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Fourth industrial revolution and trade unions in South African platinum mining industry

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Fourth industrial revolution and trade unions in South African platinum mining industry

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A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

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ABSTRACT

The fourth industrial revolution is unavoidable and its impact on jobs is taking centre stage across the business sector and government discussions. The labour movement in the country realises the threat of this revolution on jobs and livelihood of the working class. The South African platinum mining industry is amongst the industries that are directly affected by the Fourth Industrial Revolution.

The study is aimed at investigating the impact of fourth industrial revolution on trade unions' future sustainability and existence. An in-depth interview method was used as the main data collection method. The participants were identified using a purposive voluntary sampling method. The sample was limited to the platinum mining industry and it involved members of three dominant trade unions namely; NUM, AMCU and UASA. The data collected was analysed based on specific themes that were identified during the study.

The study findings indicated there is need for trade unions to focus on training and development of their members in order to remain relevant and sustainable. There is need for change of leadership qualities even though it could not conclude on the proposed visionary leadership style. Trade unions need to be adaptive organisations in order to survive the impact of Fourth Industrial Revolution. There's need for them to form partnerships with employers and focus on training and development of their members.

DECLARATION

I, **Luxolo Mpafa**, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Luxolo Mpafa

Signed at ……**Johannesburg**……

On the ……**22nd**…….. day of ……**October**…… **2018**

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LIST OF ABBREVIATIONS

AMCU: Association of Mining and Construction Union

AMU: African Mine Workers Union

BU: Business Unionism

CEO: Chief Executive Officer

CNC: Computerized Numerical Control

GDP: Gross Domestic Products

ICs: Industrial Councils

ICA: Industrial Conciliation Act

NEDLAC: National Economic Development and Labour Council

NOB: National Office Bearer

NUM: National Union of Mineworkers

PwC: PricewaterhouseCoopers

RU: Radical Unionism

ROB: Regional Office Bearer

RAIR: Robotics, Artificial Intelligence and Automation

SMU: Social Movement Unionism

TU: Trade Union

UASA: United Association of South Africa

1IR: First Industrial Revolution

4IR: Fourth Industrial Revolution

CHAPTER 1. INTRODUCTION

1.1 Purpose of the study

The purpose of this research is to determine the impact of Fourth Industrial Revolution (4IR) on trade union sustainability in the South African platinum mining industry. The South African platinum mining industry comprises, mostly, of low skilled employees. These employees are underprepared for anticipated technological changes that could result in them being declared redundant. As a results of the emergence of 4IR, more people are likely to lose their jobs to robots, technology, artificial intelligence, etc. hence the likelihood of trade unions fighting for members is becoming more urgent. Hodgson G. M (2016) cited the possibility of economic and social-inclusion conflicts between skilled and unskilled workforce. This imminent scenario poses serious challenges to the existence and sustainability of trade unions in the platinum mining industry.

The 4IR will lead to the mechanisation of most mining operations (Hattingh et al, 2010; Ivanov, 2017). As a consequence, only skilled employees will be absorbed by the system. Working conditions and environments, which trade unions used as a tool for recruitment, are no longer going to matter to majority of potential trade union members.

The continued resistance, by trade unions, to technological changes in South Africa's platinum mining industry is as a result of trade unions' failure to conceptualise innovative technologies as challenges that require research, education and training. To remain relevant, trade unions will have to advocate for training of their members in anticipation of the impact of the 4IR (Hlatshwayo & Buhlungu, 2017). For this to be achieved, the study argues that trade unions need leaders who will embrace technological changes and derive strategies to respond to the imminent 4IR in order to remain in existence and be sustainable.

1.2 Context of the study

The Union of South Africa was formed in 1910, it formally exclude black workers from any political expression and racialized the structure of the labour market. Bhorat et al (2014) realises the impact of the 1911 Mines and Works Act, which reserved skilled mining jobs for whites only, on the current workforce in the mining industry. Due to this setup, the mining industry continues to experience a huge skills gap amongst its workforce. Hlatshwayo M (2017) noted the need to restructure skills and create more skilled workforce in order to deal with technological changes. Between 2013 and 2017, about ten thousand (10 000) mine employees were granted apprenticeship as means of skills development (Chamber of Mines' report, 2017)

Trade unionism in the South African mining industry started during the 20th century. The core foundation of collective bargaining legislation in South Africa was the Industrial Conciliation Act (ICA) of 1924, which provided for the voluntary establishment of permanent collective bargaining institutions, namely Industrial Councils (ICs), by employers' organizations and registered non-African trade unions (Godfrey et al, 2010). The formation of African Mine Workers Union (AMWU) in 1941 was a turning point in the South African labour market. Black mine workers discovered a need to organise themselves in order to fight for improved working conditions and defend their rights in the workplace.

An increase in global competitiveness has led to investment in technologies and process improvements to drive productivity. This has led to changes in the nature of the trade unions. Industrial restructuring, growth in flexibility, changes in workplace practices and an increase in job insecurity have a huge effect on trade unions' ability to organise workers

According to Hyman (2001), some trade unions focused on different "classes" hence adopting radical unionism (RU), some focused on "markets" hence adopting business unionism (BU) and others focused on the "society" hence adopting social-movement unionism (SMU).

The technological changes will have a fundamental influence on the working environment of the future (Lars et al, 2015)

The South African mining sector contributes about seven percent (7%) towards the country's GDP (Stats SA, 2017). It grew for about 12.8% in the first quarter of the year 2017 (Stats SA, 2017). According to the Chamber of Mines' report (2017) the platinum mining industry is responsible for about 172 444 direct and indirect jobs in the country. It is one of the industries that are bound to be impacted by the fourth industrial revolution as the mines intend to mechanise in pursuit of low production costs and safe operating environments.

Hattingh et al (2010) notes that in South Africa, many platinum, chrome and manganese mines are using trackless mechanized mining equipment of continually increasing engineering sophistication. Mine mechanisation is the important strategy in design and operation of modern mines. Its main objectives is to improve safety in the mines and to reduce mining costs. Technology remains a decisive element in determining the size and character of the workforce. For example, in the case of platinum mining industry, the workforce was reduced by close to 26 000 workers between years 2012 and 2016 (Chamber of Mines' report, 2017).

The replacement of manually powered hammer-and-chisel drilling with rotary percussive rock drills (Hattingh et al, 2010) changed the character of the workforce from predominantly "blue-collar and unskilled" to one that is dominated by semi-skilled and skilled workers operating in a highly automated production environment.

As a consequence, trade unions have had to focus on recruiting high-earning and skilled workforce that is not easily convinced to join trade unions. The Chamber of Mines report (2016) indicates an average 16, 4% increase in employee earnings between 2005 and 2016.

1.3 Problem statement

1.3.1 *Main problem*

The impact of the fourth industrial revolution on job losses in platinum mining is of concern to trade unions. Job loses lead to reduced workforce and subsequent membership loss for trade unions. Ratna and Kaur (2012) noted that a more unionised workplace has potential for increase in productivity. Job losses may result in uncertainties which might have negative impact on productivity and profitability of the platinum mining industry.

Daud and Tumin (2013) believe that during periods of uncertainty, organisations should adopt “participative management style” to improve employee satisfaction and productivity. Employees join trade unions to satisfy their needs (Daud & Tumin, 2013).

The emergence of technological changes poses serious challenge to the existence and sustainability of trade unions. The trade union members need to change their attitudes and approaches towards their employers through application of scientific management method (Evangelopoulos, 2011).

In the midst of ever changing working environments, the scientific management theory remains relevant for the organisation’s future sustainability and existence (Sarker & Khan, 2013).

To remain strong and relevant, trade unions will not only have to defend the interests of workers, but also respond comprehensively to technological changes.

1.3.2 *Sub-problems*

Sub-problem 1: The first sub-problem concerns providing skills development and training, particularly with regards to finding ways to invest in technological skills development.

Training of employees for the sake of compliance to mining charter is not the solution. Workforce need to be trained on skills that will guarantee future employment as a result of fourth industrial revolution. This sentiment was also emphasised by Hlatshwayo (2017), who argued that trade unions' failure to acknowledge technological changes as a subject that requires research, education and organisational capacities is posing serious challenges to their future existence and sustainability.

Sub-problem 2: The second sub-problem is finding ways to source and develop visionary leadership from trade union leaders. Trade union leaders can no longer be ignorant of the impact of the imminent fourth industrial revolution. They need to derive new mechanisms of attracting skilled workers into trade unions.

Sub-problem 3: The third sub-problem concerns the union's ability to deliver quality services to members. The platinum mining industry has experience a decline in total membership of trade unions.

This decline is largely attributed to poor service delivered to members by their trade unions of choice. Uys (2011) revealed that existence of trade unions in the future is dependent on the quality of their service to members. In agreeing, Ratna and Kaur (2012) also noted that membership service contributes to the satisfaction of trade union members.

Sub-problem 4: The fourth sub-problem is the employer's attitude towards technological innovations and improvement. In the mining industry, technological changes improve working conditions (Hattingh et al, 2010) and it should upskill the workforce. The employer's willingness to upskill the workforce with regard to operating the new technologies will be useful for the existence of trade unions.

1.3.3 *Objective of the study*

Based on the problems identified, the study's main objectives will be to:

1) Evaluate whether trade union leaders understand the concept of 4th Industrial Revolution.
2) Assess whether trade unions are aware of the impact of 4th Industrial Revolution on their existence
3) Determine the state of readiness of trade unions for the 4th Industrial Revolution
4) Assess structural changes trade unions will make to deal with 4th Industrial Revolution.
5) Assess whether trade unions are able to use the 4th industrial revolution to improve their service to members
6) Assess whether employers make use of 4th industrial revolution to minimise influence of trade unions

1.4 Significance of the study

The theory suggests that the fourth industrial revolution is imminent and is going to change the way businesses are conducted. The platinum mining industry is highly unionised and has experienced disagreements between trade union leaders and business managers.

These disagreements have resulted in delays on implementation of significant projects. Willis, Dixon, Cox, and Pooley (2004), stated that when mines introduce new technology they need to consult with their employees otherwise the new technology is bound to fail without internal acceptance. During the change management process communication is vital and most employees communicate freely through trade unions (Odhony & Omolo, 2014).

