comprised of the following sections:

- Section A served to acquire demographic information and determined the age, sex, level of education, nationality, years in office and e position they occupied in the organizational hierarchy.
- Section B comprised of five-point Likert type questions where respondents were required to rate their responses where 1 was 'strongly disagree' and 5 is 'strongly agree' on perceptions of management on employee involvement in health and safety regulations in the place of work.
- Section C was comprised of five-point Likert type questions where respondents were required to rate their responses where 1 is 'strongly disagree' and 5 is 'strongly agree' on aspects pertaining to creating a safe and healthy workplace.
- Section D was comprised of five-point Likert type questions where respondents were required to rate their responses where 1 was 'strongly disagree' and 5 is 'strongly agree' on aspects pertaining to employee behavior on safety related matters.
- Section E comprised of five-point Likert type questions where respondents were required to rate their responses where 1 was 'strongly disagree' and 5 is 'strongly agree' on aspects pertaining to risk identification, training and communication in the place of work.



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- Section F of five-point likert type questions where respondents were required to rate their responses where 1 was 'strongly disagree' and 5 is 'strongly agree' on management safety commitment, perceptions of management commitment to safety issues in the workplace.

The research instrument is included in the Addenda.

6.2.3 Validity and reliability of the research instrument

Research instruments must be selected or developed carefully to fit the research design and the plan for data analysis so that the data collected will be useful for answering the research questions. Good research instruments produce valid and reliable results. Validity and reliability often are called psychometric properties of the research instrument, which means they represent how well instruments measure the variables of interest to the researcher. It should be emphasized that the research instrument administered to the sample at Mpumalanga Province platinum mines employees and employers, represents a research instrument comprising of several sections and hence it is necessary that the validity and reliability for this instrument be ascertained.

6.2.3.1 Validity of the research instrument

Validity can be defined as the degree to which a test measures what it is supposed to measure. There are three basic approaches to the validity of tests and measures as shown by Hair, Anderson, Tatham & Black (1998). These are content validity, construct validity, and criterion-related validity.

➤ Content Validity

This approach measures the degree to which the test items represent the domain or universe of the trait or property being measured. In order to establish the content validity of a measuring instrument, the researcher must identify the overall content to be represented. Items must then be randomly chosen from this content that will accurately represent the information in all areas. By using this method the researcher should obtain a group of items which is representative of the content of the trait or property to be measured. Identifying the universe of content is not an easy task. It is, therefore, usually suggested that a panel of experts in the field to be studied be used to identify a content area (Hair *et al.* 1998).



➤ Construct Validity

Construct validity must be investigated whenever no criterion or universe of content is accepted as entirely adequate to define the quality to be measured. Welman, Kruger & Mitchell, (2005) say that when we measure something with an instrument, the instrument we use must measure the variable which it is supposed to measure. The construct validity approach concerns the degree to which the test measures the construct it was designed to measure (Hair *et al.* 1998). In this study the perception of employers and employees of health and safety regulations at the selected platinum mine.

There are parts to the evaluation of the construct validity of a test. Most important, each test of relations between measures reflects on the validity of both the measures and the theory driving the test (Strauss & Smith, 2009).

➤ Criterion-Related Validity

This refers to the degree to which diagnostic and selected measurement tests correctly predict the relevant criterion. The relevant criterion refers to the variable to be diagnosed (Welman, Kruger & Mitchell, 2005). This approach is concerned with detecting the presence or absence of one or more criteria considered to represent traits or constructs of interest. One of the easiest ways to test for criterion-related validity is to administer the instrument to a group that is known to exhibit the trait to be measured. This group may be identified by a panel of experts. A wide range of items should be developed so that invalid may be questions culled out after the control group has taken the test. Items that are drastically inconsistent with respect to the responses made among individual members of the group should be deleted. If the researcher has developed quality items for the instrument, the culling process should leave only those items that will consistently measure the trait or construct being studied (Mason & Bramble, 1989).

6.2.3.2 Reliability of the research instrument

Reliability is concerned with the findings of the research and relates to the credibility of the findings (Welman, Kruger & Mitchell, 2005). The reliability of a research instrument concerns the extent to which the instrument yields the same results on repeated trials. Although unreliability is always present to a certain extent, there will generally be a good deal of consistency in the results of a quality instrument used at different times. The tendency toward consistency found in repeated measurements is referred to as reliability (Carmines & Zeller, 1979) as quoted by Key (1997).

6.2.4 Measurement Scale

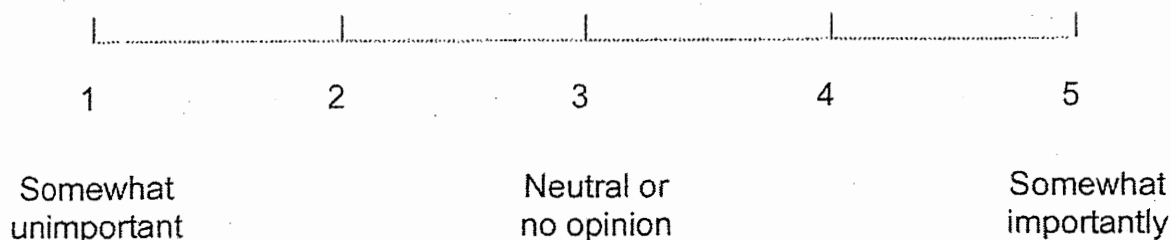
The decision on the measurement scales (nominal, ordinal, interval or ratio) used in a research instrument to collect the data has important implications for the type of statistical analysis that a researcher may perform. In this study, the Likert five-point interval scale was used it is an interval measurement scale hence it is necessary to briefly discuss it.

6.2.4.1 Interval Scale

Interval scales of measurement have the power (abilities) of nominal and ordinal scales, plus one other strength of incorporating the concept of equality of interval (the distance between 1 and 2 equals the distance between 2 and 3, 3 and 4, and so on). Besides this equality interval scales also have a zero point that has been established arbitrarily, as in temperature (Cooper & Schindler, 2005).

For the purposes of this research, it was decided to use a Likert five-point interval scale, as shown in the figure below which shows that the “equidistance” between the numbers.

FIGURE 1: Illustration of a Likert five-point scale



SOURCE: Adopted from Leedy & Ormrod, (2005).

Interval measurement scales allow for more advanced statistical procedures, such as the arithmetic mean as a measure of central tendency and the standard deviation as a yardstick of dispersion, t-tests, F-tests and other parametric tests. An interval scaled research instrument facilitates the performance of the necessary inferential statistical data analysis (Leedy & Ormrod, 2005; Cooper & Schindler, 2005).

TABLE 1: Summary of all the measurement scales

	Measurement scale	Characteristics of the scale	Statistical possibilities of the scale
Non-interval scales	Nominal scale	A scale that 'measures' in terms of names or designations of discrete units or categories	Enables one to determine the mode, the percentage values, or the chi-square
	Ordinal scale	A scale that 'measures' in terms of such values as 'more' or 'less', 'larger' or 'smaller', but without specifying the size of the intervals	Enables one also to determine the median, percentile rank, and rank correlation
Interval scales	Interval scale	A scale that measures in terms of equal intervals or degrees of difference but whose zero point, or point of beginning, is arbitrarily established	Enables one also to determine the mean, standard deviation, and product moment correlation; allows one to conduct most inferential statistical analyses
	Ratio scale	A scale that measures in terms of equal intervals and an absolute zero point of origin	Enables one also to determine the geometric mean and the percentage variation; allows one to conduct virtually any inferential statistical analysis

SOURCE: Adopted from Leedy & Ormrod, (2005).

6.3 Pilot Testing of Research Instrument

A pilot study was deemed necessary to ensure operational administration, validity and reliability of the questionnaire. Cronbach's alpha coefficient was computed to assess internal consistency.

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.885463



6.4 Phases in Sampling Design

The phases leading towards the sampling design include concepts such as population (N), target population, sampling frames, sampling units, sampling and sample size. The sampling method employed is another relevant set of information that requires some explanation. For the purpose of primary, quantitative data sourcing, it is important to have a common understanding regarding the above concepts.

6.4.1 Population and target population

A population or universe is any complete group or body of people or any collection of items under consideration for the research purpose (Collis & Hussey, 2003). For the research in question, the population (N) refers to the employers and employees in the selected platinum mine in Mpumalanga South Africa.

The above broad definition of the population was narrowed down to the target population, which comprises the complete group of specific population elements relevant to the research project. The target population for this research comprised only the employers and employees in the selected platinum mine. The actual number of employees was obtained from management of the platinum mining company. This delimitation of the target population is important in order to identify the source from which the primary data is to be obtained. Two Rivers Platinum Mine is located on the border of Mpumalanga and Limpopo province in South Africa. It has a workforce of 3 060 employees, including sub contracted labour. The workforce per session is a third of the population, meaning that in every session of work there are about 1020 employees at work; the other third will be on leave; the other on standby or they work the night shift. Females' constitute 13.52% of employees and this goes to show that mining is still a male dominated industry. There are about 50 individuals who occupy managerial or leadership positions.

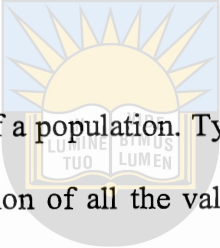
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6.4.2 Sampling frame and unit

The sampling frame is closely related to the target population which comprises the complete group of specific population elements relevant to the research project (Hair *et al.* 2003). In actual practice, the sample will be drawn from a list of population elements that is often somewhat different from the target population that has been defined (Zikmund, 2003) as cited by Sin Lye Yee, & Hooi (2011). The sampling frame for the research in question was comprised of employers and employees of the selected platinum mines of South Africa. This will further be explained below:

Zikmund (2003), as cited by Sin Lye Yee, & Hooi, (2011) is of the opinion that during the actual sampling process, the elements of the target population must be selected according to a certain procedure. The sampling unit is a single element or group of elements subject to selection in the sample (Vogel, 2006). For the research in question, the sampling unit comprised Platinum mine employees, therefore, the sampling frames and sampling units for the target population was deemed to be similar.

6.4.3 Sampling and sample size



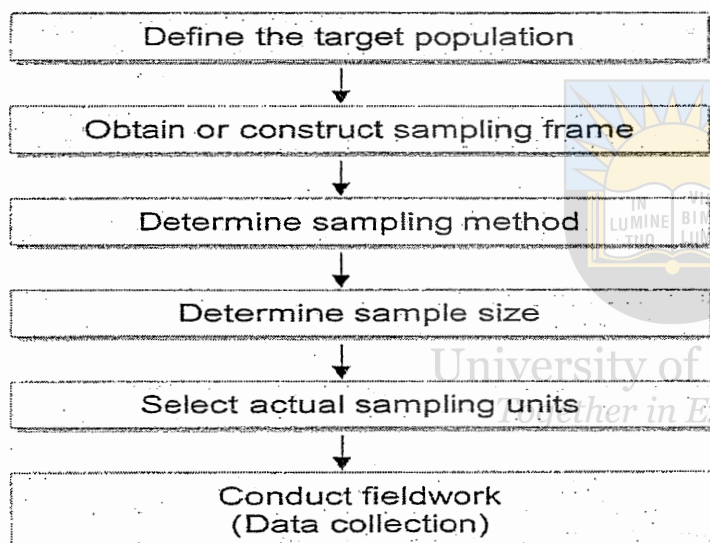
In statistics, a sample is a subset of a population. Typically, the population is very large, making a census or a complete enumeration of all the values in the population impractical or impossible. The sample represents a subset of manageable size. Samples are collected and statistics are calculated from the samples so that one can make inferences or extrapolations from the sample to the population. This process of collecting information from a sample is referred to as sampling (Cooper & Schindler, 2005).

The best way to avoid a biased or unrepresentative sample is to select a random sample, also known as a probability sample. A random sample is defined as a sample where the probability that any individual member from the population being selected as part of the sample is exactly the same for any other individual member of the population. There are several types of random samples such as random samples, systematic samples, stratified random samples, and cluster random samples. A sample that is not random is called a nonrandom sample or a non-probability sample. Some examples of nonrandom samples are convenience samples, judgment

samples, purposive samples, quota samples, snowball samples, and quadrature nodes in quasi-Monte Carlo methods (Collis & Hussey, 2003; Zikmund, 2003)

In figure 2, the decision regarding the sequential stages is illustrated, although the actual order of events did not always follow this particular sequence. These events are generally highly interrelated (Collis & Hussey, 2003; Zikmund, 2003; Cooper & Schindler, 2005).

FIGURE 2: Phases in selecting a sample



SOURCES: Adopted from Collis & Hussey (2003); Zikmund (2003) and Cooper & Schindler (2005).

Collis & Hussey (2003) are of the opinion that a good sample must be:

- i. Chosen at random (every member of the population must have a chance of being chosen);
- ii. Large enough to satisfy the needs of the investigation being undertaken; and

- iii. Unbiased and representative of the population from which it is drawn.