Delays in implementation are mostly caused by lack of understanding and insufficient information about the new technology being introduced. Trade unions continue to fight for their members through advocating for improved working conditions and salaries. They have not yet conceptualise the impact of technology on their future existence. This needs to change as changes happen at a faster pace and require leaders who can simultaneously think and decide on future plans (Pryor et al, 2008)

The study will provide guidance to the impact the fourth industrial revolution will have on trade unions. Understanding this impact will assist trade unions to re-evaluate their role in the industry and determine strategies that might assist them to defeat challenges posed by 4IR. This study will benefit both trade unions and mining companies to identify calibre of leaders that will be needed in the future. Yordsala, Tesaputa and Sri-Ampai (2014), concluded that future organisation will need leaders with vision and who possess high levels of flexibility. They further noted that future leaders should show readiness for technological changes. With visionary leaders at the helm of both trade unions and mining companies, disagreements could easily be resolved. This will lead to speedy implementation of innovative technologies for maximum benefit of all stakeholders.

1.5 Delimitations of the study

The study is about the impact of fourth industrial revolution on trade unions. Knowing that the 4IR impacts trade unions across all sectors, the study is limited to the platinum mining industry in South Africa. Looking at the geographical spread of the platinum belt, the study only focuses on the Rustenburg area in North West province. Participants are drawn from three platinum mining companies namely; Anglo platinum, Sibanye Stillwater and Lonmin Platinum. Leaders and members of NUM, AMCU and UASA which are the big three recognised trade unions voluntarily participated in the study.

1.6 Definition of terms

1. **AMCU:** A splinter trade union from NUM. it is currently a majority union in the platinum belt.
2. **GDP**: It is the monetary value of all the finished goods and services produced within a country's borders in a specific time period, usually annually
3. **Fourth Industrial Revolution**: Schwab, K (2015) described the fourth industrial revolution as the current and developing environment in which disruptive technologies and trends such as the Internet of Things (IoT), robotics, virtual reality (VR) and artificial intelligence (AI) are changing the way we live and work.
4. **IndustriAll**: A global trade union of manufacturing and mining workers
5. **Marikana Massacre**: The year 2012 killing of 34 striking mine workers by South African police in Marikana.
6. **Mechanisation**: the process of automating work in the mining industry
7. **NUM**: A once dominant trade union in the South African mining industry. It lost its majority status to AMCU in 2012
8. **RAIA**: Robotics, Artificial Intelligence and Automation. The technological changes that are taking place.
9. **Shop steward**: An employee who is a trade union member responsible for representing fellow employees in a workplace
10. **UASA**: The third biggest trade union in the platinum belt that mostly represents employees in the supervisory bargaining category.

1.7 Assumptions

The study is based on trade unions' view on the impact of 4IR. It is assumed that all participants will respond based on personal experiences rather than organisational views. This will ensure broader perspective on the concept under research. All identified participants are assumed to be knowledgeable about the concept under research. This will ensure credible and reliable outcomes. All participants participated voluntarily without any perceived ideas about either the researcher or the desired outcome of the research.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

The literature review will cover the background of industrial revolution, the fourth industrial revolution and leadership. The background gives a brief explanation of industrial revolutions starting from the 1IR to the 4IR. The 4IR is discussed into details in the context of mining industry. The discussion leads to identification of key focus areas which are training and development. The leadership component gives two different perspectives and is linked to the current leadership styles of trade union leaders. The discussion concludes by identifying kind of leadership that might be needed in the era of 4IR.

2.2 Background discussion.

In the past two hundred and fifty years since the dawn of the industrial revolution, the world has undergone a tremendous transformation (Lars et al, 2015). From the first industrial revolution up to the third industrial revolution more jobs were created. According to Schwab (2016), the first industrial revolution used water and steam power to mechanize production. The second industrial revolution used electric power to create mass production (Schwab, 2016). The third industrial revolution used electronics and information technology to automate production (Schwab, 2016).

Schwab (2016) noted that the speed of current breakthroughs has no historical precedent. When compared with previous industrial revolutions, the fourth industrial revolution is evolving at an exponential rather than a linear pace. Moreover, it is disrupting almost every industry in every country. And the breadth and depth of these changes herald the transformation of entire systems of production, management, and governance.

2.3 Fourth industrial revolution

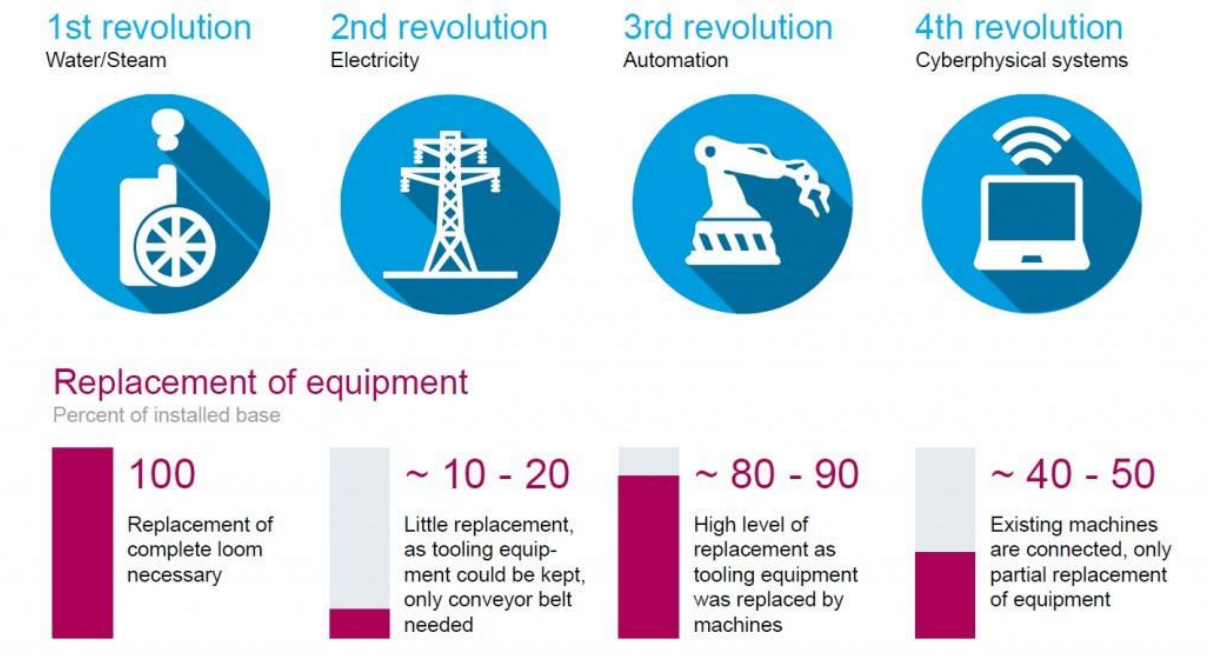
The Fourth Industrial Revolution is upon us. This revolution was presided by three other revolutions (Schwab, 2016). The first industrial revolution (1IR) started with the mechanisation of manufacturing. Bloem et al (2014) argues that the first industrial revolution occurred as a result of mechanical production on the basis of water and steam. This argument is supported by Lars et al (2015) who argue that it occurred as a result of changes in power sources. The emergence of the 1IR led to creation of specialised job (Stearns, 2012). This view was supported by Lars et al (2015), who argued that the 1IR led to a change of the required skills and knowledge needed by the workforce. The 1IR led to sustained economic growth and opportunities for employment, thus influencing social and cultural aspects of life (Lars et al, 2015).

McDougall W (2014), described second industrial revolution as the introduction of division of labour and mass production with the help of electric energy. Bloem et al (2014), described it as the introduction of conveyor belts and mass production. It is also about the use of electric power to create mass production (Schwab, 2016).

The third industrial revolution entails use of electronics and information technology to automate production. Both Bloem et al (2014) and Schwab (2016) are in agreement with the description. The internet and interconnection of work positions has become more complex and requires more accountability, flexibility, reachability, self-organisation and qualifications (Ahlers, 2016).

The fourth industrial revolution is defined as the fusion of technologies that is blurring the lines between the physical, digital, and biological spheres (Schwab, 2016). Figure 1 below indicates the history of industrial revolution.

Figure 1: **The history of industrial revolution**



Source: Premium Times 2016

Lars et al (2015) noted, in relation to manufacturing industry in German, that workers utilize more computerized machines and other forms of industrial automation. The fourth industrial revolution is transforming the global economic landscape.

Following the progress in robotics, artificial intelligence and automation technologies (RAIA), companies from various economic sectors adopt RAIA to decrease costs, generate additional revenues, provide consistent product quality, streamline operations, expand production/service capacity and improve company's competitiveness (Ivanov, 2017).

The fusion of technology across physical, digital and biological spheres is a characteristics of exponential changes in technology (Schwab, 2016). According to Schwab (2016) this fusion leads to profound shifts across all industries, marked by the emergence of new business models which affects every aspect of society.

Lars et al (2015) notes the introduction of cyber physical systems as one of the revolutionary changes in the fourth industrial revolution. The systems allow machines to communicate with each other more efficiently.

This has a potential to destroy more jobs. Hodgson G. M (2016) alluded that innovative technology is changing the character of work and the patterns of employment across industries. The reason the fourth industrial revolution will not follow the pattern of previous revolutions is because technology is changing at a much faster rate than people do. Technology tends to drive costs down while people drive costs up making it difficult for organisations to be profitable.

Naude, W (2017) emphasises that in the era of fourth industrial revolution, technologies normally complement higher-skilled workers while lower-skilled workers are replaced. This is different from earlier industrial revolutions which saw technology replacing skilled workers and compliment low skilled workers (Naude, 2017). According to Schwab (2016), about 7.1 million jobs, worldwide, could be lost through redundancy, automation or disintermediation. The massive introduction of RAIA will lead to profound economic, social and political changes, the most obvious of which is that the majority of currently existing jobs will disappear (Ivanov, 2017). This is further emphasised by Naude (2017), stating that up to 66 per cent of all jobs in developing countries are at risk.

Technological changes and advancements influence the strength and the impact of trade union together with their ability to organise. Technology is changing the manner businesses are conducted nowadays (Ramlall, 2003). It leads to business downsizing and a shift in industrial employment away from large companies (Jose, 1999). Venter (2003) argued that technological improvements have impact on employment relations as well as design, location and nature of work itself. Ahlers (2016) argued that 4IR increase job security concerns but also promotes new, flexible forms of employment.

The mining industry is one of the biggest contributors to South Africa’s gross domestic products (GDP). It contributes about seven percent (7%) towards GDP (StatsSA, 2017).

Technology, mine mechanisation, has been used in the industry for a long time. Its main objective is to improve safety and working conditions (Hattingh et al, 2010). Its potential to reduce jobs has led to conflicts between mine owners and labour movements. Akhtar and Moore (2016) noted that trade unions recognise that technological improvements do not foster conflicts in workplaces but engagement for implementation normally cause conflicts.