According to Cooper & Schindler (2005), some principles that influence sample size are:

- The greater the dispersion or variance within the population, the larger the sample must be to provide estimation precision;
- The greater the desired precision of the estimate, the larger the sample must be;
- The narrower or smaller the error range, the larger the sample must be;
- The higher the confidence level required in the estimate, the larger the sample must be;
- The greater the number of sub-groups of interest within the sample, the greater the sample size must be, as each sub-group must meet minimum sample size requirements.

Larger samples enable researchers to draw more representative and accurate conclusions and to make predictions with greater accuracy than do smaller samples.

6.4.4 Sampling method

As shown in figure 2, the construct of the sampling frame is followed by the determination of the sampling method. Research literature (Cooper & Schindler, 2006; Zikmund, 2003) describes a wide variety of sampling methods. Sampling methods can be divided into two main categories, namely probability and non-probability samples. Probability sampling may be described as a sampling method in which every member of the population has a known (in advance), non-zero probability of selection. Non-probability sampling, on the other hand,

represents a sampling method in which units of the sample are selected on the basis of personal judgment or convenience.

Based on the merits of the sampling frame and sampling unit described above, a probability sampling method was deemed appropriate for this research. More specifically simple random sampling was employed. The motivation for this decision is that simple random sampling gives each member of the population an equal chance of being chosen. It is not a haphazard sample and one way of achieving a simple random sample is to number each element in the sampling frame (e.g. give everyone on the Electoral register a number) and then use random numbers to select the required sample. Random numbers can be obtained using a calculator, a spreadsheet, printed tables of random numbers, or by the more traditional methods of drawing slips of paper from a hat, tossing coins or rolling dice. In the contemporary world, Stat Trek's Random Number Generator is used where one assigns to it the number of random numbers required, the minimum value and the maximum value. In this research, all the respondents comprised employees from the selected platinum mine. A questionnaire was used to gather the data with a cover letter explaining the purpose of the research.

6.4.5 Research instrument administration and actual sample

The questionnaire was hand distributed to the respective respondents from the selected platinum mine using simple random sampling to select the respondents. The questionnaires consisted of a series of statements pertaining to employer and employee perceptions on the implementation of health and safety regulations.

6.4.6 Response rate

Table 2 was used as a guideline a response rate of 5% was deemed adequate.

Table 2: Guidelines for Sampling

Target population	Percentage suggested	Number of respondents (actual sample)
20	100%	20
30	80%	24
50	64%	32
100	45%	45
200	32%	64
500	20%	100
1 000	14%	140
10 000	4,5%	450
100 000	2%	2 000
200 000	1%	2 000

SOURCE: De Vos *et al.* (2005)

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Since 153 questionnaires were returned by the employees reflecting a 15% representativity.

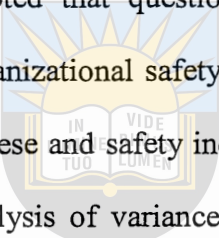
6.5 Data Analysis

The assumption of quantitative research is that if a quantitative method of data collection is used, then a quantitative method of analysis should be used (De Vos, 2005). The researcher used descriptive statistics for demographic data to assess the knowledge and practice of mine workers on occupational health and safety regulations in the place of work. Further analysis employed inferential statistical methods to investigate whether the employers follow up on proper procedures pertaining safety conduct in the mine. The researcher used analysis of variance (ANOVA) and the t-test to test the relationship between variables using SAS software. The purpose of the tests is to find the difference between distributions and the tests measure any

statistical significance between the means and distributions of samples (Welman, Kruger & Mitchell, 2005).

6.6 Limitations

Perception surveys had been conducted before and little or no changes were made on the input of employees. Acquiescence refers to the phenomena where research participants tend to constantly answer yes or no, irrespective of the content of the question (Welman, Kruger & Mitchell, 2005). Guldenmund (2007) noted that questionnaires have not been particularly successful in exposing the core of an organizational safety culture. This is clear both from the factors found and the relations between these and safety indicators. Due to the response rate the researcher was unable to conduct an analysis of variance on the perceptions of the different occupational groups.

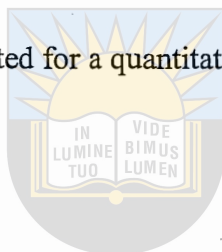
The logo of the University of Fort Hare is a circular emblem. It features a central shield with a sunburst at the top. Inside the shield, there is a book and the Latin motto 'IN VIDE TUO LUMEN'. The shield is flanked by two figures. The entire emblem is set against a background of rays emanating from the top.
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6.7 Ethical Considerations

Confidentiality was maintained by omitting names and personal identification while the information obtained from this research is strictly used for academic purposes. Ethical clearance was obtained from the University of Fort Hare. Mining management was informed and consent obtained. Informed consent was obtained from the respondents who were to participate in the study.

6.8 Conclusion

The present chapter discussed the methodology of the study. The questionnaire was comprehensively modified and expanded to address present-day requirements. Strong support from secondary sources also motivated the type of questions included in the research instrument. The Likert five-point interval measuring scale was adopted as it met the statistical data analysis requirements of the research. Moreover, pilot testing of the research instrument was deemed necessary to ensure the operational administration, validity and reliability of the questionnaire. Finally, the target population, sampling frame and sampling unit were identified and the sampling method described. The study opted for a quantitative research design.



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CHAPTER 7

PRESENTATION OF DATA

7.1 Introduction

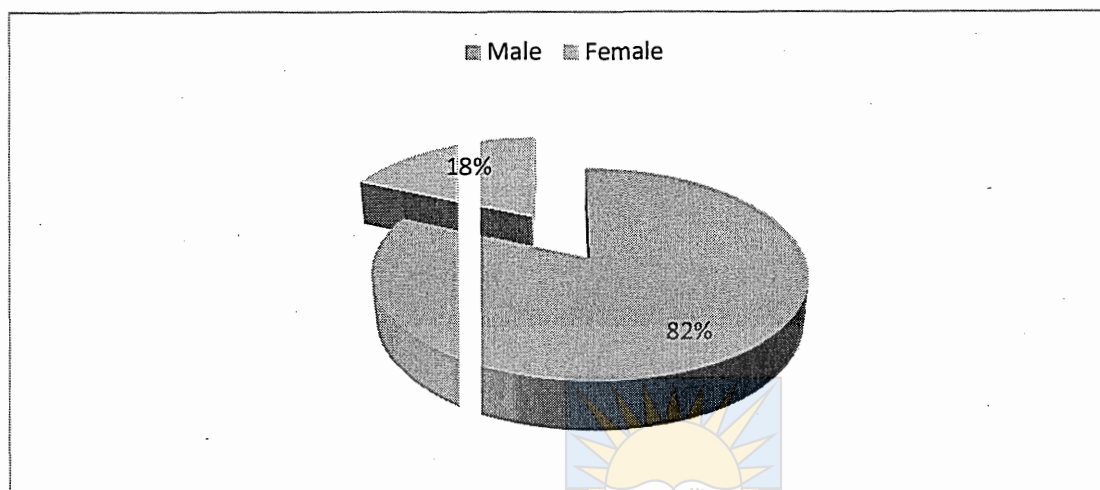
The primary purpose of this chapter is to outline the major findings of the study. The major aim of the study was to investigate “Employer and Employee’ perceptions on the implementation of health and safety regulations at a selected Platinum mine in Mpumalanga Province, South Africa.” A survey was carried out at Two Rivers Platinum Mine in Mpumalanga province South Africa. In this chapter emphasis will be on the findings of this study. Reference will be made to relevant literature in view of the findings. A survey questionnaire was delivered by hand to a total of 50 employers and 250 employees. To employees 250 research instruments were handed out. Of these 153 were returned indicating a response rate of 66.2%. Of the 50 instruments handed out to employers, 22 were returned, a response rate of 44%. Data pertaining to the variables included in the study are presented and summarized by means of charts, graphs and the calculation of descriptive measures.

7.2 Demographic Variables

The demographic variables under consideration are sex, age, race, level of study, position occupied, number of years in organization, nationality, for both groups (employers and employees).

7.2.1 Sex

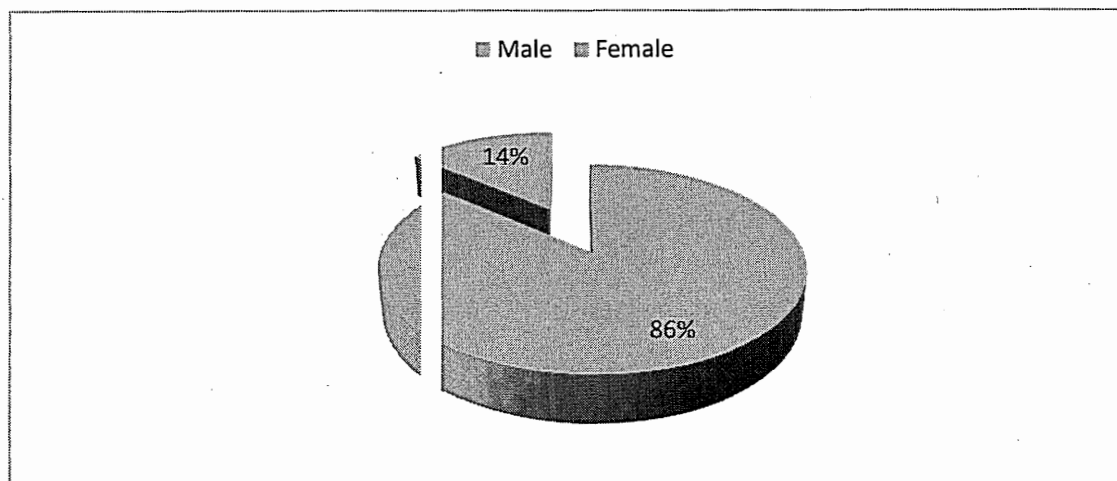
7.2.1.1 Figure 3: Gender of employees



Of the 153 employee respondents, 125 were male and 28 female, or 82% and 18% respectively.

Mining is still a male dominated industry.

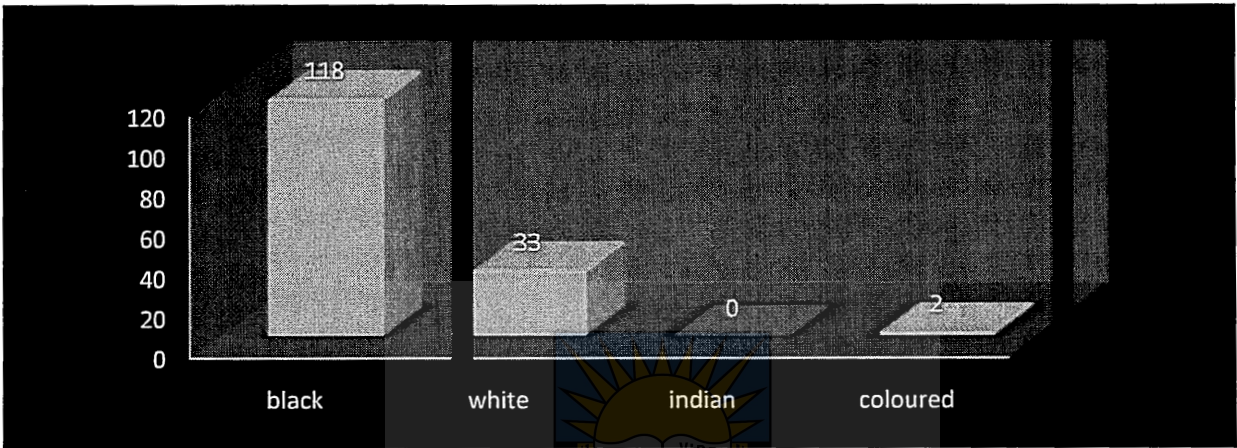
7.2.1.2 Figure 4: Gender of Employer



Of the 22 employer respondents, 19 were male and 3 female plotted, or 86% and 14% respectively. Mining is still a male dominated industry.

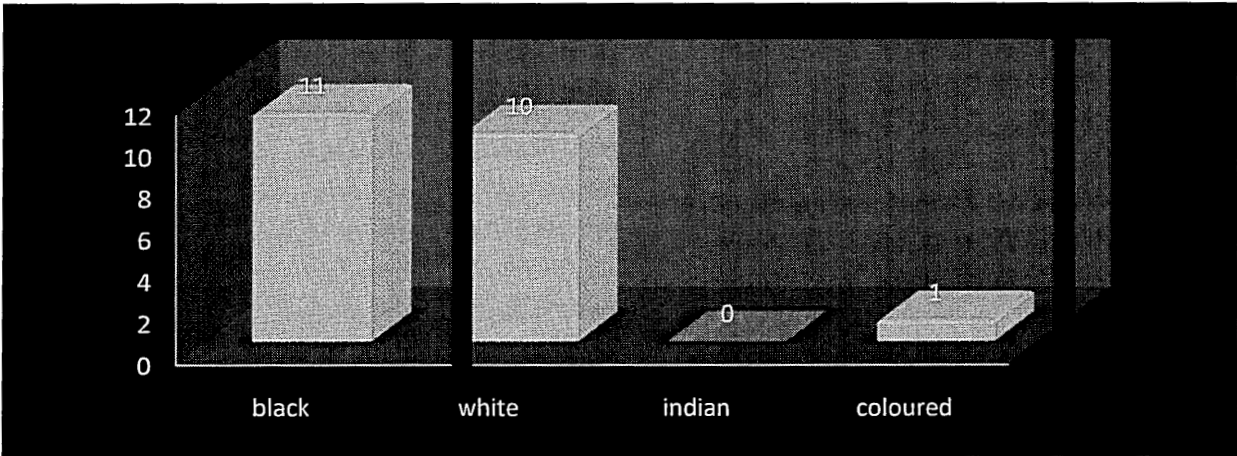
7.2.2 Race

7.2.2.1 Figure 5: Race of employees



Of the 153 respondents, 118 (77%) were black, 33 (22%) were white and less than 2% were coloured. The demographic data indicates that the industry is still dominated by black employees who comprise 77% of the working population.

7.2.2.2 Figure 6: Race of employer



Of the 22 respondents, 11 (50 %) were black, 10 (45%) were white and 1 (5%) coloured as shown in figure 6.

7.2.3 Age

7.3.3.1 Figure 7: Age Employees

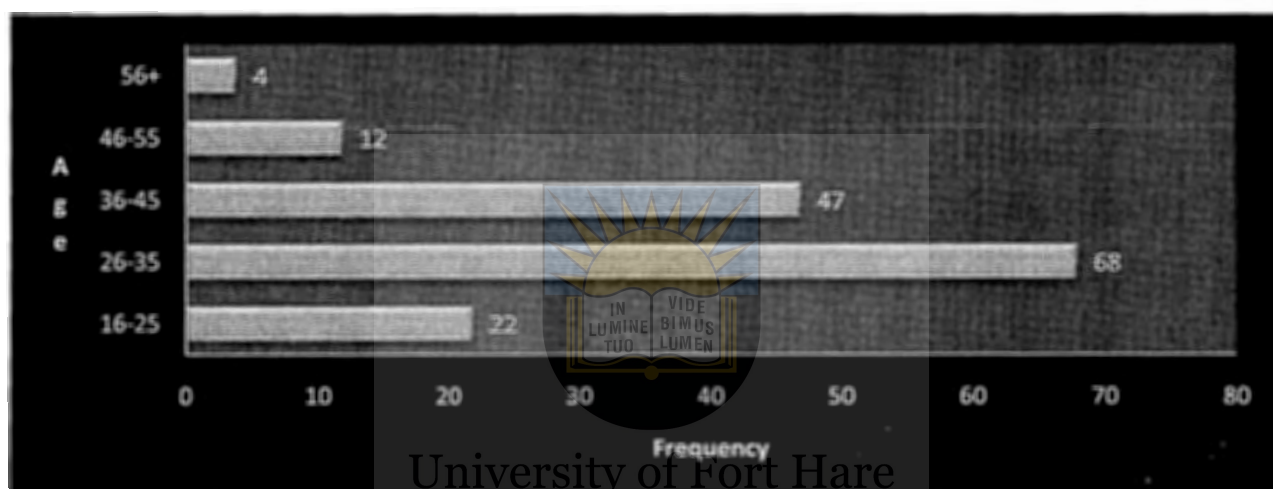
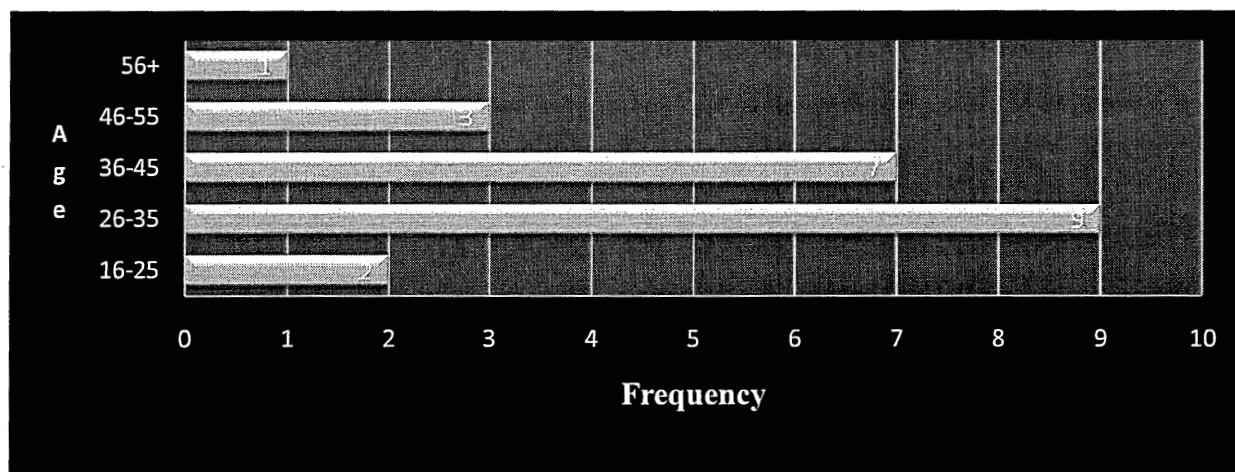


Figure 7 indicates 44% of the workforce was aged from 26-35, 30% were 36-45, 15% were 16-25, 9% were 46-55 and 2% for employees above 56 years old.

7.3.3.2 Figure 8: Age Employer



Of the employers 40% was aged from 26-35, 31% was aged from 36-45, 9% was aged from 16-25, 14% was aged from 46-55 and 6% of employers were above 56 years old.

7.2.4 Level of Study

7.2.4.1 Figure 9: Level of Education Employees

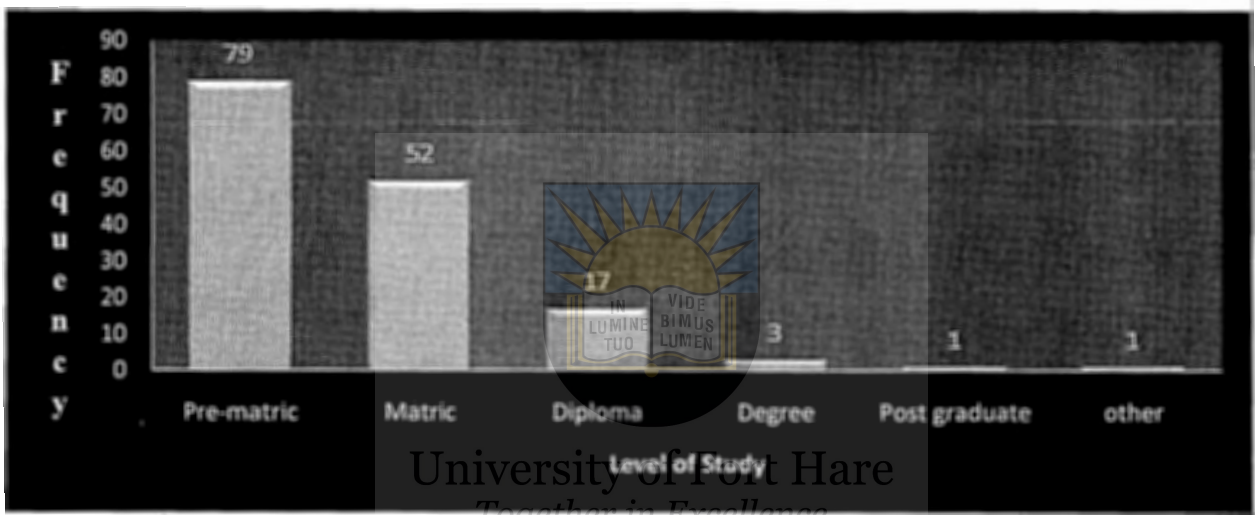
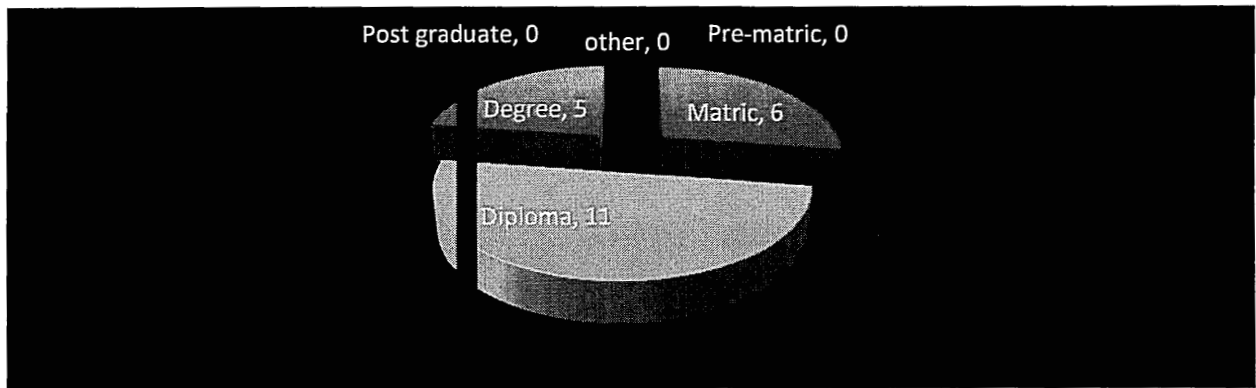


Figure 9 shows that 79 (51%) employees had a pre-matric qualification, 52 (34%) had matric, 17 (11%) had a diploma, 3 (2%) were degreed and 1 (1%) had a post graduate qualification and one person held a certificate in mining.

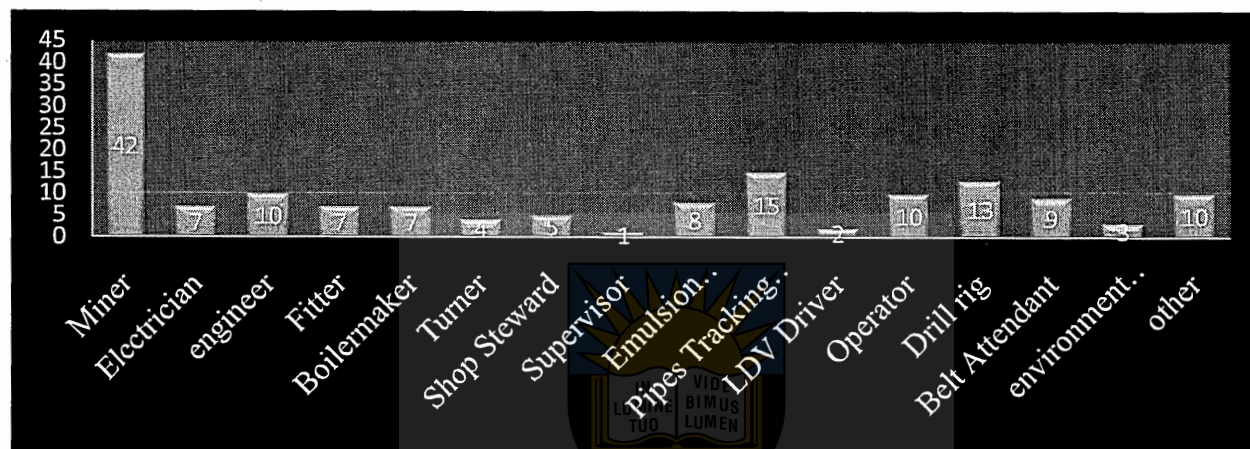
7.2.4.2 Figure 10: Level of Education Employer



Of the employers 50% (11) had a diploma, 23% (5) had a degree and 27% (6) had matric.

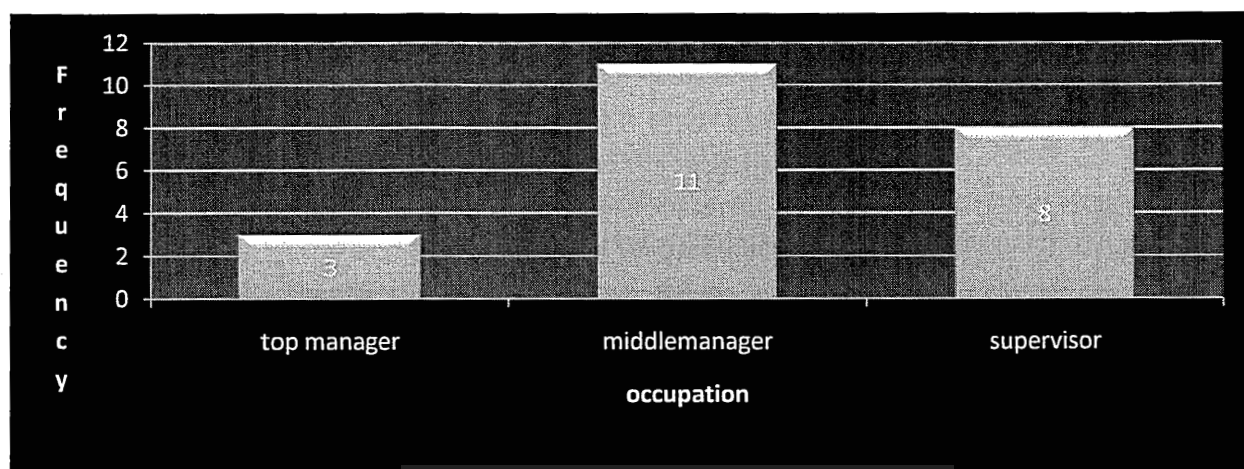
7.2.5 Position occupied

7.2.5.1 Figure 11: Position Occupied by Employee



The occupations of the employees were distributed as follows: Miners, 47; Electricians, 7; Engineers, 10; Fitters, 7; Turners, 4; Shop Stewards, 5; Emulsion operators, 15; Pipes Tracking Ventilation, 2; LDV Driver, 10; Drill Rig Operators, 13; Belt Attendant, 9; Environment Officer, 3; other (trainer, administrator and facilitators), 10.