Willis et al (2004) noted that technological changes in the mining industry can be utilised to improve investment in education and training of workers. This would lead to positive socio-economic benefits.

Willis et al (2004) further argues that regardless of job losses in the mining industry due to mechanisation, the 4IR has potential to increase employment in secondary industries which will need to meet the higher technology demand of the mining industry. A highly technologized mining industry has potential to create more employment opportunities in other secondary industries such as manufacturing, services etc.

Use of technology in mining industry is faced with challenges such as poor implementation (Willis et al, 2004) and need for training and development (Hattingh et al, 2010). Hattingh et al (2010) suggests that advanced planning is required to ensure that people with the appropriate skills are recruited and trained for mechanization projects.

For years, production in South Africa's platinum mines has rested on the muscular shoulders of men risking life and limb to drill into the rock face with jackhammers. Stoddard (2014) noted that labour upheaval and a political push, to make the mines safer and to transform the low-wage workforce, have set in motion a drive to mechanize mines. The 2014 platinum belt strike by AMCU members dictated the employers push towards mechanization. Researchers from most universities agree that mechanization will have negative impact on trade union's bargaining power. Hlatshwayo (2017), noted that Trade unions understand that mechanization can undermine their collective bargaining power.

2.3.1 *Training and development of workforce*

Training and Development is defined as the ability of acquiring skills, knowledge and understanding with the aim of improving performance at individual and organisational levels (Tahir N et al 2014).

With the eminence of the fourth industrial revolution, training and development of the workforce is crucial. Schwab, K (2016) suggested that there is a need to shape a future that works for all of us by putting people first and empowering them.

The primary purpose of trade union leader is to protect jobs and fight against exploitation and victimisation of the workplace. Hlatshwayo, M (2017) notes that trade union leaders view technological innovations as preserve of management while their duty is to fight for better wages and improved working conditions.

The result of not engaging with technology is that unions are “caught on the back foot” when new technology is introduced (Hlatshwayo, 2014). Skilling the current workforce for future employability could be the solution for employers and trade unions. Tahir N et al (2014) also noted that training and development can assist in improving the moral of the workforce and assist employees to resonate with the goals of the employer.

Report conducted by Deloitte in 2016 discovered that skills play a major role in determining competitiveness and most organisation were concerned about the unavailability of key skills on their performance (Deloitte, 2016). According to the report by the chamber of mines (2017), the South African mining industry invested about R5 billion in skills development.

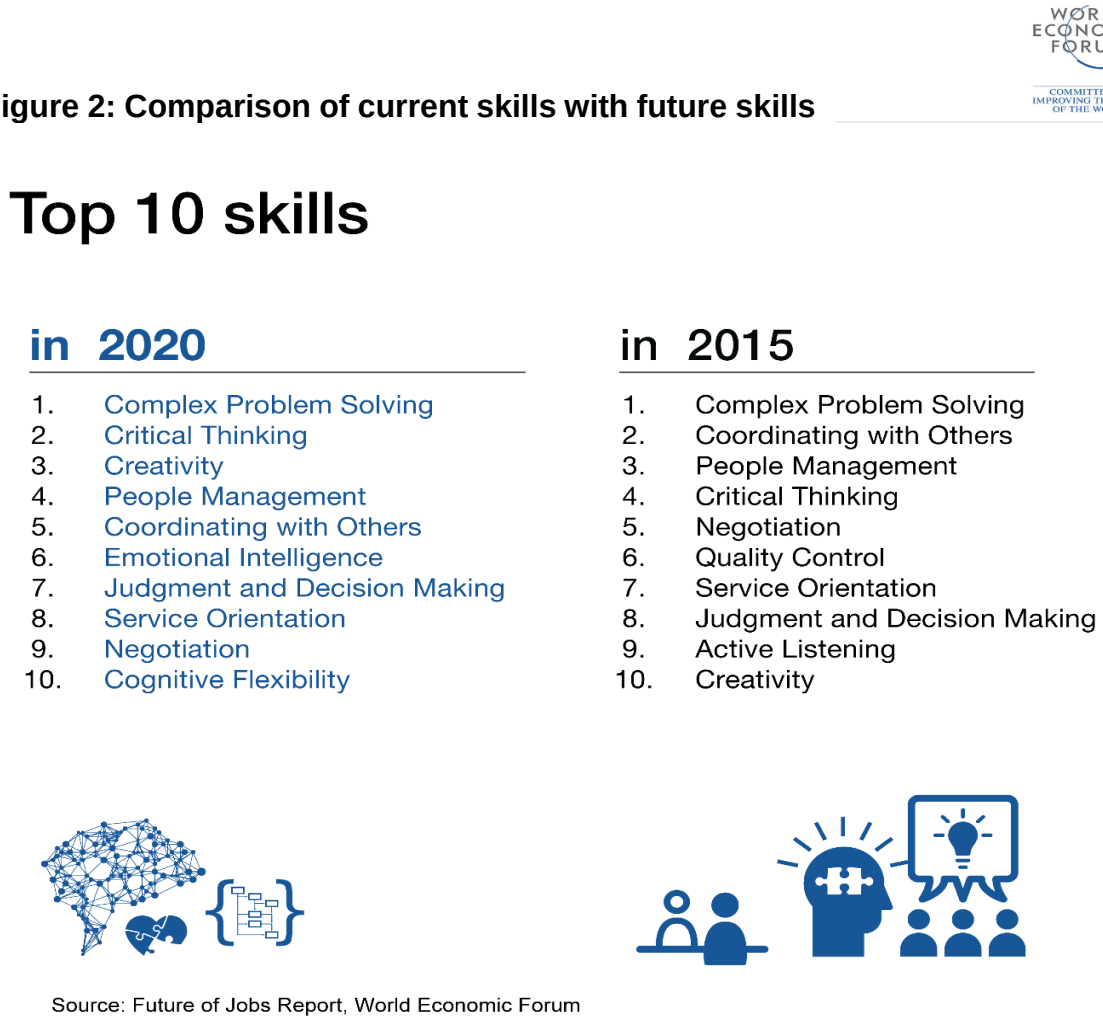
Bloom and van Reenen (2010) related technology application to management practices and skills. They argued that skilled managers are more likely to implement appropriate technologies and promote effective innovations in their organisations (Bloom & van Reenen, 2010).

The South African mining industry supported about 18,000 tertiary education learners during period 2011 to 2015 (chamber of mines' report, 2017) and more than 10,000 apprenticeships during the period 2011 to 2015. This investment could be beneficial for the workforce in mitigating the impact of technological innovations in the industry.

It is anticipated that by 2020, the fourth industrial revolution would have introduced advanced robotics and autonomous transport, artificial intelligence and machine learning, advanced materials, biotechnology and genomics, which will change today's work force (Gray 2016).

On evaluating future skills requirements, Gray (2016) discovered that about 35% of the skills that are considered important on the workforce today will no longer be needed. A survey done by the World Economic Forum's Global Agenda Council on the Future of Software and Society indicates that people expect artificial intelligence machines to be part of a company's board of directors by 2026 (Gray, 2016). Figure 2 below compares the present skills with future skills in terms of importance.

Figure 2: Comparison of current skills with future skills



Source: Future of Jobs Report, World Economic Forum

2.3.2 *Proposition 1*

For the trade unions to survive the impact of the fourth industrial revolution, they will require massive investment on training and development of the workforce. Trade unions with the capacity to conduct research on automation are able to mitigate the negative effects of technological changes on jobs and workers (Hlatshwayo, 2014).

2.4 Leadership

The phenomenon of leadership is widely researched, more especially in the field of management and organizational development. Adlam and Villiers (2003) noted leadership quality, ability, effectiveness and style as most researched aspects of leadership. In defining leadership, many scholars have defined leadership based on two different perspectives namely traditional and contemporary perspectives. The traditional perspective views leadership as mere formulation of goals and objectives, and ensuring their efficient accomplishment. According to the traditional perspective, leaders get cooperation of their followers through exercising power (Anderson, Ford & Hamilton, 1998).

In agreeing with Anderson et al (1998), other scholars argued that leadership is about interpersonal influence that get individuals to do what the leader wants to be done (Schermerhorn, Hunt & Osborn 2000). From this perspective it can be argued that leadership is about leaders getting what they want without considering the inputs of the followers. The build-up to Marikana massacre is a perfect example of this kind of leadership within trade union movements.

The contemporary definition of leadership argues that leadership is the ability of a leader to inspire confidence and support, motivate followers and managing change (Dubrin, 1998). This sentiment was also shared by Sergiovanni (1999), who perceived leadership as a personal thing comprising one's heart, head and hand. The heart component of leadership comprises of beliefs, values and vision (Sergiovanni, 1999). To explain the head component, Sergiovanni (2007) argued that it consists of individual leader's ability to utilize accumulated experience in dealing with present challenges. The leader's ability to decide and act is part of the head component of leadership (Sergiovanni, 2007).

Based on theory, one can define leadership as a process of utilizing the three leadership components – heart, head and hand, to decide and act when dealing with present challenges. Leadership definition in both the traditional and contemporary perspective seems to be having some similar characteristics.

For example, both perspectives noted that leadership does not occur in isolation. Rather, it occurs when two or more people are interacting (Anderson et al, 1998) and the leader seeks to influence the behavior of other people (Dubrin, 1998; Sergiovanni, 2007). However, to a large extent, the traditional perspective of leadership is based on exercising power over followers to maintain the status quo (Anderson, Ford & Hamilton, 1998), while the contemporary perspective is based on continuous improvement and power sharing with the followers (Sergiovanni, 2007). The traditional perspective of leadership is based on downward exercise of power and authority while the contemporary perspective seeks to develop respect and concern for the followers and see them as a powerful source of knowledge, creativity and energy for improving the organization.

2.4.1 *Leadership in the era of technology*

The 4IR has brought significant changes in the manner in which organisations are run. Today's leaders have to constantly monitor and examine their organisations' strategies and visions. Tellis (2014) noted that most organisation fail to succeed due to lack of visionary leaders. Most organisations succumb to technological changes due to leader's unwillingness to execute their visions (Tellis, 2014).

Yordsala, Tesaputa and Sri-Ampai (2014) also argued that organisations, nowadays, require leaders with vision and who possess high levels of flexibility. The trade unions opposition to mechanisation of mines is a clear demonstration that trade union leaders are not so flexible towards changes in the industry. Yordsala et al (2014) further argued that leaders should show readiness for technological changes. Most mining companies have had challenges with implementing innovative changes due to trade unions' reluctance to accept such changes. This is a clear demonstration of leaders who are not ready for technological changes. Germain V (2016) noted that today's leaders need to lead with purpose and vision. He further argued that for organisations to succeed in the 4IR, they need leaders who are authentic, transparent and able to build trust (Germain, 2016).