7.2.5.2 Figure 12: Position occupied by Employer



It should be noted that 50% (11) of the respondents were middle managers, 36% (8) were supervisors and 14% (3) were from top management.

7.2.6 Years in organisation

7.2.6.1 Figure 13: Years in organisation of Employees

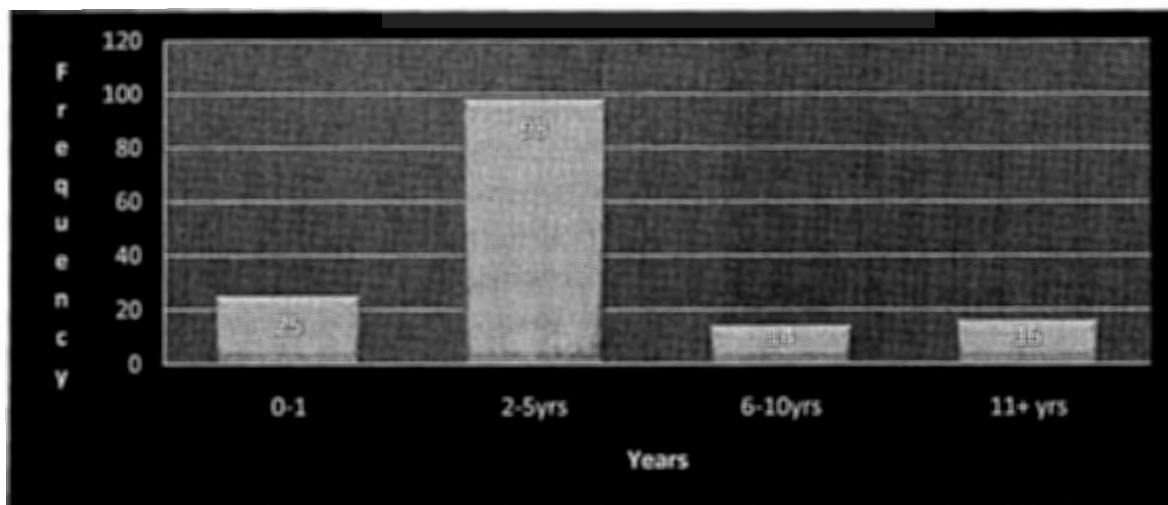


Figure 13 indicates that 98 (65%) employees had spent 2-5 years in the organization, 25 (16%) had been it for less than 1 year, whilst 14 (9%) had been there for 6-10years, while 16 (10%) had spent 11+ years in the organization.

7.2.6.2 Figure 14: Years in organisation of Employer

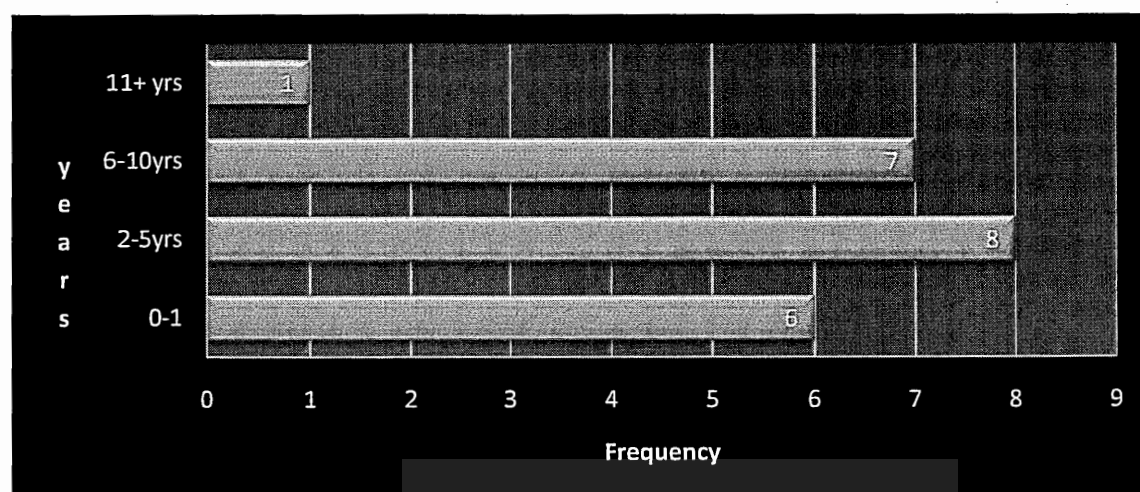


Figure 14 indicates that 8 (65%) employees had spent 2-5 years with the organization, 6 (16%) had less than 1 year, 7 (9%) from 6-10 years, and 1 (10%) had 11+ years in the organization.

7.2.7 Nationality

7.2.7.1 Figure 15: Nationality of employees

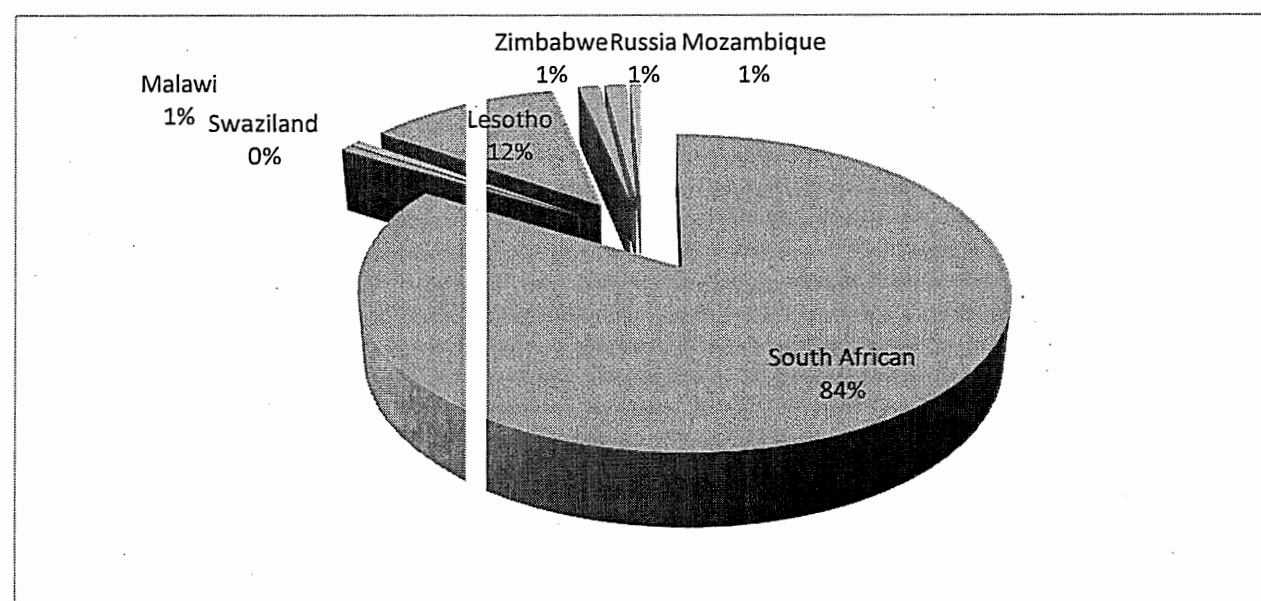
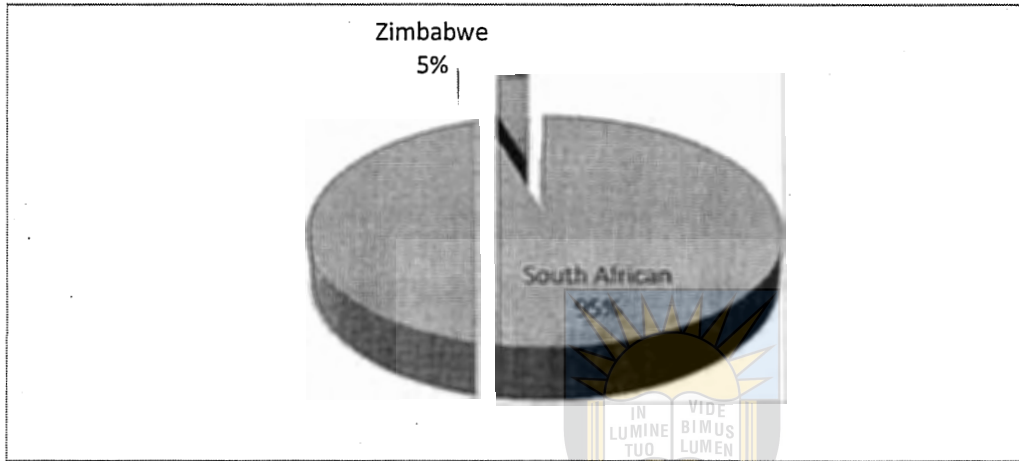


Figure 15 shows 84 % of the workforce to be comprised of South Africans, 12% percent of Sotho, 1% Russian 1 %, Mozambican, 1% Zimbabwean, and 1% Malawian. It shows that the labour force is no longer dominated by foreigners as 84% were South Africans.

7.2.7.2 Figure 16: Nationality of Employers



Employer nationality was 95% South African and 5% Zimbabwean

7.3 Results on Employee Perceptions

7.3.1 Results on the perceptions about employers' commitment to health and safety regulations in the workplace.

Table 3 Employer commitment to health and safety

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
integration of health and safety objectives	3%	14%	16%	47%	20%
employer was actively involved in the promotion of health and safety regulation	10%	5%	2%	46%	37%
Employers' focus is on productivity and profitability rather than health and safety	7%	27%	11%	18%	36%

Respondents were asked to indicate if health and safety objectives were effectively integrated with operational, financial, environmental and quality objectives. The responses show that 47% agreed, 20% strongly agreed, 16% was not sure, 14% disagreed and 3% strongly disagreed.

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Respondents were asked to indicate whether the employer was actively involved in the promotion of health and safety regulations. The responses show that 46% agreed, 37% strongly agreed, 2% was not sure, 10% disagreed and 5% strongly disagreed.

Respondents were asked to indicate whether the employers' focus was on productivity and profitability rather than health and safety. The responses show that 36% agreed, 18% strongly agreed, 11% was not sure, 27% disagreed and 7% strongly disagreed.

Given these results it may be noted that the employer's commitment to safety in the workplace was seem to be high. Thus the general perception is that employers are committed to health and safety regulations in the workplace.

7.3.2 Employee perceptions on risk identification, training, communication

Table 4 Employee perceptions on Risk identification, training, communication

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
hazard identification, risk assessment were regularly reviewed	3%	8%	11%	23%	56%
well trained to respond to incidents that occur	2%	4%	5%	29%	60%
health and safety communication information was readily available	1%	3%	3%	69%	24%

Respondents were asked to indicate if hazard identification and risk assessment were regularly reviewed, with the involvement of people who do the work. Of the responses 56% agreed, 23% strongly agreed, 11% was not sure, 8% disagreed and 3% strongly disagreed.

Respondents were asked to indicate if they were well trained to respond to incidents that occur in the workplace. Of the responses 60% agreed, 29% strongly agreed, 5% was not sure, 4% disagreed and 2% strongly disagreed.

Respondents were asked to indicate if health and safety communication information was readily available to which 69% responded in agreement, 24% strongly agreed, 3% was not sure, 3% disagreed and 1% strongly disagreed.

Based on these results it is noted that measures of risk identification, training and communication were in place according to the employees.

7.3.3 Employees' general views on health and safety regulations

Table 5 Employees' general views on health and safety regulations

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
take risks to get the job done	3%	8%	11%	23%	56%
discuss issues on how to improve health and safety	2%	4%	5%	29%	60%
health and safety rules were always enforced	1%	3%	3%	69%	24%

Respondents were asked to indicate if they often take risks to get the job done. For this appeared to be the case 23% agreed, 55% strongly agreed, 11% was not sure, 8% disagreed and 3% strongly disagreed.

Respondents were asked to indicate if they often discuss issues on how to improve health and safety to which 29% agreed, 60% strongly agreed, 5% was not sure, 4% disagreed, and 2% strongly disagreed.

Respondents were asked to indicate whether health and safety rules were always enforced. Here 69% agreed, 24% strongly agreed, 3% was not sure, 3% disagreed and 1% strongly disagreed.

Table 5 indicates that employees were conscious of health and safety in the workplace even though a greater percentage took risk to get the job done.

7.4 Results about employers perceptions

7.4.1 Management's perception on employees' commitment to health and safety regulations

Table 6 Management's perception on employees' commitment to health and safety regulations

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Workforce involved in managing health and safety	0%	5%	5%	81%	9%
Employees understand health and safety responsibilities.	9%	5%	5%	72%	9%
Teamwork	5%	9%	14%	65%	9%

Respondents were asked to indicate if the workforce was involved in managing their own and others health and safety. Here 81% agreed, 9% strongly agreed, 5% was not sure, 5% disagreed and no one strongly disagreed.

Respondent were asked to indicate if employees understand their health and safety responsibilities. With this 72% agreed, 9% strongly agreed, 5% was not sure, 5% disagreed and 9% strongly disagreed.

Respondent were asked to indicate if there was a sense of teamwork. Here 65% agreed, 9% strongly agreed, 14% was not sure, 9% disagreed and 5% strongly disagreed.

The above indicates that employers had a positive perception of the employees' commitment to health and safety.

7.4.2 Employers perceptions on creating a safe and healthy workplace

Table 7 Employers perceptions on creating a safe and healthy workplace

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Legal requirement	0%	9%	41%	49%	9%
Safe site	0%	4%	14%	64%	18%
Personal protective equipment availability	5%	9%	0%	59%	27%

Respondents were asked to indicate if all the legal requirements were systematically met and 49% agreed, 9% strongly agreed, 41% was neutral, 9% disagreed and 0% strongly disagreed with this.

Respondents were requested to indicate if the site design is as safe as is reasonably possible. With this 64% agreed, 18% strongly agreed, 14% was neutral, 4% disagreed and 0% strongly disagreed.

Respondents were asked to indicate if all the protective equipment required is available in sufficient quantities, well fitting quantities and in a good condition. With this 59% agreed, 27% strongly agreed, no one was neutral, 9% disagreed and 5% strongly disagreed.

The above responses indicate that employer' perceptions on creating a safe and healthy workplace was positive.

7.5 Inferential Statistics

This section outlines the inferential statistics used to assess the perception of respondents on the implementation of health and safety regulations.

7.5.1 Analysis of Variance Employees

An Alpha level of 0.05 was set to test if there was a significant difference between the mean scores of respondents. When the p-value is less than 0.05 the mean groups are said to be statistically different.



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Table 8 Analysis of Variance Employees

Perception	Mean	P value	df	Decision
Race vs attributes				
Race perception on training	4.26 vs. 3.63	0.0016	150	Reject H0
Race perception on communication	4.21 vs. 3.78	0.0075	150	Reject H0
Race perception on reaction to incident	4.22 vs. 3.67	0.0019	150	Reject H0
Years in organisation vs attributes				
Effective meetings on health and safety regulations	4.03 vs. 3.43	0.033	149	Reject H0
Training with introduction of new technology	4.24 vs. 3.73	0.027	149	Reject H0
Occupation vs attributes				
Employer involvement in promoting health and safety regulations	4.17 vs. 2.4	0.009	137	Reject H0
Employers focusing on productivity	4.29 vs. 2.1	0.042	137	Reject H0
Health and safety regulations effective and well implemented	4.33 vs. 2.4	0.027	137	Reject H0
Management supports programs to improve health and safety regulations	4.12 vs. 2.6	0.005	137	Reject H0
Equipment is kept in safe operating condition and are easily accessible	4.6 vs. 2.4	0.025	137	Reject H0
Risk taking on job	4 vs. 1.2	0.009	137	Reject H0
Level of study vs attributes				
Supervisor encouragement to improve and safety	4.15 vs. 3.12	0.014	169	Reject H0
Hazard identification risk assessment regularly reviewed With people who do the work	4.37 vs. 2	0.036	169	Reject H0
Training needs systematically met with introduction of new technology	4.08 vs. 2	0.024	169	Reject H0
New employees trained to do the job safely	4.5 vs. 2	0.016	169	Reject H0

7.5.1.1 Race vs. Attributes

7.5.1.1.1 Race on training

The respondents were asked to indicate their perception as to whether new employees were trained in a timely and effective manner so that they could do the job safely. The probability level was 0.0016 which is less than Alpha of 0.05 (mean 4.26 vs 3.63 DF=150 MSE=0.7799487 Critical Value=3.3477 p-value 0.0016). The difference in means was statistically significant; White employees (33) had a higher mean, than black employees (118) on training of new employees.



7.5.1.1.2 Race on communication

Respondents were asked to indicate their perception on the availability of health and safety information. Black employees (118) had a higher mean, than to white employees (33) on the availability of training material. The null hypothesis for a difference < 0 was rejected, as indicated by a significance level of 0.0075 (mean 4.21 vs 3.78 DF=150 MSE=0.461457 Critical Value=3.3477 p-value 0.0075). The differences in means were statistically significant.

7.5.1.1.3 Training to React To Respond To Incident

Respondents were required to indicate how well they are trained to respond to incidents that occur in the workplace. The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.001946 (mean 4.22 vs 3.67 DF=150 MSE=0.6277025 Critical Value=3.3477 p-value 0.0019). Black employees (118) had a higher mean, as compared to White

employees (33) on being well trained as to respond to incidents. The difference in means was statistically significant.

7.5.1.2 Years in organization vs. Attributes

7.5.1.2.1 Effective meetings on health and safety regulations

Using the number of years employed in the organization, the employees were required to indicate if employers had effective meetings on health and safety regulations. The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.033 (mean 4.03 vs 3.43 DF=149 MSE=0.7463276 Critical Value=3.6745 p-value 0.033). Employees who were employed for more than 10 years had a higher mean, (4.03 vs 3.43) indicating that employers and supervisors were effective at running meetings and presenting information on health and safety regulations.

7.5.1.2.2 Training needs met with introduction of new technology.

Using the number of years employed in the organization, the employees were requested to indicate if training needs were being met with the introduction of new technology. The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.027027 (mean 4.24 vs 3.73 DF=149 MSE=0.7518066 Critical Value=3.6745 p-value 0.027). Group 1 (less than 1 yr) had a higher mean, (4.24 vs 3.73) meaning that training needs were analysed systematically for each job.

7.5.1.3 Occupation Vs Attributes

7.5.1.3.1 Employer involvement in promoting health and safety regulations

The occupational groups were requested to indicate their perception on employer involvement in promoting health and safety regulations. The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.009 (mean 4.17 vs 2.4 DF=137 MSE=1.077234 Critical Value=4.9368 p-value 0.009). A major difference was noted with shop stewards, miners and belt attendants. This was computed by a mean of 4.17 vs 2.4, the difference being statistically significant.



7.5.1.3.2 Employers focusing on productivity

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The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.042 which is less than Alpha of 0.05 (mean 4.29 vs 2.1 DF=137 MSE=1.424242 Critical Value=4.9368 p-value 0.042). The difference was noted from; Operators, Fitters and belt were the respondents were asked if employer focuses on productivity than health and safety regulations. This was computed by a mean of 4.28 vs 2.1, the difference being statistically significant.

7.5.1.3.3 Health and safety regulations effective and well implemented

Respondents were asked to indicate their perception as to whether health and safety regulations were well implemented and effective. The null hypothesis for a difference < 0 was rejected this is indicated by a significance level of 0.027 (mean 4.33 vs 2.4 DF=137 MSE=0.7846335 Critical Value=4.9368 p-value 0.027). Shop steward perception differed from that of engineers, miners, operators, belt attendant and environment officers who agreed that health and safety regulations were effective and well implemented. This was computed by a mean of 4.33 vs 2.4, the difference being statistically significant.

7.5.1.3.4 Management supports programs to improve health and safety regulations

Respondents were required to indicate their perception as to whether health and management supports programs to improve health and safety regulations. The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.005 (mean 4.12 vs 2.6 DF=137 MSE=0.9517252 Critical Value=4.9368 p-value 0.005). A difference was noted from Shop stewards, miners, operators and belt attendants on whether management supports programs to improve health and safety regulations. This was computed by a mean of 4.12 vs 2.6, the difference being statistically significant.

7.5.1.3.5 Equipment is kept in safe operating condition and are easily accessible

Respondents were asked to indicate their perception whether as to equipment was kept in safe operating condition and was easily accessible. The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.025 (mean 4.6 vs 2.4 DF=137 MSE=0.9613867 Critical Value=4.9368 p-value 0.025). Shop stewards were not of the same opinion as miners, operators and belt attendants who agreed that equipment was kept in safe operating condition and is easily accessible. This was computed by a mean of 4.6 vs 2.4, the difference being statistically significant.

7.5.1.3.6 Risk taking on job

Respondents were asked to indicate their perception as to whether they often take risks to get the job done. The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.009 (mean 4 vs 1.2) DF=137 MSE=1.711049 Critical Value=4.9368 p-value 0.009). Shop Stewards strongly disagreed whilst Pipes Tracking Ventilation, Drill Rig operators, LDV Drivers, Supervisors agreed that they often take risks to get the job done. This was computed by a mean of 4 vs 1.2, the difference being statistically significant.

7.5.1.4 Level of study vs. Attributes

7.5.1.4.1 Supervisor encouragement to improve health and safety

The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.014 (4.15 vs 3.12 DF=169 MSE=0.8521103 Critical Value=4.0768 p-value 0.014) signifying a difference in perception. Employees with a pre-matric qualification had a lower mean, (4.15 vs

3.12) than individuals who had a degree. Those with a degree agreed that their supervisors encouraged them to make changes to improve employee health and safety whilst those with a pre matric qualification did not agree.

7.5.1.4.2 Hazard identification risk and assessment regularly reviewed with people who do the work

The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.036 (4.37 vs 2 DF=169 MSE=0.8195524 Critical Value=4.0768 p-value 0.036). Employees with other qualifications such as a certificate had a lower mean (4.37 vs 2) as than individuals who had a degree. Those with a degree agreed that hazard identification, risk assessment was regularly reviewed with people who do the work, whilst those with other qualifications such as certificates did not agree.



7.5.1.4.3 Training needs systematically met with introduction of new technology.

Employees were asked to respond as to whether their training needs were being analysed with the introduction of technology. The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.024 (mean 4.08 vs 2 DF=169 MSE=0.7418883 Critical Value=4.0768 p-value 0.024). Employees with other qualifications such as certificate had a lower mean, (4.089 vs 2) than individuals who had a degree.

7.5.1.4.4 New employees trained to do the job safely

Employees were asked whether new employees were trained in a timely and effective manner to do the job safely. The null hypothesis for a difference < 0 was rejected as indicated by

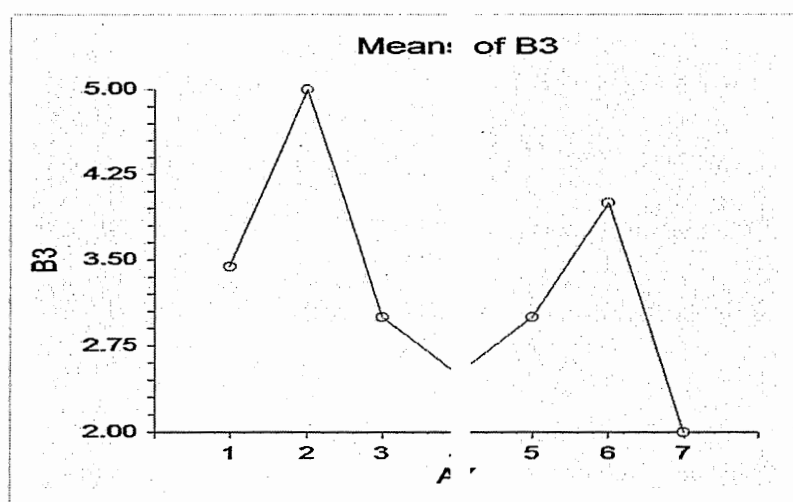
a significance level of 0.016 (mean 4.5 vs 2 DF=169 MSE=0.7660187 Critical Value=4.0768 p-value 0.016). Employees with other qualifications, such as a certificate had a lower mean (4.5 vs 2) than individuals who had a degree. Those with a degree agreed that new employees were trained in a timely effective and manner to do the job safely, while those with other qualifications such as certificates did not agree.

7.5.1.5 Nationality vs. Attributes

South Africans had a lower mean (1.43 vs 3.36) suggesting that they disagreed that management focus was on profit and productivity rather than safety. Respondents from Lesotho were not sure. Other nationalities were normally distributed. The null hypothesis for a difference < 0 was rejected this is indicated by a significance level of 0.033 (mean 1.43 vs 3.36 DF=168 MSE=1.436102 Critical Value=4.2206 p-value 0.033).