2.4.2 *Proposition 2*

The fourth industrial revolution poses serious challenge to the future existence of trade unions. For trade unions to exist in future, they need visionary leaders at their helm.

2.5 Conclusion of Literature Review

The fourth industrial revolution is unavoidable and now upon us. It is different from the previous revolutions. The changes will happen at a faster pace across all industries. The platinum mining industry will be highly mechanised. This will lead to reduction of jobs and acquisition of highly qualified employees. This scenario will change the labour relation in the workplace. Improved working conditions and better salaries will no longer be sufficient enough for employees to join trade unions. The new era of mechanised mining will require skilled employees. Training and development will play a major role in recruiting and/or retaining members for trade unions. Trade unions will need leaders who are flexible, inspirational and people-oriented. The top-down approach will no longer be sustainable. Leaders will have to be more consultative.

2.5.1 *Proposition 1:*

For the trade unions to survive the impact of the fourth industrial revolution, they will require massive investment on training and development of the workforce.

2.5.2 *Proposition 2:*

The fourth industrial revolution poses serious challenge to the future existence of trade unions. For trade unions to exist in future, they need visionary leaders at their helm

CHAPTER 3. RESEARCH METHODOLOGY

This section describes the methodology used in the study. It takes into consideration the research design, population, the sample and sampling method, research instrument, data collection, data analysis and interpretation, study limitations, validity and reliability and demographics of participants. The data was collected through face-to-face interviews and surveys. The research data was collected over a period of three months. The study involved participation of trade unions and mining companies within the South African platinum mining sector.

3.1 Research methodology

This study adopted a qualitative research approach with the aim of gaining in-depth knowledge and understanding about trade unions' view of how 4IR will impact on them. This approach was chosen based on Reason and Rowan (2004) who concluded that qualitative research approach is used to connect meanings to participants' views and experiences. This narrative was also argued by Trochim and Donnelly (2007) who stated that qualitative research method enables the researcher to acquire in-depth and clear understanding about the subject matter. The qualitative research paradigm requires deep understanding of the concept (Antwi &Hamza, 2015) and knowledge is acquired through concept interpretation (Rahi, 2017).

The qualitative research method allowed participants to freely express their views, about the impact of 4IR on trade unions, without being channelled. The semi-structured questions allowed the researcher to record, analyse and interpret perceived participants' views of the study. This approach was necessary because it enabled the researcher to acquire in-depth knowledge and responses of trade union leaders about the phenomena of 4IR.

3.2 Research Design

The impact of 4IR on trade unions in South Africa is a subject that is under-researched hence a qualitative research method was utilised in the study. This study employed semi-structure interviews as the means of collecting data.

This research method is utilised when there is need for clear and deep understanding of the subject being studied (Trochim & Donnelly, 2007).

3.2.1 *Population*

The study specifically focus on the South African platinum mining industry. More particularly at three companies, Sibanye Stillwater, Lonmin and Anglo Platinum. All these companies have adopted mechanisation strategy to improve safety, productivity and operational efficiency. There's high levels of unionisms at all these three companies and that was helpful for the fulfilment of research objectives.

To gather information, interviews were conducted with trade union leaders from three dominant trade unions in platinum mining industry namely AMCU, NUM and UASA. At least, fifteen (15) in-depth interviews were conducted with trade union leaders and mine managers. To increase sample size and acquire more information, employer representatives and trade union members were allowed to participate in the study through survey. A minimum of seventy (70) employees participated in the questionnaire survey.

3.2.2 *Sample and sampling method*

For the purposes of gathering relevant information from the participants, all participants had to have some understanding of the concept of the Fourth Industrial Revolution. To ensure correct selection of participants, a purposive voluntary sampling method was used. This method assisted in ensuring that participants are knowledgeable about the concept of 4IR and trade unions.

Neuman (2000) argued that this sampling method is significant for a researcher when selecting specialised participants that are difficult to reach.

According to Strydom (2008), when using this method, population characteristics form the basis of sample selection. Uys (2011) believes that purposive voluntary sampling is not for statistical representative but for selection of participants.

The sample group consisted of trade union leaders at various levels, trade union members and mining company officials. All participants passed the selection criteria listed below:

- The participant had to be an official of a company or a member and/or leader of a registered trade union.
- The participant had to be willing to participate in the study
- The participant had to be willing to be interviewed while being recorded.

During interviews, the researcher was referred to other potential participant by some of the participants. The identified potential participants agreed to participate in the research and were also interviewed. This sampling method is called snow-ball sampling. Neuman (2000) described snow-ball sampling as a technique that occurs as a results of referral by a participant to other potential participants in a network circle.

Using both sampling methods ensured that data was saturated hence the researcher could arrive at conclusion. The participants' profile is shown in the table below.

Table 1: Profile of participants

Description of respondent	Type of respondent	Total number interviewed
National Office Bearers	Trade union leaders	2
Regional leaders	Trade union leaders	5
Union officials	Trade union employees	4
Mine managers/	Mining Company officials	4

3.3 The research instrument

The study was conducted by using a semi-structured interview questionnaire. The questionnaire was divided into three (3) sections and each section had a specific issue to address in the research.

Table 2: Sections of research instrument

SECTION	SPECIFIC ISSUE	PURPOSE OF ISSUE	WHO MUST PARTICIPATE
1	Demographics	To determine the demographics of the participants	All
2	Occupational Information	To determine the experience of the participants	All
3	Affiliation Information	To evaluate the relevance of the study to the participants	All

3.4 Procedure for data collection

The study used in-depth interview and surveys as the methods of collecting data. The in-depth interview was the primary method of collecting data using semi-structured interview questionnaire. The surveys were conducted by two field workers who volunteered their services to the researcher. Initially, the researcher had targeted to conduct at least sixty (60) face-to-face interviews. This proved to be impossible as most targeted participants were either not willing to participate or not available at agreed times. Eventually, a total of fifteen (15) face-to-face interviews were conducted with trade union leaders and mine bosses. The main purpose of the interviews was to evaluate the impact of 4IR on trade unions and their state of readiness. The in-depth interviews were conducted in total of seven (07) sessions. The first two sessions were in the month of June 2018 while the remainder were in the month of July 2018.

Table 3: Sample representativeness

Participant No.	Participant Description	Interview Date	Interview Venue
Participant 1	NUM National leader	19/06/2018	Birchwood Hotel, JHB
Participant 2	NUM National leader	19/06/2018	Birchwood Hotel, JHB
Participant 3	NUM Regional leader	20/06/2018	Birchwood Hotel, JHB
Participant 4	NUM Regional leader	20/06/2018	Birchwood Hotel, JHB
Participant 5	NUM Regional leader	20/06/2018	Birchwood Hotel, JHB
Participant 6	AMCU regional leader	18/07/2018	Recreation Club, Rustenburg
Participant 7	AMCU Regional leader	18/07/2018	Recreation Club, Rustenburg
Participant 8	AMCU Official	20/07/2018	CCMA Office, Rustenburg
Participant 9	AMCU shop steward	20/07/2018	Waterfall Mall, Rustenburg
Participant 10	Mine Manager	24/07/2018	Recreation Club, Rustenburg
Participant 11	UASA Official	24/07/2018	Stay Easy Hotel, Rustenburg
Participant 12	UASA Official	24/07/2018	Stay Easy Hotel, Rustenburg
Participant 13	Mine Official	27/07/2018	Waterfall Mall, Rustenburg
Participant 14	Mine Official	30/07/2018	Golf Club, Mooinooi
Participant 15	Mine Manager	30/07/2018	Golf Club, Mooinooi

3.5 Data analysis and interpretation

Data analysis entails giving order, structure and meaning to collected data (Uys, 2011). The researcher collected qualitative data from three different trade unions and mining company representatives. All the data collected through interviews had to be transcribed before it could be analysed. King and Horrocks (2010), argued that data transcription is a necessary step before commencement of analysis.

After data was transcribed, it was then coded to identify specific themes for analysis. Saldana (2009) as cited in Uys (2011) describe coding technique as a process of intensively reading transcript and identifying themes that relate to the research question. To analyse data, all identified themes were aligned to the responses of participants. The analysis of data hugely depended on the transcripts and notes that were taken during interviews. The research was mostly conducted in English except for two occasions where participants preferred to express themselves in SeTswana.

3.6 Limitations of the study

The study identified some limitations regarding the data collection method used. The identified limitations are accepted and have no potential to compromise the results of the study. The following limitations have been identified:

- The language: The questionnaire and interviews were drafted and conducted in English and some participants had difficulties in expressing themselves in English. This resulted in longer interviews than expected and some participants leaving blank spaces in the survey questionnaire.
- Data: Some participants, particularly union leaders, were unable to express their individual views. They mostly responded in line with the views of their organisations regarding the subject matter.

- Honouring scheduled interviews: The study aimed at interviewing at least 60 people but due to unavailability of potential participants only fifteen were interviewed. Some participants wouldn't honour their scheduled interviews.
- Researcher's affiliation: Some participants were unwilling to participate due to researcher's affiliation to another trade union. The national office bearers of other trade unions were unavailable to be interviewed by a member of another trade union.
- Usage of voice recorder: During interviews, a voice recorder was used for record purposes. Some interviewees were uncomfortable and refused to be voice-recorded in some instances.

3.7 Validity and reliability

3.7.1 *External validity*

Trochim and Donnelly (2007) as cited in Uys (2011) define external validity as the extent to which research findings can be generalised. The research was strictly focused on South Africa's platinum mining industry. The sample was randomly taken from three different mining companies and trade unions. However, to ensure high external validity, the following were followed:

- Thorough description of the research context was given
- The researcher ensured a clear selection criteria for participants
- All participant were randomly selected and willingly participated

Considering the nature and scope of the research, the findings cannot be generalised to other industries and trade union formations. The views expressed in this report only represent the views of the participants.

3.7.2 *Internal validity*

Considering the nature of the research subject, participants had a potential to express organisational views as opposed to individual views. To ensure credible and believable results (Trochim & Donnelly, 2007), the researcher had to ensure the following:

- The anonymity and confidentiality of the participants were guaranteed before they could participate in the study.
- The objectives of the study and the role of the researcher were clearly explained to all participants so as to build trust relationship
- All perceptions and uncertainties were clarified to participants before commencing with interviews.

3.7.3 *Reliability*

Trochim and Donnelly (2007) as cited in Uys (2011), describe reliability as the process of ensuring that one would obtain the same results if one would make the same observation twice. The study used qualitative research method hence its reliability could be ensured by taking dependability into account. The data was collected through interviews and surveys until it was saturated. All participants willingly participated in the study. The chosen sampling method and selection criteria ensured that participants had sufficient knowledge about 4IR and trade unions.

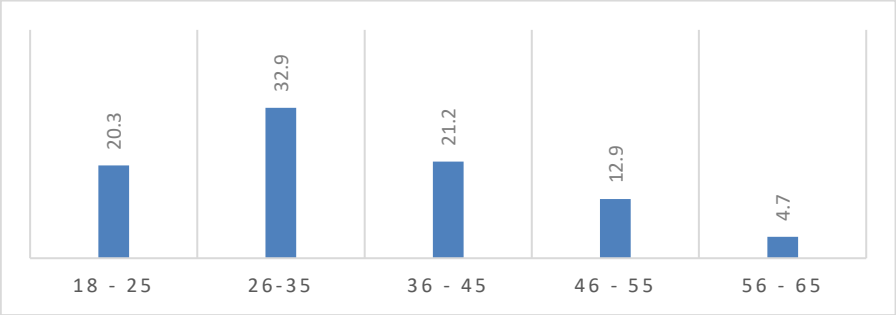
3.8 Demographic profile of respondents

The study targeted mine workers who are either affiliated to or knowledgeable about trade unions. The population sample was characterised based on age, gender, race, nationality, academic qualification, employment status and trade union affiliation.

- Age

  Majority of participants were between the ages of 18 and 35. This was expected considering the fact that mining companies recruit youngsters. The results are represented in figure 3.

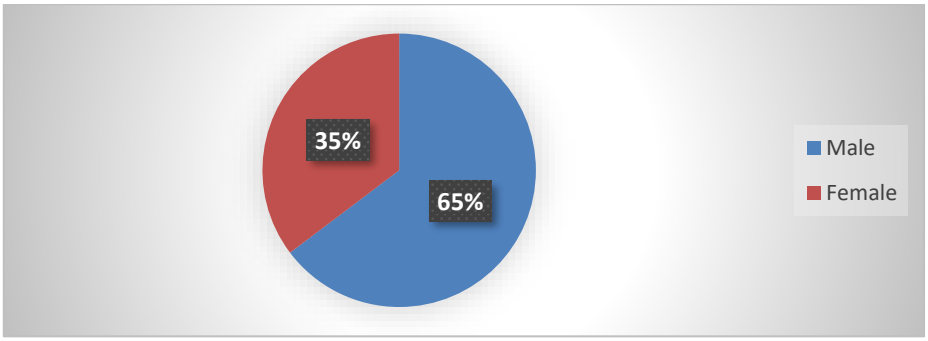
Figure 3: Age category of participants (%)



- Gender

  The mining industry is historically dominated by males. It was expected that majority of participants would be males. The female participants exceeded the targeted figure of 25 percent (25%). Figure 4 below shows the participants' percentage figures in terms of gender.

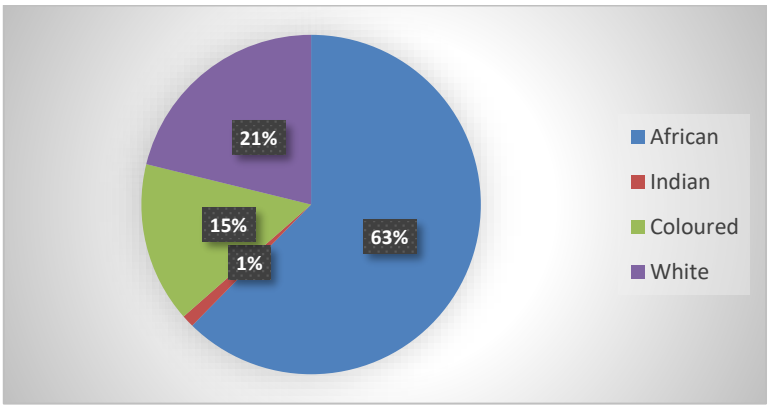
Figure 4: Gender of participants (%)



- Race

  The labour laws in the country force companies to recruit based on employment equity. Even though race had no impact on the study, it was important to consider sample from different races. Figure 5 below represents racial demographics of the sample.

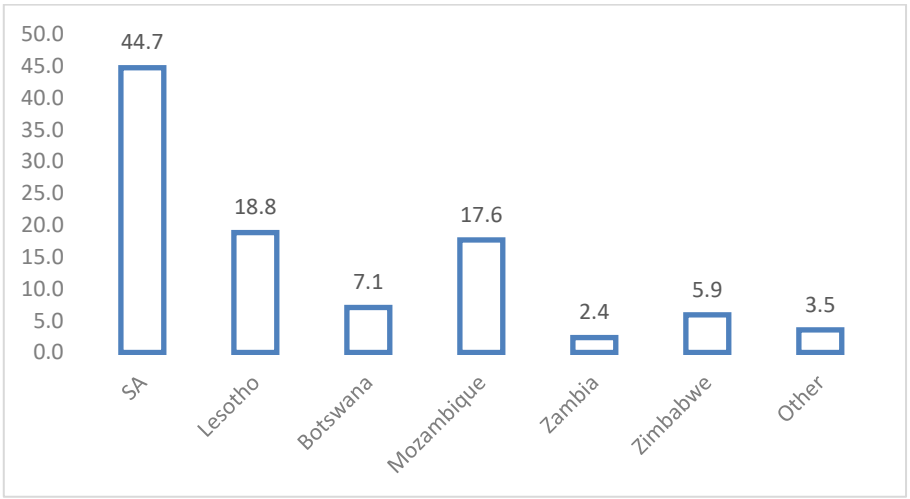
Figure 5: Race of participants



- Nationality

  Historically, the mining industry recruited cheap labourer from various African countries. Most of the labourers had no formal education hence 4IR would have direct impact on them. Only 45% of the participants are South African nationals.

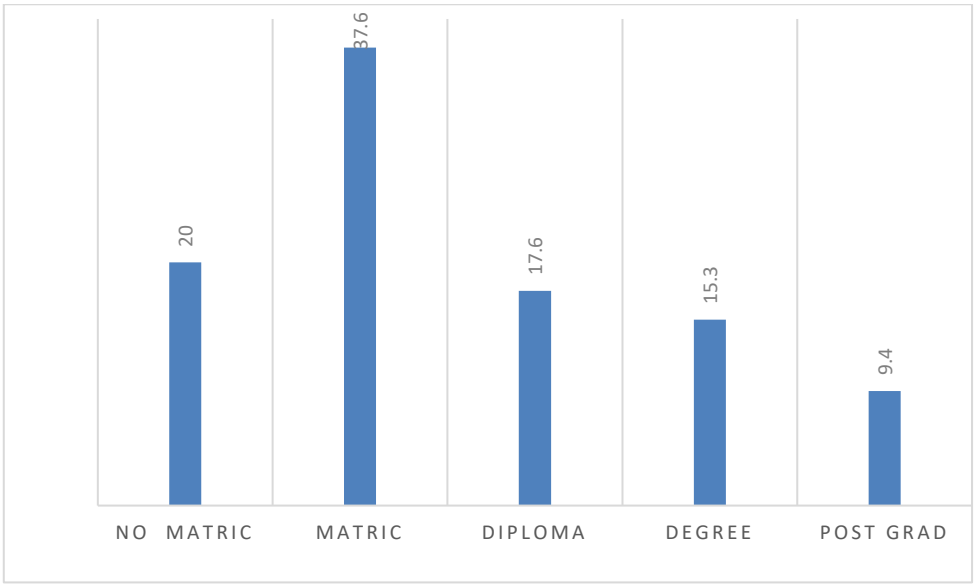
Figure 6: Nationality of participants (%)



- Academic Qualification

  The participants' academic qualification is crucial for the purposes of the study. Theory suggest that the 4IR will require skilled employees. Only 20% of the sample had no matric qualification.

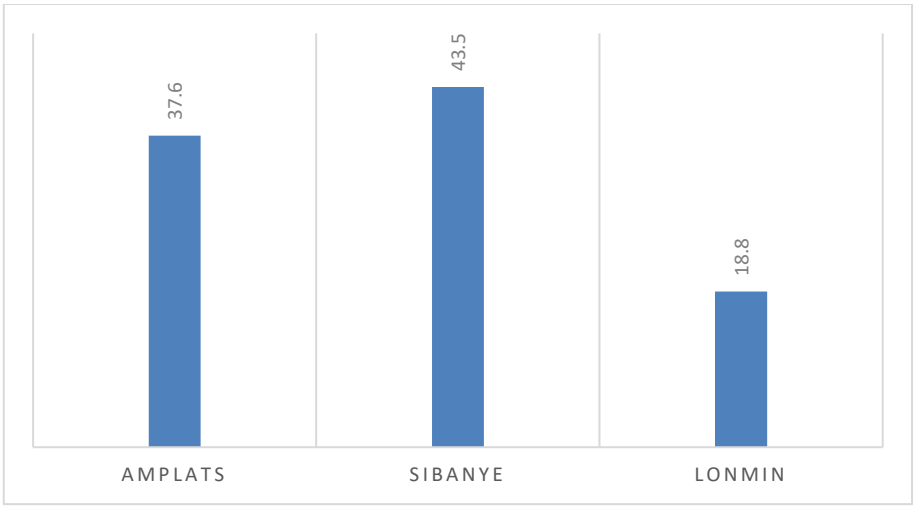
Figure 7: Academic Qualification of participants (%)



- Employment status

  Employment status was to ensure that participants fairly represents the sample population.

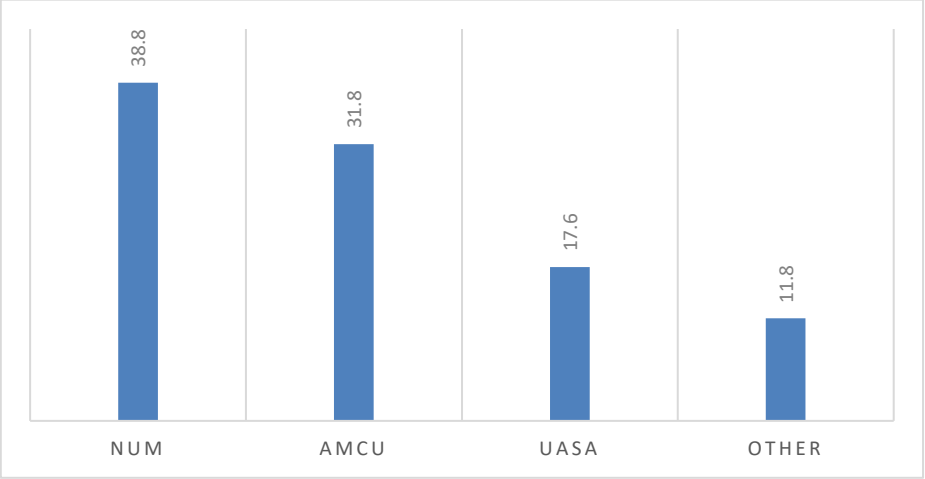
Figure 8: Employer Representation (%)



- Trade union affiliation

  For purposes of fairly representation it was important for all trade unions in the industry to be accommodated. Focus was on NUM, UASA and AMCU who are the big three trade unions in the sector. However, some participants were either not affiliated or affiliated to different trade union.