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Figure 17 employer focuses on productivity rather than safety



7.5.2. Analysis of Variance Employers (one way)

Table 9 Analysis of Variance Employers

Perception and Attribute	mean	P value	df	Decision
Age: Employees informed after investigating incidents for root causes and improvement control	4.33 vs 3	0.0005	17	Reject H0
Years in org; Plant being checked daily	4.42 vs 3.16	0.021	18	Reject H0
Focus on Productivity than Doing Job Safely	4.28 vs 2.67	0.025	18	Reject H0
Support of programs to improve health and safety	4.42 vs 3.5	0.032	18	Reject H0
Race: Race on employees aware of risks involved in their work	4 vs 3.9	0.0005	19	Reject H0
Noise control	5 vs 3.63	0.027	19	Reject H0
Noise control effective	4.2 vs 3.45	0.019	19	Reject H0
Management support for programs to improve health and safety	4.4 vs 3.72	0.022	19	Reject H0
Management involvement in promoting health and safety regulations	4.5 vs 3.72	0.025	19	Reject H0
Management involvement in implementing health and safety regulations	4.4 vs 3.81	0.031	19	Reject H0

7.5.2.1 Age

Employees informed after investigating incidents for root causes and improvement control

The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.0005 (mean 4.33 vs. 3 DF=17 MSE=3.921569E-02 Critical Value=4.3027 0.0005). This was because the perception of managers older than 56 years differed from the other age groups. The

rest of the age groups had a higher mean, (4.33 vs. 3) suggesting that employees are informed after investigating incidents for root causes and improvement control.

7.5.2.2 Years in organization

7.5.2.2.1 Plant being checked daily

The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.021 (mean 4.42 vs. 3.16 DF=18 MSE=0.5859789 Critical Value=3.9970 0.021). From the responses it appears that the mobile plant is checked daily, in good condition, well maintained and meets all standards of health and safety. The perception of those with less than one year was different from that of those with 6-10 years in the organization. This was computed by a mean 4.42 vs. 3.16.



7.5.2.2.2 Support of programs to improve health and safety

The perception of those with less than one year differed from that of those with 6-10 years in the organization. Managers with less than one year was not sure while response of others were normally distributed for whether management support programs to improve employee health and safety. The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.032 (mean 4.42 vs. 3.5 DF=18 MSE=0.3382936 Critical Value=3.9970 0.032). This was computed by a mean 4 vs 3.9.

7.5.2.2.3 Focus on Productivity rather than Doing Job Safely

Management was asked whether they focus on productivity rather than doing the job safely. The perception of those with less than one year was different from that of those with 6-10 years in the organization. Management with less than one year disagreed. The null hypothesis for a difference < 0 was rejected this is indicated by a significance level of 0.026 (mean 4.28 vs. 2.67 DF=18 MSE=0.9242725 Critical Value=3.9970 p-value 0.025). This was computed by a mean 4.28 vs. 2.67.



7.5.2.3 Race

7.5.2.3.1 Race on employees' aware of risks involved in their work

The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.0005 (mean 4 vs. 3.9 DF=19 MSE=4.736842E-02 Critical Value=3.5928 p-value 0.0005). Black managers strongly agreed that employees were aware of the risks involved in their job; White managers were not sure while coloured managers agreed. This minor difference is computed by a mean 4 vs 3.9.

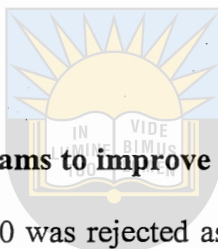
7.5.2.3.2 Noise control

On whether the noise control measures were comprehensive, coloured managers had a higher mean indicating that they strongly agreed. Black managers were not sure while white managers agreed. The null hypothesis for a difference < 0 was rejected as indicated by a

significance level of 0.027 (mean 5 vs. 3.63 DF=19 MSE=0.323445 Critical Value=3.5928 p-value 0.027). This was computed by a mean 5 vs. 3.63.

7.5.2.3.3 Noise control measures effective

On whether the noise control measures were effective, coloured managers had a higher mean indicating that they strongly agreed. Black managers were not sure while white managers agreed. The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.02 (mean 4.2 vs. 3.45 DF=19 MSE=0.4382775 Critical Value=3.5928 p-value 0.019). This was computed by a mean 4.2 vs. 3.45.



7.5.2.3.4 Management support for programs to improve health and safety

The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.022 (mean 4.4 vs. 3.72 DF=19 MSE=0.3464115 Critical Value=3.5928 p-value 0.022) indicating a difference in perception on management support for programs to improve health and safety. The perception of Black managers was different from that of white while that of coloured managers was normally distributed. Black managers were not sure and white management agreed that there was support for programs to improve health and safety. This was computed by a mean 4.4 vs. 3.72.

7.5.2.3.5 Management involvement in promoting health and safety regulations.

The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.025 (mean 4.5 vs. 3.72 DF=19 MSE=0.3516746 Critical Value=3.5928 p-value 0.025) indicating a difference in perception between black and white managers. White managers

strongly agree that they are actively involved in promoting health and safety regulations while black employers are not sure. This was computed by a mean 4.5 vs. 3.72.

7.5.2.3.6 Management involvement in implementing health and safety regulations

The null hypothesis for a difference < 0 was rejected as indicated by a significance level of 0.031 (mean 4.4 vs. 3.81 DF=19 MSE=0.2124402 Critical Value=3.5928 p-value 0.031) indicating a difference in perception between black and white managers. White managers were positive that they are actively involved in implementing health and safety regulations while black employees are not sure. This was computed by a mean 4.4 vs. 3.81.

7.6 T Test

A T-test of independent sample was used to determine whether employers and employees shared the same perception on the implementation of health and safety regulations. An Alpha level of 0.05 was set to test if there was a significant difference between the mean scores of respondents. When the p-value is less than 0.05 the mean groups are said to be statistically different. Where data was normally distributed the Equal-Variance T-Test was used and while Mann-Whitney U or Wilcoxon Rank-Sum Test for Difference in Medians was adopted when data was not normally distributed.

Table 10 T-test

T Test	Mean employer	Mean employee	T value	P value
Promotion	4.0625	4.111888	0.1861	0.057
Involvement	4.0625	4.034965	-0.1042	0.051
Progress	3.9375	3.895105	-0.1701	0.053
Resources	3.6875	4.167832	2.0552	0.067916
Corrective Action	4.0625	3.972028	-0.4161	0.069809
New Technology	3.75	3.895105	0.5993	0.091539
Training New Employees	4	4.132867	0.5367	0.083057
Discussion Of Health and Safety	3.875	3.909091	0.1424	0.052296
Equipment	3.75	3.846154	0.3618	0.064936
Risk Taking	1.9375	2.706294	-2.0291	0.042755*
Protective Equipment	4.25	4.265734	0.0730	0.051

The above table indicates that employees disagreed that they often take risks to get the job done while employers strongly disagreed to taking risks in getting the job done (mean score 2.706294 vs. 1.9375, $t=-2.0291$, $p=0.042775$).

7.6.1 T-test for promotion

The result for employers involved in the promotion of health and safety regulations reveals means not significantly different, the absolute difference being small. The p value of 0.057104 and the mean values being 4.0625 vs. 4.111888 for employers and employees respectively. The

null hypothesis for a difference $\neq 0$ could not be rejected (mean score 4.0625 vs. 4.111888, $t=0.1861$, $p= 0.057$). The difference in means is therefore statistically insignificant.

7.6.2 T-test for involvement

The result for employers' involvement in the implementation of health and safety regulations, reveal means that were not significantly different, the absolute difference being small. The p value of 0.051 and the mean values were 4.0625 vs. 4.034965 for employers and employees respectively. The null hypothesis for a difference $\neq 0$ could not be rejected (4.0625 vs. 4.034965, $t=-0.1042$, $p= 0.051$). The difference in means is therefore statistically insignificant.

7.6.3 T-test for progress

The result for employers' achieving progress in the implementation of health and safety regulations reveals means were not significantly different, the absolute difference being small. The p value of 0.053 and the mean values were 3.9375 vs. 3.895105 for employers and employees respectively. The null hypothesis for a difference $\neq 0$ could not be rejected (3.9375 vs. 3.895105, $t=-0.1701$, $p= 0.053$). The difference in means is therefore statistically insignificant.

7.6.4 T-test for resources

The result for resources being readily available and allocated to ensure health and safety revealed means that were not significantly different, the absolute difference being small. The p value of 0.067916 and the mean values were 3.6875 vs. 4.167832 for employers and employees respectively. The null hypothesis for a difference $\neq 0$ could not be rejected (3.6875 vs.

4.167832, $t=2.0552$, $p= 0.067916$). The difference in means is therefore statistically insignificant.

7.6.5 T-test for corrective action

The result for corrective action carried out quickly and putting effective and permanent solutions into place reveals means that were not significantly different, with the absolute difference being small. The p value of 0.069809 and the mean values were 4.0625 vs. 3.972028 for employers and employees respectively. The null hypothesis for a difference ≤ 0 could not be rejected (4.0625 vs. 3.972028, $t=-0.4161$, $p= 0.069809$). The difference in means is therefore statistically insignificant.



7.6.6 T-test for new technology

The result for training needs being systematically analysed with the introduction of new technology reveals means that were not significantly different, the absolute difference being small. The p value of 0.091539 and the mean values were 3.75 vs. 3.895105 for employers and employees respectively. The null hypothesis for a difference ≤ 0 could not be rejected (3.75 vs. 3.895105, $t=0.5993$, $p= 0.091539$). The difference in means is therefore statistically insignificant.

7.6.7 T-test for training new employees

The result for new employees being trained in a timely and effective manner so that employees can do the job reveals means that were not significantly different, with the absolute difference being small. The p value of 0.083057 and the mean values were 4 vs. 4.132867 for employers and employees respectively. The null hypothesis for a difference ≤ 0 could not be rejected (4 vs

4.132867, $t=0.5367$, $p=0.083057$). The difference in means is therefore statistically insignificant.

7.6.8 T-test for discussing health and safety regulations

The result for employees discussing on how to improve health and safety, reveals means that were not significantly different, the absolute difference being small. The p value of 0.052296 and the mean values were 3.875 vs. 3.909091 for employers and employees respectively. The null hypothesis for a difference $\neq 0$ could not be rejected (3.875 vs. 3.909091, $t=0.1424$, $p=0.052296$). The difference in means is therefore statistically insignificant

7.6.9 T-test for equipment

The result for equipment being kept in a safe operating condition and being easily accessible, reveals means that were not significantly different, the absolute difference being small. The p value of 0.064936 and the mean values were 3.75 vs. 3.846154 for employers and employees respectively. The null hypothesis for a difference $\neq 0$ could not be rejected (3.75 vs. 3.846154, $t=0.3618$, $p=0.064936$). The difference in means is therefore statistically insignificant.

7.6.10 T-test for risk taking

The result for often taking risks to take the job done, reveals means were significantly different. The p value of 0.042 and the mean values were 1.9375 vs. 2.706294 for employers and employees respectively. The null hypothesis for a difference $\neq 0$ was rejected (1.9375 vs. 2.706294, $t=-2.0291$, $p=0.042755$). The difference in means is therefore statistically significant.

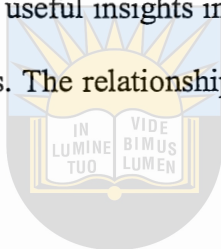
7.6.11 T-test for protective personal equipment

The result for protective personal equipment being part of daily routine, reveals means that were that not significantly different, the absolute difference is small. The p value of 0.051 and the mean values were 4.25 vs. 4.265734 for employers and employees respectively. The null hypothesis for a difference $\neq 0$ could not be rejected (4.25 vs. 4.265734, $t=0.0730$, $p= 0.051$).

The difference in means is therefore statistically insignificant.

7.7 Conclusion.

The purpose of this chapter was to provide useful insights into the perceptions of employers and employees on health and safety regulations. The relationship among variables was illustrated in figures and tables.



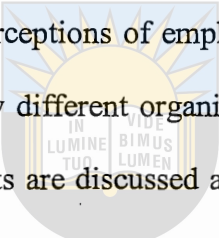
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CHAPTER 8

DISCUSSIONS LIMITATIONS OF LITERATURE AND RECOMMENDATIONS

8.1 Introduction

The previous chapter presented the findings of the research study. The chapter provided a presentation of the demographic profile of the respondents and identified the most important attributes utilized by the respondents. The data coding process provided a base from which statistically significant insights into the perceptions of employers and employees were derived. This helped to provide an insight into how different organizational groups perceive health and safety regulations. In this chapter the results are discussed and conclusions drawn regarding the hypotheses that were tested in this study. Limitations of the present study and recommendations for future research are also presented.



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8.2 Discussion

Hypothesis 1 stated employees are not well informed about the regulations of health and safety, Burke *et al.* (2006) found that as training methods became more engaging (i.e., requiring trainees' active participation), workers demonstrated greater knowledge acquisition leading to reductions in accidents, illnesses, and injuries. All methods of training produced meaningful behavioural performance improvements they concluded. Training involving behavioural modelling, a substantial amount of practice and dialogue is generally more effective than other methods of safety and health training. Real (2008) developed a theoretical frame that provided practical directions as to what shapes the safety behaviors and communication patterns of

workers in dangerous jobs are and offers insights for safety information-seeking and workplace safety. He found that those respondents with greater efficacy beliefs displayed more positive safety outcomes than those with lower efficacy beliefs. Griffin & Neal (2000) distinguished perceptions of the work environment from perceptions of performance related to safety. Perceptions of knowledge about safety and motivation to perform safely influenced individual reports of safety performance and also mediated the link between safety climate and safety performance. The results support conceptualizing the safety climate as an antecedent to safety performance in organizations. Chaves *et al.* (2009) showed that the degree of implementation is associated with the employees' level of health/safety knowledge and training and communication between the occupational safety and the health team. These findings remain unchanged after adjustment for levels of education among managers and employees.