Figure 9: Trade union representative (%)



CHAPTER 4. PRESENTATION OF RESULTS

4.1 Introduction

This chapter deals with the presentation of results as obtained from participants. The main objective of the study was to determine the impact of 4IR on the sustainability of trade unions. The results focused on the trade unions' inward and outward analyses. The inward analysis component is used to assess the state of readiness of trade unions for 4IR. On the other side, the outward analysis is used to determine trade unions' understanding of the concept of 4IR. All results are presented based on themes related to each proposition.

4.2 Results pertaining to proposition 1

The first proposition of the study argues that for trade unions to survive the impact of the fourth industrial revolution they will require massive investment in training and development for their members. The findings are grouped into three themes and four sub-themes. These findings are based on the participants' observations in their perspective workplaces. Table 4 represents the themes and sub-themes as well as brief explanation of themes.

Table 4: Themes pertaining to proposition 1

Theme	Description of theme	Explanation
1	Technological changes in the workplace	To determine how much are companies transforming towards technology. Participants noted the industries desire to mechanise most operations.
2	Employer's role in enforcing technological changes	To assess whether employers have embraced technological changes as the new way of doing business. Participants are of the view that highly mechanised mines weaken bargaining power of trade unions.
Sub-theme 2.1	Cost reduction	The participants are of the view that technology reduces operating costs thereby increasing opportunities of operational expansion. However, there's a strong view that employers tend to invest more on machine than on people.
Sub-theme 2.2	Skills development	Majority of participants view skills development as a necessity for future employment. Their biggest fear is the behaviour of skilled employees towards trade unions. Currently, skilled employees are reluctant to join trade unions
Sub-theme 2.3	Women empowerment	Most respondents view technology as a catalyst towards women empowerment. They argue that most women tend to be reluctant to join trade unions. This is a serious threat to sustainability of trade unions in the industry
Sub-theme 2.4	Job losses	Trade unions believe that technological changes bring unemployment hence threatening existence of trade union movement
3	Noticeable benefits of technological changes	Participants agreed that technology has improved production and safety of employees in the workplace. Some participants are looking at ways of using technology to their advantage.

Theme 1: Technological changes in the workplace

From the responses of participants it was apparent that technological changes in the workplace was extremely dominant. The participants claimed that there has been a massive shift towards technology. Below are some of the views of participants:

"*Every platinum producer wants to mine safely and efficiently. Currently, mechanisation makes it possible for the mining companies to achieve their vision of zero-harm and cost effective production*" ***NUM regional leader***.

"*Since the introduction of mechanisation, we have experienced a decline in workforce, companies employ educated people from universities and are pushing those who have been here since 1990s to take VSP (Voluntary Separation Package) and never replace them. As trade unions we are not happy about that*" ***NUM national leader***.

Theme 2: Employer's role in enforcing technological changes

The role of employers in enforcing technological changes is viewed as weakening trade unions. There was a wide range of factors that were identified as contributing to weakening of trade unions. These factors were arranged into four sub-themes.

Sub-theme 2.1: Cost reduction

Majority of the participants expressed their dissatisfaction with consequences of cost reduction. Below are the quotations from three participants:

"*Companies emphasises the importance of reducing operating costs but they hardly incentives employees for their efforts. This makes us [trade unions] look weak and unable to fight for our members*" ***UASA Official.***

AMCU Regional leader said "*Our members used to work excessive hours to compensate for the peanuts they get paid, now with this new cost reduction story they are not allowed to work overtime. This is causing us problems, we fight everyday with our members*". Similarly, a Mine Manager elaborated "*The concept of cost reduction has caused tensions between unions and management. Unions feel denied their hard-earned bonuses, in meetings one has to be careful in mentioning cost-reduction as it might spark unnecessary argument*".

Theme 2.2: Skills development

All participants agreed that the workforce needs to be developed. However, there were different views as to who benefits from skilled workforce – trade unions or mining companies? Nevertheless, skills development was viewed as a benefit for individual worker/member. Below are some of the quotations from participants:

"*Re-skilling is what we stand for, companies need to send our members for training so that they can be employable. We all benefit from this*" ***NUM National leader*****.**

"*Even though we would like to see our members trained, they mustn't forget who fought for their training. Sometimes people leave us after getting promoted*" ***AMCU Steward***

"*Training and development is our priority, especially when there's new machinery to be used. We all benefit from skilled workforce*" ***Mine Manager***

Theme 2.3: Women empowerment

Technology in the industry is viewed as improving women empowerment. This is phenomenon trade unions are proud of even though some believe that this poses serious challenges.

NUM Regional leader said "*machines have balanced workload in the industry hence we see significant improvement in women entering the industry. We are happy about that, it's what we struggled for even though majority of them [women] chased us away in 2012*"

AMCU Regional leader said "*With these machines, there's no more job for man only. We all do the same job. We like seeing women in the industry even though most of them do not care about unions. They just want to work and go home*"

Theme 2.4: Job losses

Technological changes have led to job losses. Job losses give participants sleepless nights as they tend to lead to community unrest. All participants were concerned about job losses due to mechanisation in the industry.

"*I am yet to see mechanisation that doesn't lead to job losses. In every mine where there has been mechanisations, there's always retrenchment and this is bad for us*" ***NUM Regional leader***.

Theme 3: Benefits of technological changes

All participants agreed that introduction of technology has brought some much needed benefits in the mining industry. They, however, indicated the threats brought by these benefits to trade union movement.

NUM National leader, for example, noted "*Since the introduction of new mining technologies, we have noticed a decline in number of fatalities as compared to Gold sector*". The participant elaborated further on the matter "*Improved working conditions means irrelevance of trade unions in that aspect. Remember, our recruitment strategy has always been around working conditions and better wages*"

Echoing the same sentiments as the first participant, another participant had the following to say "*Unlike before, there's more literate employees and much improved working conditions. People can decide for themselves now…they no longer need unions to tell them what to do*" ***Mine Official***.

4.3 Results pertaining to Proposition 2

The second proposition of the study was about the kind of leadership needed in the future. It argued that the fourth industrial revolution poses serious challenge to the future existence of trade unions and therefore trade unions will need visionary leaders to survive. Likewise, the findings are grouped into different themes and sub-themes based on participants' responses. Table 5 represents the themes.

Table 5: themes pertaining to second proposition

Theme	Description of theme	Brief explanation
1	Trade Unions' view on 4IR	The participants view 4IR as a challenge to trade unions.
2	The future of trade unions	Majority of participants are optimistic about the future of trade unions
Sub-theme 2.1	Specialisation	The most popular view is that future trade union members will be very sophisticated and will require different approach.
Sub-theme 2.2	Weakened collective bargaining	The majority of participants are concerned about the possibility of weaker collective bargaining
3	Future levels of unionism in the sector	There are two very strong views about the subject. Participants are divided between the two sub-theme
Sub-theme 3.1	Increase in membership	A significant number of participants believe that there'll be increase in trade union numbers
Sub-theme 3.2	Decrease in membership	Even though not in majority, a sizeable number of participants are not so optimistic about the future members. They,

Theme 1: Trade union's view on 4IR

The participants showed sufficient knowledge about 4IR. They believe that the 4IR brings new challenges for trade unions. There's a strong view that trade unions should transform to accommodate modern day challenges.

For example, ***NUM Regional leader stated*** "*The mechanisation caught us off guard around year 2002, we can't say we don't know how to deal with technological changes now. Otherwise we may as well close shop and leave*". This sentiment was echoed by another participant who said "*Technology is here, all we have to do is to adapt and transform*" ***UASA Official***

Theme 2: Future of trade unions

Majority of participants expressed little optimism about the future of trade unions. From their expression there are two sub-themes that emanated

Sub-theme 2.1: Specialisation

Participants emphasised the amount of specialisation brought by technological changes. They believe that trade unions need to undergo structural changes to remain relevant. ***NUM National leader noted*** "*Since the introduction of machines, companies have attracted skilled employees. This had negative impact on our membership figures*". Another participant shared a similar view

"*These machines are operated by educated people who earn lot of money. They don't care about unions…to attract them we must stop electing leaders who are noise makers, education level must be considered before electing leaders*" ***AMCU Steward***

Sub-theme 2.2: Weakened collective bargaining

Participant showed great concern about possibility of trade unions losing their bargaining power. Below are some of the views from participants:

Mine Manager said "*Nowadays, unions can't just go on strike. Their members understand the impact of being on strike…this has weakened their bargaining power*"

"*Before these machines companies were scared of us [trade unions] now they don't care because machines can produce more than people*" ***AMCU Official.***

"*Introduction of technology has killed our militancy, when there's no militancy it's difficult to bargain as a team. Each union stands for itself, no more collectivism and togetherness*" ***NUM Regional leader***

Theme 3: future levels of unionism

There are two very strong views about the subject. Participants are divided between the two sub-themes

Sub-theme 3.1: Increase in membership

Based on participants' responses, about 53% of participants believe that despite introduction of technology in the industry, trade union members will continue to grow but they acknowledge that there has to be some structural changes in trade union movement. Below are some of the views:

"*I'll talk about our union, majority of our members are youth and they continue to join us. We have better benefits that entice them to join hence I believe our membership will continue to grow*" ***NUM National leader***

"*Trade union membership can only increase if they start electing people who are knowledgeable about running business. They can't achieve anything if they continue electing people who resolve everything through strikes and intimidation*" ***Mine Manager***

"*Increase of membership is a guarantee, as long managers continue to victimise us*" ***AMCU Regional leader.***

"*our scope of organising cut across three sectors, technological changes in one sector will not have meaningful impact on our membership hence I believe it can only increase*" ***NUM Regional leader***

Sub-theme 3.2: Decrease in membership

A noticeable percentage of participants believed that trade union membership will definitely decline in the future. They based their argument based on many factors including age, gender, skills, leadership etc.

"*The current leaders think being a leader is a career…they don't educate themselves hence some people are reluctant to join unions. I don't see unions increasing their members, it'll continue to drop*" ***UASA Official***

"*Truth be told, there's lots of non-unionised employees. People no longer see the need to join unions when there's low risk of being victimised by employers. Skilled employees hardly utilise union services hence they don't see value in joining. With these technological improvements, things can only get worse*" ***NUM Regional leader***

4.4 Summary of the results

This chapter focuses on the findings of the study with regard to the two study propositions. The first proposition states that for trade unions to survive the impact of the fourth industrial revolution they will require massive investment on training and development of their members. Based on the responses of the participants, themes related to the proposition were identified for ease of analysis. In relation to the first proposition, at least seven themes were identified.

The second proposition states that the fourth industrial revolution poses serious challenge to the future existence of trade unions and therefore trade unions will need visionary leaders to survive. For this proposition, three themes and four sub-themes were identified. The researcher believes that the themes identified for each proposition are sufficient for one to make informed conclusion.

CHAPTER 5. DISCUSSION OF THE RESULTS

5.1 Introduction

The objective of this chapter is to discuss the findings of the study. Qualitative data was collected through in-depth interview method. For ease of analysis, the data was transcribed and coded to give it specific themes related to the propositions. Each identified theme will the discussed separate in this chapter. The discussion will start with the first proposition and all the seven themes pertaining to it. Afterwards, the second proposition and its themes will follow in the discussion. The demographic profile of the participants has already been discussed in chapter 3 therefore it will not be discussed again in this chapter.

5.2 Discussion pertaining to Proposition 1

The first proposition of the study argued that for trade unions to survive the impact of the fourth industrial revolution they will require massive investment in training and development for their members. To conclude on the accuracy of the proposition, seven identified themes are analysed in relation to perception of the participants and literature review. These themes are discussed below:

5.2.1 *Technological changes in the workplace*

This theme was aimed at determining how much are mining companies transforming towards technology. From the responses of the participants it became clear that mining companies are already transforming towards mechanised mining. Participants acknowledged that technological changes have brought some serious challenges for trade unions. From literature review it was noted that mechanisation of mines leads to safe and cost-effective operation. This collaborates with the views of participants. Participants also noted that technology has led to an increase in specialised jobs that are out-sourced to contractors who employ fewer employees.

This threatens the existence of trade unions as it is difficult to recruit people who are only employed for a short period to perform a specific task.

5.2.2 *Employer's role in enforcing technological changes*

This theme was aimed at assessing whether employers have embraced technological changes as the new way of doing business. The study revealed that employers indeed play a role in enforcing technological changes. Their role is perceived to be instrumental in weakening trade unions' bargaining power. High levels of mechanisation results in manifestation of factors that have potential to weakening trade unions in the industry. These factors were identified as cost reduction, skills development, women empowerment and job losses.

- Cost reduction

  The employers' desire to reduce operating costs in a threat to the existence of trade unions. Cost reduction means replacing physical labour with machines to execute tasks much safer and faster. The literature revealed that the 4IR will results in job losses (Schwab, 2016 & Naude 2017).

- Skills development

  Training and skills development are a necessity for the survival of organisations under the era of 4IR. The study reveals that participants valued the importance of skills development. They noted its relevance in the era of 4IR and how important it is for future employability of trade union members. Interestingly, all participants believe that the employers should carry the burden of training and development. The trade unions' attitude to give training responsibility to employers might be dangerous to their future existence. Hlatshwayo (2014), alluded that trade unions' reluctance to train and develop their members is a reason they become reactionary when new technologies are introduced.

- Women empowerment

  Technological changes have improved women employment in the industry. Trade unions have made significant structural changes to accommodate needs of their female members.

  The NUM, for example, amended its constitution to include a women structure from branch level until national level. This is a positive move which has made NUM more attractive to female employees. However, there is high level of uncertainty amongst female employees joining trade unions. Most of them have not yet conceptualised the importance of belonging to a trade union. This is one shortcoming that trade unions need to address before it's too late.

- Job losses

  As envisaged by most scholar in the literature review, technological changes have led to massive job losses in the industry. This was also acknowledged by the participants. Unfortunately, trade unions have no solutions to job losses as employers are protected by labour relations act (LRA). The LRA empowers employers to dismiss employees for operational reasons provided there is compliance with section 189 of LRA. The platinum industry experienced twelve percent (12%) declined in employment between year 2012 and year 2016 (Chamber's report, 2016).

5.2.3 *Noticeable benefits of technological changes*

Technological changes have brought more improved working conditions with more literate personnel. There has been a massive drop in terms of mine injuries. The number of fatalities was reduced by 55% between year 2010 and year 2014. Hattingh et al (2010), stated that technology seeks to improve safety and working conditions in the mining industry.

5.2.4 *Conclusion regarding proposition 1*

The results concur with the first proposition. It is evident that trade union existence will be challenged by the emergence of 4IR hence they need to embark on training and development of their members. Unfortunately, evidence from the interviews indicates that trade unions are not yet taking full responsibility for training and development of their members. They believe that the employers should carry the burden of training and development.

5.3 Discussion pertaining to Proposition 2

The second proposition argues that the fourth industrial revolution poses serious challenge to the future existence of trade unions and therefore trade unions will need visionary leaders to survive. All themes pertaining to the proposition are discussed separately.

5.3.1 *Trade Unions' view on 4IR*

The findings reveal that trade unions are very much aware of the impact of 4IR on trade unions' sustainability and existence. They believe that mechanisation is the future of mining industry of which for them to survive they need to adapt. This view resonates with Ramlall (2003), assertion that technology changes the manner organisations are conducted. What is lacking though, from trade union perspective, is a clear strategy on how they are going to adapt. Trade unions have to transform towards meeting demands of the new labour market. All participants agreed that the labour market has changed and needs trade unions that are adaptive and flexible. If trade unions fail to adapt, they will not survive in the future.

5.3.2 *Future of trade unions*

From the findings of the study, the future of trade unions is not promising. There are two factors that were highlighted as threat to the future existence of trade unions, specialisation and collective bargaining.

- Specialisation

  Technology has led to specialisation of jobs which results in employment of skilled employees. This resonates with Hodgson (2016), assertion that innovative technology will change the character of work and the patterns of employment across industries. Specialised jobs result in reduced workforce numbers and give employees a sense of job security. Trade unions are aware that job security reduces chances of employees joining trade unions hence they might find it difficult to survive in the future.

- Collective bargaining

  Technology has weakened the bargaining power of trade unions. Skilled employees are able to individually bargain for their employment contract. This takes away the trade unions authority to bargain for the collective workforce. Participant alluded to the fact that most employees are more concerned about their careers and have no regard for struggles of other fellow workers. This is weakening the bargaining power of trade unions.

5.3.3 *Future levels of unionism*

There were two contrasting views about the future levels of unionism in the industry. It is difficult to conclude on the participants views regarding the matter. One segment of the participants believed that trade union membership is bound to increase while another believed that it can only decrease. The segment that advocated for increase in membership cited leadership maturity, employer hostility towards employees, quality service to members and trade union benefits as some of the reasons for their argument. The employment of young skilled workers and specialisation of jobs were highlighted as some of the reasons why trade union membership will decrease. The reduction of workforce by close to 26 000 workers between years 2012 and 2016 (Chamber of Mines' report, 2017), makes it more likely to conclude on possible reduction in future trade union membership.

5.3.4 *Conclusion regarding proposition 2*

The findings of the study suggest that trade unions are aware of the need to adapt to technological changes. They highlight the trade unions' analysis on their future. However, there is no concrete evidence that suggest that there is a need, specifically, for visionary leadership. It therefore cannot be concluded that visionary leadership is needed for future survival of trade unions.

5.4 Conclusion

This chapter dealt with the discussion of the research findings that were presented in chapter 4. The findings were discussed according to different themes related to each study proposition. Proposition 1, claimed that for trade unions to survive the impact of the fourth industrial revolution they will require massive investment in training and development for their members. With regard to this proposition, seven themes were identified and discussed. All these themes were discussed in conjunction with the literature review with the aim of finding either similarities or differences with previous studies. The discussion of the seven themes led to conclusion that corresponds with the first proposition. The results concur with the first proposition. It is evident that trade union existence will be challenged by the emergence of 4IR hence they need to embark on training and development of their members. Therefore, proposition 1 was proven to be valid.

The second proposition was tested through discussion of three major themes that were identified. Again, the study findings were compared to the literature to determine if there are any similarities or differences. Unfortunately, the findings of the study were not sufficient to support the second proposition. It, therefore, cannot be concluded that visionary leadership is needed for future survival of trade unions. Therefore proposition 2 is not accepted.

CHAPTER 6. CONCLUSIONS & RECOMMENDATIONS

6.1 Introduction

This chapter aims at providing conclusion and recommendations based on the findings of the study. The conclusion will determine whether the research problem and sub-problems have been clear addressed. The study will make recommendations for future research based on the study's findings and shortcomings.

6.2 Conclusions of the study

The study argued that 4IR impacts on jobs thereby threatening the sustainability and existence of trade unions. The trade union's response to 4IR will determine their future existence. The study revealed that training and development will play a major role in ensuring trade union sustainability. However, trade union leaders have not yet derived mechanism to train and develop their members for the imminent 4IR. This failure might threaten trade union's future existence and sustainability as stated by Hlatshwayo (2014), that TUs' failure to acknowledge technological changes as a subject that requires research, education and organisational capacities is posing serious challenges to their future existence and sustainability. At any workplace where trade unions exist they should build training facilities to train their members for future skills. They can form partnership with employers to minimise the cost effect and guarantee future employment of the trained members.

In future, trade unions will not be attractive to employees. Trade union leaders need to transform their organisation to be adaptive to the new era of technological changes. Trade union leaders can no longer afford to continue acting on behalf of members as collective.

Each member has different needs and trade unions should strive to meet such needs to convince members that they are advocating for their interests.

Trade union leaders should appeal to all categories of their members. The youthful skilled members should also feel represented by their trade unions. Trade union leaders have to address the perception that they are no longer relevant especial amongst young and female members.

Trade union need to improve their services and benefits to members. Members will no longer join trade unions for protection in the workplace. They'll need some social development and personal development opportunities. Trade unions should consider adopting social-movement unionism as explained by Hyman (2001). The quality of service delivered can be improved through membership benefits such as bursaries for members and their dependants, providing day care services for all female members, providing free training on financial services and pension funds, free funeral covers and developing applications for ease of communication.