However it is to be noted from the findings of this research that the difference in perception is with the union representatives. Shop stewards had a lower mean on equipment being kept in safe operating condition and being easily accessible, employers' involvement in promoting health and safety regulations and management's supports programs to improve health and safety regulations. Union representatives had a negative perception, indicating that they were not happy with how equipment was being kept with lack of employer involvement in promoting programs on health and safety and with a lack of managements support. Is this to say employers and unions disagree about the safety policies and why is it that the other groups could not note it? Is it that, as representatives of employees they are their spokesman and believe that more can be done to improve the health and safety of their representatives or it is a case of ignorance on the part of employees? Liu (2011) found that China's frequent coalmining accidents highlighted legislative defects that disabled enterprise unions from exercising their statutory functions

effectively in regard to occupational safety. Are South African trade unions trying to avoid this or do they seek to empower workers on health and safety?

Based on the findings of the study Hypothesis 1 is rejected because employees had a positive perception indicating that they are well informed on the health and safety regulations.

Hypothesis 2 sought to find out if employers do not abide by the provisions of the health and safety regulations and the safety objectives. As indicated in the literature management of health and safety is an area that every organization needs to take seriously. This research focuses on issues of leadership associated with the role management plays with regard to safety. It is therefore expected that if there is a strong level of management or employer involvement in matters of health and safety regulations it will be reflected by a positive response on the perception to health and safety regulations. The results suggest that the perception of the groups under study were not significantly different in perception except on risk taking (mean score 2.706294 vs. 1.9375, $t=-2.0291$, $p\text{-value } 0.042775$). This means that employers are involved in the implementation of health and safety regulations.

However, the findings of this research reveal significant differences in perception from the respective races. White employees had a higher mean on management support for programs to improve health and safety; Management involvement in promoting health and safety regulations; Management involvement in implementing health and safety regulations showing a positive response for all these. Black employees had a higher mean on; employees being aware of risks involved in their work. Is this to say that there are different training structures and that employees are treated differently along racial lines? Strong management commitment to safety can only be shown if management has the same perception. Questions need to be asked on the

difference in perception between black and white employers in dealing with health and safety matters.

8.3 Recommendations for the employer

Managing health and safety is more than simply reacting to accidents, requirements from insurers or demands from the health and safety executive, and is to recognize that proactively managing health and safety is one of the key performance indicators of success. Mearns *et al.* (2010) noted that research has supported the application of social exchange theory and reciprocity in organizations. The extent to which employees feel that their employers meet obligations regarding pay and interpersonal treatment is also related to in-role and citizenship performance (Turnley *et al.* 2003). Similarly, leader-member exchange has been found to be related to safety citizenship behavior (Hofmann *et al.* 2003). In general, these results suggest that when employers are perceived to meet their obligations, treat employees fairly, and provide valued services and benefits, employees will reciprocate with higher levels of commitment and performance. Management needs to be more involved and if an incident occurs corrective measures, not punitive ones to be are put in place so that the root cause can be identified and resolved if possible.

Barrett (2005) contends in terms of perception of the need for change within occupational settings, that behaviour at both individual and organisational levels is influenced by underlying attitudes and beliefs (Bentley & Haslam, 1998). According to Winum *et al.* (1997), strategies to implement organisational change are often rejected because principles and knowledge about the psychology of change are violated or ignored. More specifically, Armenakis *et al.* (1993)

suggested that the effectiveness with which interventions are implemented depends upon readiness to change. Thus, in order to implement changes to better the working environment safety wise management to ensure that an environment needs prepares the employees to change is created thus preventing resistance.

Key measures for successful implementation

People are key to successful implementation of health and safety regulations. This implies that people involved in the implementation process have to be:

- ✓ Informed about the implementation process
- ✓ Consulted about their needs, concerns, perceptions, attitudes and expectations
- ✓ Trained and mentored to understand and apply the regulations to their full extent

Malik (2010) found that the all accidents cannot be prevented and also cannot be stopped the occupational illness but with the effective role of management the effect of these illness and accidents should be minimize. Cohen (1977) as cited by Fernández-Muñiz, Montes-Peón, & Vázquez-Ordás, (2007), found that at firms determined to have successful safety programs, certain common factors are present, including a strong management commitment to safety as reflected by management's knowledge of the problems and their conviction that high safety standards are attainable and their effort towards those ends. Organisations should not only invest in health and safety as is supported by Kniesner & Leeth, (2004) who found that, apart from reducing injuries by encouraging greater investment in health and safety capital, safety inspections might also directly improve miner safety by identifying violations and forcing mines to rectify hazardous conditions. In order for the employer to achieve health and safety goals it is

essential that perceptions be regardless of race the same that and relations between unions and management must improve as have the same goal: to keeping the workplace incident free.

8.4 Recommendations to the employees

This research has implications for employees. They need to understand the value of regulations that are in place so as to keep the working environment safe. It highlights the importance of knowledge for it is only when one knows what health and safety regulations do that they can be realized in actual workplace policies and practices. Kitson, Harvey, & McCormack (1998) argued that successful implementation of research into practice is a function of the interplay of three core elements--the level and nature of the evidence, the context or environment into which the research is to be placed, and the method or way in which the process is facilitated.



8.5 Limitations

This research had its limitations, among them:

- Financial and time constraints hindered the research from being a nationwide one as it only focused on one platinum mine.
- To the researcher was not familiar with the mining language (Fanakalo), causing challenges in the translation of terms respondents were not familiar with.

- A larger sample size would have provided a more stringent research design, thus allowing results to be more generalisable and providing greater insight into the perceptions of the groups under study.
- Due to practical operational requirements, only a third of the workers and management staff were available at one any time to receive the perception survey.

8.6 Direction for future research

Saleh & Cummings 2011 believe that more interaction and partnership between academia, beyond the traditional mining engineering discipline, and the mining community (mining operators, researchers, and regulators), would be particularly helpful in promoting safety innovations and advancing the safety agenda of the mining industry.

- Future studies should look whether employees have the power to say no to an unsafe working environment.
- Whereas this study only focuses on a single mineral, future studies could look at the mining of different minerals of which the same regulations apply.
- Future research should also look into the impacts of poor health and safety regulations so that a holistic approach can be developed to combat the challenges of health and safety.
- Future research should also look into the changes in demographics following apartheid to see if employee composition at the top of the organization has changed and to see why things are in the way they are.
- A qualitative approach to the study can also be fruitfully applied for problem areas.

8.7 Conclusion

In this chapter the results presented in Chapter 7 were discussed and recommendations made. Despite the limitations highlighted, the research study has provided useful insight on the perceptions of the groups under study in relation to the various attributes. Hypotheses 1 was rejected and Hypotheses 2 was rejected. The hypotheses were either accepted or rejected and the literature survey contributed to improved understanding of the issues in full.



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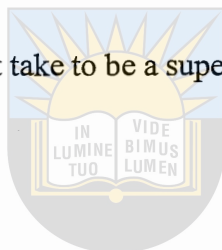
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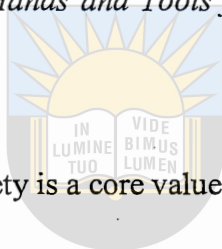
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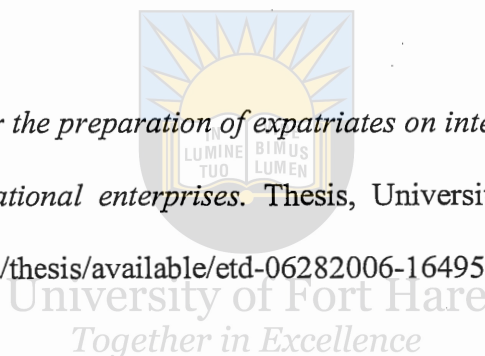
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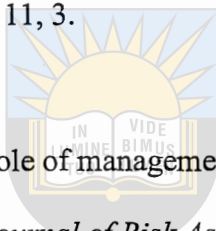
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APPENDIX A

FACULTY OF MANAGEMENT AND COMMERCE
 SCHOOL OF BUSINESS AND ENTERPRISE
 DEPARTMENT OF INDUSTRIAL PSYCHOLOGY
 PRIVATE BAG X 1314, ALICE 5700, SOUTH AFRICA
 TEL: (040) 602 2607
 MOBILE: 082 876 7129
 anel@ufh.ac.za



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Dear Sir/Madam

Request on granting access to your company for conducting research

The University of Fort Hare together with the National Council of Research, with their main aim of providing qualitative research, request if you could grant one of our master student, Hlatywayo Clifford K (200604849) in the Department of Industrial Psychology at the University of Fort Hare permission and assistance to conduct research in your company as part of the fulfillment and completion of his Master's degree.

The research will be on: **"Employer and Employee' perceptions on implementation of health and safety regulations at a selected Platinum mine, in Mpumalanga Province, South Africa"**. A proposal attached will be discussed with the relative people. It will be highly appreciated if upon granting permission you could provide us with the contact person and contact details (telephone number, cell- phone number, e-mail), should the student need some information pertaining this study.

Your assistance on the above mentioned matter will be highly appreciated. If you need any information on the student, feel free to contact me at numbers and e-mail address as on letterhead.

Yours sincerely

Mr. Andre Nel

Lecturer/ Supervisor

Department of Industrial Psychology

Student : Clifford Hlatywayo

Mobile: 078 565 6450

Email: 200604849@ufh.ac.za

APPENDIX B

RESEARCH INSTRUMENTS

EMPLOYERS QUESTIONNAIRE



University of Fort Hare
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FACULTY OF MANAGEMENT & COMMERCE

DEPARTMENT OF INDUSTRIAL PSYCHOLOGY

RESEARCH QUESTIONNAIRE FOR MANAGEMENT IN THE PLATINUM MINING
SECTOR.

RESEARCH TOPIC: *Employer and Employee' perceptions on implementation of health and safety regulations at a selected Platinum mine, in Mpumalanga Province, South Africa.*

Abstract

Sound health and safety regulations can be beneficial to an organization. In order for organizations to meet their goals and staff to perform to the best of their abilities there is need for a conducive environment that fosters employee health and safety wellness. On the hierarchy of needs Maslow is of the opinion that safety needs are the second most important needs. Health and safety regulations impose the general duty to the employers to provide a reasonably safe and healthy working environment, to provide protective equipment and such information, training and supervision as is necessary to ensure health and safety, and to report to an inspector any incident in which a person dies or is injured or when a dangerous situation arises. Many workers have an intuitive feeling that work in South African factories and mines are dangerous. For a union wanting to take action over hazardous work, accident statistics can be very useful to help focus campaigns on the most dangerous industries and jobs.

South African unions propose that the government should enact new health and safety regulations to compel mining companies to uphold higher safety standards and prevent avoidable mine accidents and deaths. Is this to say current legislations is ineffective or there are loopholes that can be adjusted. Is this a case in which employees are not well informed or employers simply not abiding to health and safety regulations or it's a case of ineffective health and safety regulations.

The purpose of this study is to examine employer and employee perceptions on the implementation of health and safety regulations in the platinum mining sector, of South Africa.

BIOGRAPHICAL INFORMATION

My name is Clifford Kendrick Hlatywayo (200604849). I am a master's student in the Department of Industrial Psychology at the University of Fort Hare conducting a research as a prerequisite for the completion of my degree. The research is on *"Employer and Employee' perceptions on implementation of health and safety regulations at a selected Platinum mine, in Mpumalanga Province, South Africa"* The research is solely for academic purposes and all information obtained will be kept in the strictness of confidence. Your name is not required and there is no right or wrong answer.

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Your contributions are highly appreciated

Thank you

Contact details:

Name: HLATYWAYO CLIFFORD K

Cell number: (0027) 78 565 6450

Email address: kendiehlantz@yahoo.ca or 200604849@ufh.ac.za

SECTION A: Demographic Information

(Mark with an X in the appropriate box)

1. Sex

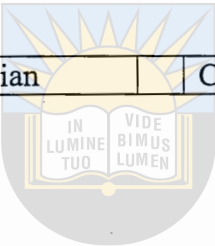
Male		Female	
------	--	--------	--

2. Age

Below 25		26-35		36-45		46-55		56+	
----------	--	-------	--	-------	--	-------	--	-----	--

3. Race

Black		White		Indian		Coloured	
-------	--	-------	--	--------	--	----------	--



Other (specify).....

4. Level of study

Pre-Matric		Matric		Diploma		Degree		Post graduate	
------------	--	--------	--	---------	--	--------	--	---------------	--

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Other (specify).....