In the platinum mining industry employers are already implementing technological changes. These changes have led to massive job losses which caught trade unions off guard. Trade unions should persuade employers to fund community development programmes that will be aimed at developing community members for future employment in the mines. Trade unions should play a major role in creation of decent and permanent jobs for the surrounding communities. This will ensure that they remain relevant especially amongst the young and female employees.

6.3 Recommendations

There is need for trade unions to work together with employers to prepare their members for highly technological workplace. Technology reduces operating cost and ensures safe production hence it is beneficial to all stakeholders.

Trade union leaders should embark on roadshows to increase awareness of 4IR and its impact on jobs and members. The awareness will educate members on how to adapt and respond to the challenges of 4IR. The leaders and their education desks should ensure that members participate in these roadshows.

Both the employers and trade unions should start researching on mechanisms that can be put in place to avoid job losses due to innovative technologies.

Through NEDLAC, trade unions and employers should advocate for government subsidy in training and development for future jobs. This subsidy should be specific for specialised skills that will be needed in the future. The employers should also go beyond complying with skills development legislature and assist in identifying specialised skills that require training and development.

6.4 Suggestions for further research

The participants in the study were mainly people who are in leadership positions. Perhaps the findings of the study might be different if the sample could be extended to ordinary members of trade union and mine employees.

The scope of the research was only limited to the platinum mining industry. It is suggested that for future studies the scope could be extended to the broader mining industry or other industries such as manufacturing, services, agriculture etc.

The trade unions should also conduct their own study on the impact of fourth industrial revolution. This will assist them to make empirical argument from an informed point of view. Again, they'll better equip themselves to deal with the consequences of 4IR.

REFERENCES

Adlam, R., & Villiers, P. (2003). Police leadership in the 21st century: Philosophy, Doctrine and Developments (1st edition). UK: Waterside Press.

Ahlers, E. (2016). Flexible and remote work in the context of digitization and occupational health. International Journal of Labour Research, 8(1-2), 85 – 99.

Akhtar, P., & Moore, P. (2016). The psychosocial impacts of technological change in contemporary workplaces, and trade union responses. International Journal of Labour Research, 8(1-2), 101– 131.

Anderson, T. D., Ford, R., & Hamilton, M. (1998). Transforming leadership: Equipping yourself and coaching others to build leadership organisation (6th Edition). London: St. Lucie Press

Antwi, S.K., & Hamza, K. (2015). Qualitative and quantitative research paradigms in business research: A Philosophical Reflection. European Journal of Business and Management, 7 (3), 217 – 225.

Bhorat, H., Naidoo, K. & Yu, D. (2014). Trade Unions in an Emerging Economy: The Case of South Africa. Development Policy Research Unit Working Paper 201402. DPRU, University of Cape Town.

Bloom, N. & Van Reenen, J. (2010). Why do Management Practices Differ across Firms and Countries? Journal of Economic Perspectives, 24(1), 203 – 224.

Bloem, J., Van Doorn, M., Duivestein, S., Excoffier, D., Maas, R., & Van Ommeren, E. (2014). The Fourth Industrial Revolution: Things to Tighten the Link between IT and OT. VINT research report 3 of 4 (pp. 1 – 40). Sogeti.

Boyce, C., & Neale, P. (2006). Conducting In-depth Interviews: A Guide for Designing and Conducting In-depth Interviews for Evaluation Input (pp. 1 – 16). Pathfinder International.

Daud, Z & Tumin, S. (2013). The relationship between employees' need and the formation of trade union: The Malaysian manufacturing company's experience. International Journal of Business and Social Science, 4 (13), 124 – 134.

Dubrin, A. J. (1998). Leadership: Research findings, practice and skills (2nd edition). Boston: Houghton Mifflin

Evangelopoulos, N. (2011). The principles of scientific management and its Impact on scholarly work and managerial practice. Journal of Business and Management, 17 (1), 58 – 74.

"Facts and Figures" (2016). Chamber of mines of South Africa, June 2017 (pp. 1 - 40).

"Global manufacturing competitive index" (2016). Deloitte, 2016 (pp 1 – 80)

Germain, V. (2016). Winning with purpose in the Fourth Industrial Revolution. Heidrick & Struggles, 2016 (pp. 1 – 4). Retrieved from http://www.heidrick.com/knowledge-center/Publication/The-CEO-Report

Gray, A. (2016, 20 - 23 January). The 10 skills you need to thrive in the fourth industrial revolution. Presentation at World Economic Forum, Davos, Switzerland. Retrieved from https://www.weforum.org/agenda/2016/01/the-10-skills-you-need-to-thrive-in-the-fourth-industrial-revolution

Guba, E. G., & Lincoln, Y. S. (1981). Effective evaluation: Improving the usefulness of evaluation results through responsive and naturalistic approaches. San Francisco: Jossey-Bass

Hattingh T.S., Sheer T.J., & Du Plessis A.G. (2010). Human factors in mine mechanization. The Southern African Institute of Mining and Metallurgy, 255 – 258.

Hlatshwayo, M., & Buhlungu, S. (2017). Work reorganisation and technological change: limits of trade union strategy and action at ArcelorMittal, Vanderbijlpark. African Sociological Review, 21 (1), 126 - 153

Hlatshwayo, M (2017). Technological Changes and Manufacturing Unions in South Africa: Failure to Formulate a Robust Response. Global Labour Journal, 8(2), 100 – 119.

Hlatshwayo, M. (2014). NUMSA and Solidarity's Responses to Technological Changes at the ArcelorMittal Vanderbijlpark Plant: Unions caught on the Back Foot. Global Labour Journal, 5(3), 283–305.

Hodgson, G. M. (2016). The future of work in the twenty-first century. Journal of Economic Issues, L (1), 197 – 216

Hyman. R. (2001). Understanding European Trade Unionism: Between Market, Class and Society, (1st edition). London: Sage Publications Ltd

Ivanov, S. (2017). Robonomics - principles, benefits, challenges, solutions. Yearbook of Varna University of Management, 10, 283-293.

Jose, AV. (1999). The future of the labour movement: some observations on developing countries. Geneva: International Labour Organisation (Discussion papers, DP/112/1999.) retrieved from: http://www.ilo.org/public/english/region/ampro/cinterfor/temas/worker/doc/otros/xi/dp11299.pdf

King, N., & Horrocks, C. (2010). Interviews in qualitative research (1st edition). London: Sage Publications Ltd

Lars, G., Kuhn, A.T., Rule, D., Bellmann, C., Dawood, D., Moore, P., Kulik, J., Siemes, S., Singh, L., & Standley, M. (April, 2015). A Discussion of Qualifications and Skills in the Factory of the Future: A German and American Perspective. Düsseldorf, Germany.

Naude, W. (2017). Entrepreneurship, Education and the fourth industrial revolution in Africa. Discussion paper, IZA DP No. 10855, (pp. 1 – 22). IZA – Institute of Labour Economics, Germany.

Neuman, L.W. (2000). Social Research Methods: Quantitative and Qualitative Approaches (4th Edition). Boston: Allyn and Bacon

Odhong, E.A., & Omolo, J. (2014). An analysis of the factors affecting employee relations in the flower industry in Kenya: Case of Waridi Ltd, Athi River. International Journal of Business and Social Science, 5 (11), 147 – 160.

Pryor, M.G., Taneja, S., Humphreys, J., Anderson, D. & Singleton, L. (2008). Challenges facing change management theories and research. Delhi Business Review, 9 (1), 1 – 20.

Rahi, S. (2017). Research design and methods: A systematic review of research paradigms, sampling issues and instruments development. International Journal of Economics and Management Sciences, 6 (2), 1 – 5.

Ramlall, SJ. (2003). Enhancing the effectiveness of HR through the integration of IT. Journal of Business & Economics Research, 1(10), 47-56.

Ratna, R. & Kaur, T. (2012). Measuring impact of trade unions on workmen satisfaction in a manufacturing unit. International Journal of Management and Social Sciences Research, 1 (1), 49 – 54.

Saldana, J. (2009). The coding manual for qualitative researchers (3rd edition). London: Sage Publications Ltd.

Sarker, M.S.I., & Khan, M. R.A. (2013). Classical and neoclassical approaches of management: An overview. IOSR Journal of Business and Management, 14 (6), 1 – 5.

Schermerhorn, J. R., Hunt, J. G. & Osborn, R. N. (2000). Organisational Behaviour (7th edition). USA: John Wiley & Sons, Inc.

Schwab, Klaus. (14 January 2016). Fourth Industrial Revolution: what it means, how to respond. World economic forum. Retrieved from https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond

Sergiovanni, T. J. (2007). Rethinking Leadership: A collection of articles (2nd edition). London: Sage Publications Ltd

Stearns, P. N. (2012). The Industrial Revolution in World History (4th edition). Philadelphia: Westview Press.

Stoddard, E.D (14 October 2014). Platinum mines push for automation despite costs. Mail and Guardian. Accessed on 26 July 2016 from: https://mg.co.za/article/2014-10-14-platinum-mines-push-for-mechanisation/

Strydom, A. (2008). The experiences of designated employees in a predominantly white consulting business unit. Master's dissertation, North West University, Potchefstroom.

Tahir, N., Yousafzai, I. K., Jan, S., & Hashim, M. (2014). The Impact of training and development on employees performance and productivity: case study of United Bank Limited Peshawar City, KPK, Pakistan. International Journal of Academic Research in Business and Social Sciences, 4 (4), 86 – 98.

The fourth industrial revolution (10 February 2016). Premium Times. Accessed July 26, 2017, from https://i1.wp.com/media.premiumtimesng.com/wp-content/files/sites/2/2016/10/Fourth-industrial-revolution.jpg.

Tellis, G.J (2006). Disruptive technology or visionary leadership. The journal of product innovation management, 23 (1), 34 – 38

Trochim, W. K., & Donnelly, J. P. (2007). The research methods knowledge base (3rd Edition). USA: Thomson Custom Publishing.

Uys, M (2011). Factors influencing future existence of trade unions in South Africa. PHD dissertation, North West University, Potchefstroom.

Venter, R. (2003). Labour relations in South Africa (2nd Edition). Cape Town: Oxford University Press.

Willis, R.P.H., Dixon, J.R., Cox, J.A., & Pooley, A.D. (2004). A framework for the introduction of mechanized mining. The South African Institute of Mining and Metallurgy, 28 (1), 117 - 124

Yordsala, S., Tesaputa, K and Sri-Ampai, A. (2014). The development of visionary leadership administrators in Thai primary school. Journal of International Education Studies, 7 (1), 92 – 101.