5. Which position do you occupy?

Miner		Fitter		Shop steward	
Electrician		Boilermaker		Middle manager	
Engineer		Turner		Supervisor	
Top manager		Director			

Other (specify).....

6. Number of years in organization.

Less than 1 year		2-5 years		6-10		Above 10 years	
------------------	--	-----------	--	------	--	----------------	--

7. Nationality

South Africa		Malawi		Zimbabwe	
Swaziland		Lesotho		Mozambique	

Other (specify.....



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SECTION B: Management Perceptions

Please consider each of the following statements representing management perceptions on employee conduct on health and safety regulations.

Mark with an X in the appropriate box

Key		Strongly Disagree 1	Agree 4	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
		Disagree 2	Strongly Agree 5	1	2	3	4	5
1)	The workforce is involved in managing their own and others health and safety.							
2)	Employees are involved in writing work procedures.							
3)	Employees are informed after investigating incidents for root causes and improvement to controls.							
4)	Employees understand their health and safety responsibilities (e.g. reporting hazards, correcting others' unsafe behaviour)							
5)	Employees are fully aware of the risks involved in their work.							
6)	There is a comprehensive health surveillance programme (medical checking) in place for employees.							
7)	Work procedures / systems of work are understood and followed							
8)	There is a good sense of teamwork.							
9)	Health and safety are regularly discussed.							
10)	People believe that their supervisor or manager listens to health and safety issues raised and acts where appropriate.							
11)	Personal protective equipment used properly and effectively.							
12)	Health and safety are action plans in place at an individual or team level.							

SECTION C: Safe and healthy workplace

Please consider each of the following statements representing management perceptions on health and safety regulations in the workplace.

Key					Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
	Strongly Disagree	1	Agree	4					
	Disagree	2	Strongly Agree	5					
	Not sure	3							
					1	2	3	4	5
1)	All legal requirements understood and systematically met (Quarry regulations, MOHSW regulations, etc.)								
2)	Specified risk controls (from risk assessment records) appear to be fully in place.								
3)	Dust control measures appear comprehensive (e.g. bowring, dust collectors, spray systems, enclosure).								
4)	Dust measurement and monitoring effective and commensurate with risk (mg / m ³ within risk level for chemical content).								
5)	Noise control measures appear comprehensive (e.g. muffling, sound insulation panels, maintenance schedules).								
6)	Noise measurement and monitoring effective (dB/A thresholds, up to date noise maps and signs, personal monitoring).								
7)	Vibration has been effectively measured and controlled for all jobs where musculoskeletal disorders are possible.								
8)	Mobile plant is checked daily, in good condition, well maintained and meeting all standards of health and safety provision.								
9)	All fixed plant is checked daily, safe and well maintained								
10)	The site design is as safe as is reasonably possible (e.g. roadway layout and maintenance, turning areas, visibility, processing plant).								
11)	Geotechnical requirements are fully met and all areas checked by competent people prior to work.								

Key	Strongly Disagree	1	Agree	4	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
	Disagree	2	Strongly Agree	5					
	Not sure	3							
					1	2	3	4	5
12)	Work procedures are clear and usable, including those relating to contractors or other visitors (including locking-off, permit to work, emergency procedures as well as systems of work.								
13)	Vehicle movements are well controlled to minimise risk.								
14)	The use of signs is effective in contributing to good associated with the service.								
15)	Where hazardous substances are present, there are effective handling procedures, training, etc., to ensure safety and health.								
16)	All personal protective equipment that might be required available in sufficient quantities, well-fitting and in good condition.								

SECTION D: General views on health and safety regulations

Please consider each of the following statements representing general views on health and safety regulations.

Key	Strongly Disagree	1	Agree	4	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
	Disagree	2	Strongly Agree	5					
	Not sure	3							
					1	2	3	4	5
1)	Health and safety regulations are effective and well implemented.								
2)	Management supports more programs to improve employee health and safety.								
3)	Employees here are conscious on health and safety regulations.								
4)	We often discuss issues on how to improve health and safety regulations.								
5)	New employees undergo induction programs on health and safety regulations in the organization.								
6)	Equipment's are always kept in a safe operating condition and are easily accessible.								
7)	I often take risks to get the job done.								
8)	Protective wear is part of my daily work routine.								
9)	Health Safety rules are always enforced on this mine.								

SECTION E: Risk Identification, Training and Communication

Please consider each of the following statements representing perceptions on risk identification, training and communication

Key	Strongly Disagree 1		Agree 4		Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
	Disagree 2		Strongly Agree 5						
Not sure 3					1	2	3	4	5
1)	There is evidence of continuous improvement in health and safety regulations across the company, including root cause incident analysis.								
2)	There is a systematic approach in the implementation of health and safety regulations.								
3)	Safety management system is regularly reviewed by the employer and union, so that all managers and interested employees can contribute to system improvement.								
4)	Hazard identification, risk assessment are regularly reviewed, with involvement of the people who do the work.								
5)	There is a comprehensive and effective audit programme after an accident or incident.								
6)	Corrective action is carried out quickly, putting effective and permanent solutions into place.								
7)	With the introduction of new technology the training needs are analysed systematically, e.g. for each job.								
8)	New employees are trained in a timely and effective manner so that they do the job safely.								
9)	Health and safety communication information is readily available.								
10)	We are well trained to respond to incidents that occur in the workplace.								

SECTION F: Perceptions on employer's commitment to health and safety regulations in the workplace.

Please consider each of the following statements representing perceptions on employer's commitment to health and safety regulations in the workplace.

Key		Strongly Disagree 1	Agree 4	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
		Disagree 2	Strongly Agree 5	1	2	3	4	5
		Not sure 3						
1)	Employers (Senior management, directors and owners) are actively involved in promoting of health and safety regulations in the place of work.							
2)	Employers (Senior management, directors and owners) are actively involved in the implementation of health and safety regulations.							
3)	Employers (Senior management, directors and owners) focus more on productivity and profitability than getting the job done safely.							
4)	Employers (Senior management, directors and owners) are achieving progress in the implementation of health and safety regulations.							
5)	Employers and supervisors are effective at running meetings, adapting management approach, presenting information on health and safety regulations.							
6)	There are clear, high-level health and safety guidelines from which a programme of improvement work can flow.							
7)	Resources are readily allocated to ensure good health and safety e.g. Warning signs, safety clothing.							
8)	My supervisors encourage me to make changes to improve my health.							
9)	Health and safety objectives are effectively integrated with operational, financial, environmental, quality objectives.							

Thank you for your precious time.

EMPLOYEES QUESTIONNAIRE



University of Fort Hare
Together in Excellence

FACULTY OF MANAGEMENT & COMMERCE

DEPARTMENT OF INDUSTRIAL PSYCHOLOGY

RESEARCH QUESTIONNAIRE FOR EMPLOYEES IN THE PLATINUM MINING SECTOR.



RESEARCH TOPIC: *Employer and Employee' perceptions on implementation of health and safety regulations at a selected Platinum mine, in Mpumalanga Province, South Africa.*

Abstract

Sound health and safety regulations can be beneficial to an organization. In order for organizations to meet their goals and staff to perform to the best of their abilities there is need for a conducive environment that fosters employee health and safety wellness. On the hierarchy of needs Maslow is of the opinion that safety needs are the second most important needs. Health and safety regulations impose the general duty to the employers to provide a reasonably safe and healthy working environment, to provide protective equipment and such information, training and supervision as is necessary to ensure health and safety, and to report to an inspector any incident in which a person dies or is injured or when a dangerous situation arises. Many workers have an intuitive feeling that work in South African factories and mines are dangerous. For a union wanting to take action over hazardous work, accident statistics can be very useful to help focus campaigns on the most dangerous industries and jobs.

South African unions propose that the government should enact new health and safety regulations to compel mining companies to uphold higher safety standards and prevent avoidable mine accidents and deaths. Is this to say current legislations is ineffective or there are loopholes that can be adjusted. Is this a case in which employees are not well informed or employers simply not abiding to health and safety regulations or it's a case of ineffective health and safety regulations.

The purpose of this study is to examine employer and employee' perceptions on implementation of health and safety regulations in the platinum mining sector South Africa.

BIOGRAPHICAL INFORMATION

My name is Clifford Kendrick Hlatywayo (200604849). I am a master's student in the Department of Industrial Psychology at the University of Fort Hare conducting a research as a prerequisite for the completion of my degree. The research is on *"Employer and Employee' perceptions on implementation of health and safety regulations at a selected Platinum mine, in Mpumalanga Province, South Africa."* The research is solely for academic purposes and all information obtained will be kept in the strictness of confidence. Your name is not required and there is no right or wrong answer.

Your contributions are highly appreciated

Thank you

Contact details:

Name: HLATYWAYO CLIFFORD K

Cell number: (0027) 78 565 6450

Email address: kendiehlantz@yahoo.ca or 200604849@ufh.ac.za

Section A: Demographic Information

(Mark with an X in the appropriate box)

1. Sex

Male		Female	
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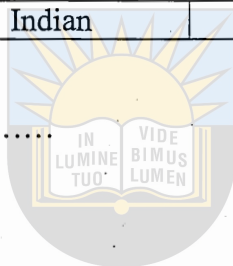
2. Age

16-25		26-35		36-45		46-55		56+	
-------	--	-------	--	-------	--	-------	--	-----	--

3. Race

Black		White		Indian		Coloured	
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Other (specify).....



4. Level of study

Pre-Matric		Matric		Diploma		Degree		Post graduate	
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Other (specify).....

5. Which position do you occupy?

Miner		Fitter		Shop steward	
Electrician		Boilermaker		Middle manager	
Engineer		Turner		Supervisor	
Top manager		Director			

Other (specify).....

6. Number of years in organization.

Less than 1 year		2-5 years		6 -10 years		Above 10	
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7. Nationality

South Africa		Malawi		Zimbabwe	
Swaziland		Lesotho		Mozambique	

Other (specify.....



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SECTION B: Perceptions on employer's commitment to health and safety regulations in the workplace.

Please consider each of the following statements representing employee's perceptions on employer commitment to health and safety regulations.

Using the scale below, indicate your choice by marking with an X in the box of your choice.

Key		Strongly Disagree 1	Agree 4	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
		Disagree 2	Strongly Agree 5	1	2	3	4	5
		Not sure 3						
1)	Employers (Senior management, directors and owners) are actively involved in promoting of health and safety regulations in the place of work.							
2)	Employers (Senior management, directors and owners) are actively involved in the implementation of health and safety regulations.							
3)	Employers (Senior management, directors and owners) focus more on productivity and profitability than getting the job done safely.							
4)	Employers (Senior management, directors and owners) are achieving progress in the implementation of health and safety regulations.							
5)	Employers and supervisors are effective at running meetings, adapting management approach, presenting information on health and safety regulations.							
6)	There are clear, high-level health and safety guidelines from which a programme of improvement work can flow.							
7)	Resources are readily allocated to ensure good health and safety e.g. Warning signs, safety clothing.							
8)	My supervisors encourage me to make changes to improve my health.							
9)	Health and safety objectives are effectively integrated with operational, financial, environmental, quality objectives.							

SECTION C: Risk Identification, Training and Communication

Please consider each of the following statements representing employee's perceptions on employer commitment to risk identification, training and communication.

Key	Strongly Disagree 1 Agree 4				Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
	Disagree 2 Strongly Agree 5								
Not sure 3					1	2	3	4	5
1)	There is evidence of continuous improvement in health and safety regulations across the company, including root cause incident analysis.								
2)	There is a systematic approach in the implementation of health and safety regulations.								
3)	Safety management system is regularly reviewed by the employer and union, so that all managers and interested employees can contribute to system improvement.								
4)	Hazard identification, risk assessment are regularly reviewed, with involvement of the people who do the work.								
5)	There is a comprehensive and effective audit programme after an accident or incident.								
6)	Corrective action is carried out quickly, putting effective and permanent solutions into place.								
7)	With the introduction of new technology the training needs are analysed systematically, e.g. for each job.								
8)	New employees are trained in a timely and effective manner so that they do the job safely.								
9)	Health and safety communication information is readily available.								
10)	We are well trained to respond to incidents that occur in the workplace.								

SECTION D: Employee general views on health and safety regulations

Please consider each of the following statements representing employee general views on health and safety regulations

Key		Strongly Disagree	1	Agree	4	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
		Disagree	2	Strongly Agree	5	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
		Not sure	3			Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
						1	2	3	4	5
1)	Health and safety regulations are effective and well implemented.									
2)	Management supports more programs to improve employee health and safety.									
3)	Employees here are conscious on health and safety regulations.									
4)	We often discuss issues on how to improve health and safety regulations.									
5)	New employees undergo induction programs on health and safety regulations in the organization.									
6)	Equipment's are always kept in a safe operating condition and are easily accessible.									
7)	I often take risks to get the job done.									
8)	Protective wear is part of my daily work routine.									
9)	Health Safety rules are always enforced on this mine.									

Thank you for your precious time.